

Kingdom of Cambodia
Ministry of Public Works and Transport

**The Project for Improving the
Logistics System of Cambodia
(Data Collection Survey on Transport of
Railway and Agricultural Products)**

Final Report

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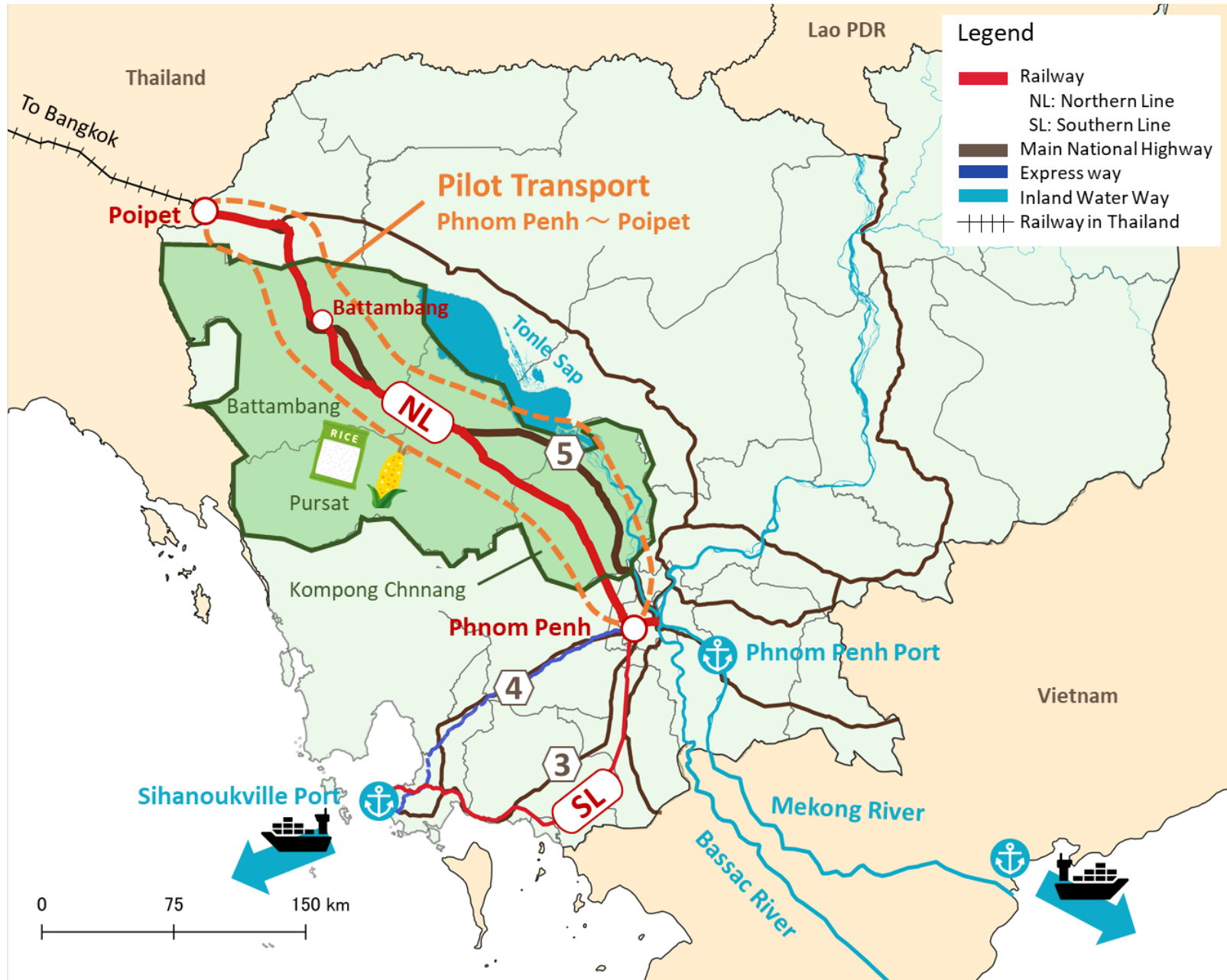
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Data Collection Survey on Transport of Railway and Agricultural Products in Cambodia



Survey Location Map

Executive Summary

Background and Objectives of the Survey

1. This survey was conducted as part of the “Project for Improving the Logistics System of Cambodia” (from May 2018 to June 2023 (tentative date)), which is being implemented by JICA to assist to achieve the goals of Industrial Development Policy, which is being implemented by the Cambodian government as part of its 2015 Growth Strategy.
2. In order to improve logistics efficiency and reduce logistics costs, the survey was implemented from March to May 2023 to improve existing freight railway, organize information for the opening of international train services, and for agricultural products for export (rice and corn), induce a shift from existing transport (trucks) to railway and inland water transport (modal shift), thereby improving logistics efficiency and reducing logistics costs.

Survey Details

3. Firstly, regarding railway transport, the survey team summarized the current status of railway infrastructure in Cambodia and the outline of railway projects and improvement plans, and identified issues in freight railway transport. In addition, pilot transport was conducted for the Northern line to compare actual service levels (lead times, costs, and procedures) between freight railway and truck transport. Also, a case study was conducted to promote freight railway transport in Thailand, and suggestions were summarized, as well as confirmation of progress and issues related to the implementation of cross-border transport between Thailand and Cambodia.
4. Secondly, with regard to the transport of agricultural products for export, the current status of the logistics of exported agricultural products (rice and corn) was confirmed, and the current distribution routes and production areas were identified. The main destinations were identified and transport scenarios (target agricultural products, expected production areas, distribution routes, ports for export and destination countries) were proposed. In the conditions of the proposed scenario, costs, lead times, and so on for (A) current truck transport, (B) inland water transport (via Phnom Penh and Ho Chi Minh), and (C) railway transport under each scenario were compared. The costs and lead times for (A) truck transport, (B) inland water transport (via Phnom Penh Port and Ho Chi Minh) and (C) railway transport were compared. Based on the results, the conditions under which modal shift from truck transport could proceed were summarized, and cost reduction measures for current truck transport were also proposed.
5. Finally, based on the survey results in freight railway and transport of agricultural products, the survey team proposed measures that the Cambodian government should take to improve logistics efficiency and reduce logistics costs in Cambodia.

Considerations and Conclusions

A part of freight railway

6. Cambodia's railway network consists of the Northern and Southern lines. These lines were damaged by the civil war, and although rehabilitated with funds of Asian Development Bank (ADB) and Cambodian government, there are still sections where axle load and design speeds are restricted.
7. In terms of operations, Royal Railway Public Limited Company (RR) operates railway transport under a concession agreement with the Ministry of Public Works and Transport (MPWT), However, delays and accidents occur frequently.
8. Through the pilot transport conducted in this survey between Phnom Penh and Poipet, the transport time of freight railway is about 1.5-2 times longer than that of truck transport. Regarding vibration, relatively large vibrations (5-7 G) were continuously occurring in the railway transport. On the other hand, in truck transport, although the continuous vibration was relatively small, large vibrations (>10 G) were observed, and the movement of the goods due to vibration was also greater than in railway transport. With regard to procedures, since only one container was transported by railway as a plot transport, it was left at the yard and required frequent time and destination changes due to other shipper's request, and waiting for the preceding another prioritized train to finish. While some infrastructure issues were identified, such as the waiting and loading/unloading manner at Container Yard (CY), railway transport costs were 24% less than that of truck transport.
9. According to the interview with logistics companies and shippers, cost is one of the most important items which influence the choice of transport mode. Railway transport is complicated by the need to coordinate with RR as well as truckers because last-mile delivery is by truck. However, improving infrastructure such as track conditions and CY construction and improvement, as well as improving punctuality and application procedures to use freight railway by users, will promote railway transport.
10. The case study for promoting freight railway transport in Thailand focused on Lat Krabang Inland Container Depot (ICD), which is located in the suburbs of Bangkok and is capable of bonded transport, and Single Rail Transfer Operator (SRTO), a facility and operator that handles container transport at Laem Chabang port and railway station. The survey team also proposed measures to be applied to Cambodia, such as bonded transport by railway, development of rail transport hubs by the government, and connectivity improvement between ports and railway.
11. With regard to cross-border transport with Thailand, the survey team confirmed that preparations are underway between the two countries with the preparation of cross-border transport by the end of 2023. As of April 2023, no critical bottlenecks were identified, although intergovernmental discussions have been completed and are pending coordination, mainly between railway operators and Customs authorities.

A part of Logistics of agricultural products for export

12. In the rice value chain, paddy rice is collected and milled at rice mills, and white rice is transported from there. There is an advantage of railway transport in mass point-to-point transportation in comparison with truck transport. Therefore, it was confirmed that several rice mills have already constructed dedicated stations for transporting rice and have started railway transport from Battambang area.
13. As for corn, the production areas are widely dispersed, so the logistics routes are also diversified. Since most corn is processed into mixed feed with other grains, it is difficult to confirm export trends. These production areas are far from railway and inland water transport routes, and it was found difficult to shift from the current truck transport.
14. The transport volume of rice by railway is estimated at about 2% of the transport volume of all commodities. Currently, most of them are transported by truck. Statistically, the amount of rice exported to neighboring countries is zero, and it is confirmed that rice cannot be transported to Thailand even if it is for transit. The rice export ports are Sihanoukville Port or Phnom Penh Port, and the estimated share of their respective rice export volume in 2022 was 84:16.
15. China (mainland) (49.5%) was the main destination of white rice exports from Cambodia in 2021, followed by France (11.7%). Exports to China (mainland) have increased sharply since 2015, surpassing France in 2016 to become the largest. Looking at the import unit price of white rice, that of the EU was higher than that of China and Malaysia, confirming a tendency to prefer high-grade rice.
16. The main export destinations of white rice from Phnom Penh Port are China (mainland), Netherland and China (Hong Kong) (2022). The percentage of white rice exports to China (mainland), which has the highest export volume from Phnom Penh Port (2022), shows 67.6% for Sihanoukville Port and 32.4% for Phnom Penh with 32.4%, with Sihanoukville port still having a higher share. As for other export destinations, most exports are from the Sihanoukville port.
17. Phnom Penh port is a river port and rice is transported by inland water transport via Vietnam. When transiting in Vietnam, it is a burden for exporters to prepare certificates and to undergo inspection, which are the reason why the rate of Phnom Penh port is lower.
18. Cambodia was removed from the EU tax exemption list in 2020. Therefore, Cambodia has been exposed to market competition with neighboring Thailand and Vietnam, and in order to maintain its market share of white rice in the EU, it is necessary to strengthen its price competitiveness by lowering the export unit price. The domestic transportation cost included in the export unit price is estimated to be about twice that of Vietnam, and it is necessary to reduce the transportation cost by shifting to rail transport.
19. Although there are no official records, a large amount of Cambodian rice is exported to Vietnam and

Thailand as unhulled and unpolished paddy rice. As the unit price per weight of rice increases by 2.1 to 2.3 times by milling, exporting paddy rice is a big opportunity loss for Cambodia.

20. By promoting the export of white rice through a reduction in the unit export price, the amount of rice milled could be increased, which would have an indirect economic impact. In particular, the rice mill cluster in the northern part of Battambang is expected to benefit a large number of farmers as paddy from a wide range of regions is accumulated there.
21. Scenarios for transportation cost estimation are based on the following three assumptions. (1) Loading capacity of 25 tons in a 20FT container, (2) Originating from Battambang rice mill collection point, (3) Destination in France, comparing three modes of truck transport (A), inland water transport (B) and railway transport (C).
22. Truck transport (A), inland water transport (B) and rail transport (C) transport loaded containers by trucks from collection points to Sihanoukville port, Chondeur Svar station and Phnom Penh port respectively. Rail transport (C) departs from Chondeur Svar station and arrives at Sihanoukville Port station. The transit ports are Sihanoukville port for truck transport (A) and rail transport (C), and Phnom Penh port for inland water transport (B). premised. The comparison results are shown in the table below.

Summary Table 1 Summary of Comparison Results by Mode (Truck, Inland Water Transport, and railway Transport)

Mode	A: Truck	B: IWT	C: Rail
Cost (USD/container)			
Land transport cost (i)	1,437 (1.00)*	1,419 (0.99)*	1,040 (0.72)*
Vessel cost (ii)	1,205 (1.00)*	1,345 (1.12)*	1,205 (1.00)*
Total (i+ii)	2,642 (1.00)*	2,764 (1.06)*	2,245 (0.85)*

Note: Ratio when track (A) is set to 1

Source: The JICA Survey Team

23. The comparison showed that truck transport was the most expensive with a total cost of USD 2,642 (including USD 1,437 for land transport), inland water transport with a total cost of USD 2,764 (including USD 1,419 for land transport), and freight railway transport with a total cost of USD 2,245 (including USD 1,040 for land transport). railway transport was the cheapest.
24. When transporting white rice from Battambang to Sihanoukville port, shifting from truck (A) to railway (C) could reduce transport cost by about 28%. When confirmed with the local rice mills, it was confirmed that there was an opinion that they would like to shift to the railway transport (C) under these conditions. However, some of them were concerned about the initial investment cost such as construction of spur line and procurement of equipment for loading from/ to wagons to shift to railway transport.
25. As for the conditions for conversion from truck transport (A) to inland water transport (B), the comparison shows that there is almost no difference in transport costs. Therefore, without simplification of procedures in Vietnam, it would be difficult to shift to inland water transport.

26. Regarding truck transport, Cambodia Trucking Association (CAMTA), an industrial association, is requesting the Cambodian government to deregulate the length of trucks from 16m to 16.7m, and it is expected to reduce vehicle procurement costs because it promotes price competition among various vehicle manufacturers.

Compilation of survey results (proposed project)

27. The projects proposed through the survey and the summary are shown in the table below.

Summary Table 2 List of Proposed Projects (Summary)

Type	Name of project [Implementing Agency]	Scope	Timeline
Rail	R1_Track improvement project [DoR].	-Improvement of tracks, bridges and culverts -Introduction of facilities in CY (oil filling line, handling line, etc.)	Short-Mid
Rail (Agri.)	R2_Station development for Rice distribution [DoR/ Provincial Government].	Development of hub (CY) for rice distribution	Mid
Rail	R3_Capacity building on MPWT [DoR].	R3-1_Assistance on modification of the Concession agr. R3-2_Assistance to realize international freight train operation R3-3_Support for supervision of track improvement (15t→20t) R3-4_Asset management	Short
Rail	R4_Safety improvement [DoR].	R4-1_Installation of safety devices (e.g., warning device, fence) R4-2_Education and campaign for safety R4-3_Establishment of accident investigation committee	Short
truck (Agri.)	T1_Relaxing of Load Weight and Truck Length regulation Designated road for heavy trucks [GDLT].	To ease regulation for specified road for tuck (Truck length: 16m→16.7m, Load weight: 40 ton→50ton)	Short
IWT (Agri.)	W1_River port development [MPWT/ PPAP].	River port development (Chong Khneas, Kompong Chhnang, Prek Kdam, Kompong Leaeng, Boeungket, Chhlong, Sovannaphum) -Warehouse, Bulk Cargo terminal	Long
IWT (Agri.)	W2_Formality enhancement on international trade via PPAP [MPWT].	Request for Vietnam Customs	Short

Source: The JICA Survey Team

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Final Report

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Abbreviations

Abbreviation	Official Terms
ADB	Asian Development Bank
BTB	Battambang
CAMTA	Cambodia Trucking Association
CBTA	Cross-border Transport Agreement
CIF	Cost, Insurance and Freight
CRF	Cambodia Rice Federation
CY	Container Yard
DoR	Department of Railway
EBA	Everything But Arms
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FOB	Free on Board
FT	Feet
GDL	General Department Logistics
GDLT	General Department of Land Transport
GDP	Gross Domestic Product
GMS	Greater Mekong Subregion
GPS	Global Positioning System
GSP	Generalized System of Preferences
Ha	Hectare
HCM	Ho Chi Minh
ICD	Inland Container Depot
IDP	Industrial Development Policy
ISO	International Organization for Standardization
IWT	Inland Water Transport
JICA	Japan International Cooperation Agency
KHR	Khmer Riel
LCB	Laem Chabang
LDC	Least Developed Countries
LKB	Lat Krabang
LM	Lower Mekong
LOLO	Lift on Lift off
MAFF	Ministry of Agriculture, Forestry and Fisheries
MPH	Move per hour
MPWT	Ministry of Public Works and Transport
NH	National Highway
NLC	National Logistics Council
NLSC	National Logistics Steering Committee
PAS	Port Autonomous Sihanoukville
PAT	Port Authority of Thailand
PK	Kilometer Post
PLC	Public Limited Company
PP	Phnom Penh
PPAP	Phnom Penh Autonomous Port
PPP	Public Private Partnership
PPSEZ	Phnom Penh Special Economic Zone
RMG	Rail Mounted Gantry Crane
RR	Royal Railway Public Limited Company
RRC	Royal Railway of Cambodia
RTG	Rubber Tired Gantry Crane
SEZ	Special Economic Zone
SHV	Sihanoukville
SKO	Sen Kro Ob
SRT	State Railway of Thailand
SRTO	Single Rail Transfer Operator
TEU	Twenty feet Equivalent Unit
THB	Thai Baht
THC	Terminal Handling Charge
TS	Tonle Sap
UM	Upper Mekong
USD	United States Dollar
VAT	Value Added Tax

Chapter 1 Survey Outline

1.1 Background of Survey

Cambodia is located along the Southern Economic Corridor of the Greater Mekong Subregion (GMS) and is situated at a strategic point with potential as a transit base for horizontal integration with neighboring countries and international trade. In recent years, private investment in labor-intensive industries such as garment industry has expanded, taking advantage of inexpensive labor and location characteristics, and the country has achieved steady economic growth. In the midst of expanding global supply chains, the Cambodian government is expanding the Southern Economic Corridor, Sihanoukville Port, and other transport infrastructure to further improve connectivity with neighboring countries. Therefore, the issue is to strengthen the overall logistics system, including human resources, policies, and institutional issues.

The Cambodian government formulated the Industrial Development Policy 2015-2025 (IDP) as its growth strategy for 2015, aiming to achieve a shift from labor-intensive industries that support current economic growth to a more skilled and technical worker-centered industrial form by 2025. The IDP has established comprehensive measures to achieve its goals, especially four priorities to be implemented by the end of 2018: 1) reduction of industrial electricity prices, 2) formulation and implementation of the Master Plan (M/P) for Logistics, 3) strengthening labor market mechanisms and technical training, and 4) development of Sihanouk Province as a multipurpose special economic zone model, and Initiatives were initiated.

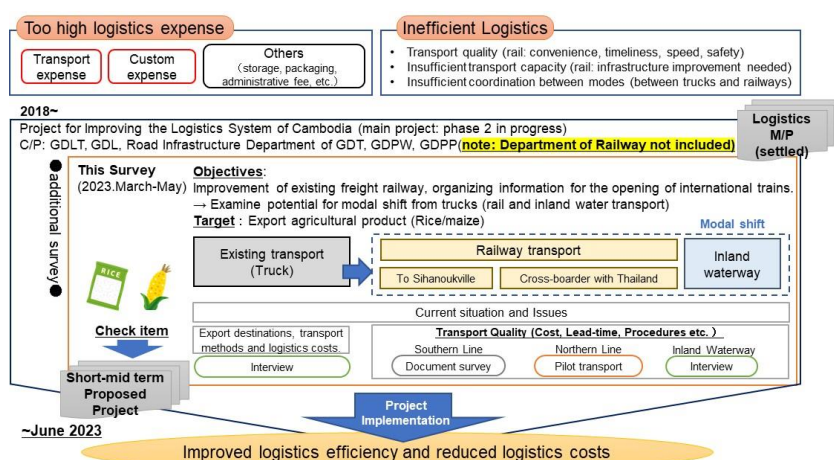
Of these, the Ministry of Public Works and Transport (MPWT), which is in charge of transport infrastructure, established the General Department of Logistics (GDL) in October 2016 to formulate and implement the logistics M/P, and is developing a system to improve the logistics system across organizations through the establishment of the National Logistics Council (NLC) and the National Logistics Steering Committee (NLSC). At the request of the Government of Cambodia, JICA has been providing technical assistance for the formulation of the Logistics M/P, the development of a cross-organizational implementation framework, the implementation and coordination of priority projects, and the establishment of an evaluation and monitoring system, in order to facilitate the implementation of the Logistics M/P through capacity building of the GDL and logistics-related institutions. The Logistics System Improvement Project (hereinafter referred to as the 'main project') is being implemented from May 2018 to June 2023 with the aim of contributing to the improvement of Cambodia's logistics system to one that is affordable, stable and reliable.

In the course of implementing the main project, it is expected to survey the possibility of modal shift, including strengthening the railway network to reduce logistics costs in Cambodia, and to improve the logistics of agricultural products for export. The project team is expected to identify the current status and issues of the logistics of major agricultural exports, and to survey and organize the necessary measures for improvement in the short- to medium-term, and to compile them into a proposal.

1.2 Purpose of Survey

The positioning of this survey in light of the background of the survey is shown in Figure 1-1.

The counterpart for the main project does not include the Department of Railway (MPWT: DoR), and the implementation of the railway project formulated in the draft logistics M/P has been somewhat delayed¹. As part of the main project, this survey will compile information for improving existing freight railways and opening international train routes in order to improve logistics costs (mainly transport and customs clearance costs), which are still below international standards, and inefficient logistics systems. The purpose of this program is to induce a modal shift from existing transport (trucks) to railway and inland water transport (modal shift), thereby improving logistics efficiency and reducing logistics costs.



Note: GDLT (General Department of Land Transport), GDL (General Department of Logistics), GDT (General Department of Technique), GDPW (General Department of Public Works), GDPP (General Department of Policy and Planning)
Source: The JICA Survey Team

Figure 1-1 Positioning of this survey

While railway and agricultural products for export are the focus of this survey, export cargoes fall into two main categories: containers and bulk. Table 1-1 shows the correspondence between the transport modes covered in this survey and the transported goods when the containers are classified into agricultural and other categories. Chapter 3, "Current Status and Issues of Railway," describes the blue box, and Chapter 4, "Current Status and Issues in the Logistics Sector of Agricultural Products for Export," describes the contents of the green box.

Table 1-1 Correspondence between transport mode and transported goods

	Target Goods		
	Container Transport		Bulk transport
	Agri.	Except agri. products	Fuel, etc.
Transport Mode	Railway	✓	✓
	Waterway	✓	N/A
	Road	✓	N/A

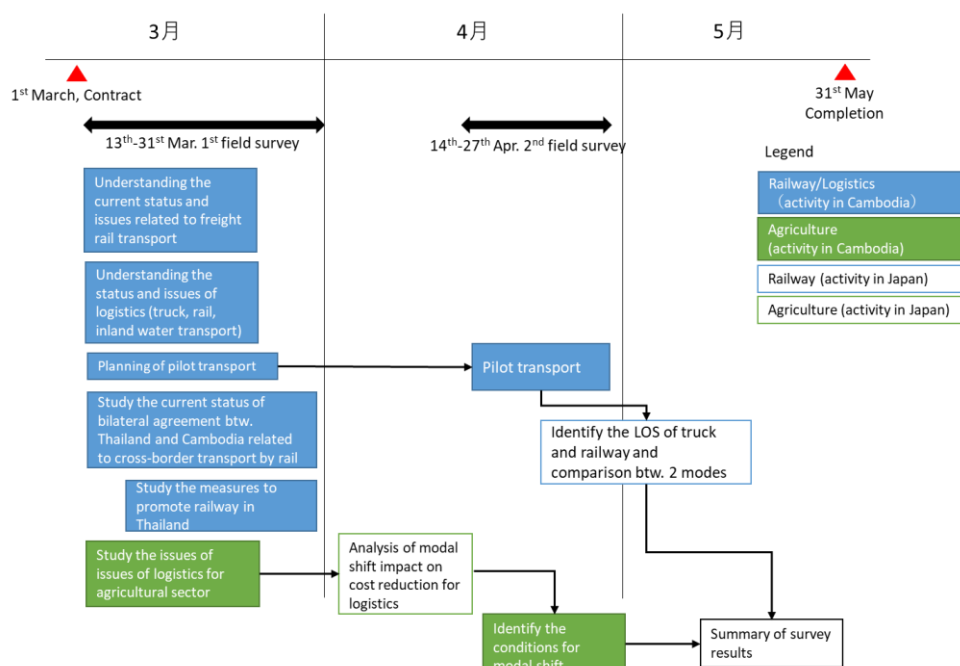
Note: Items marked ✓ are covered by this survey; N/A are not covered.

Source: The JICA Survey Team

¹ Annual Report on Implementation of Interim Master Plan on Intermodal Transport Connectivity and Logistics System of Cambodia 2021

1.3 Work Flow

This survey was conducted over a three-month period from March to May 2023. Of these, two field surveys in Cambodia were conducted: the first from Monday, March 13 to Friday, March 31 (three weeks), and the second from Monday, April 14 to Thursday, April 27 (two weeks). The overall survey process and activities are described below.



Source: The JICA Survey Team

Figure 1-2 Survey process

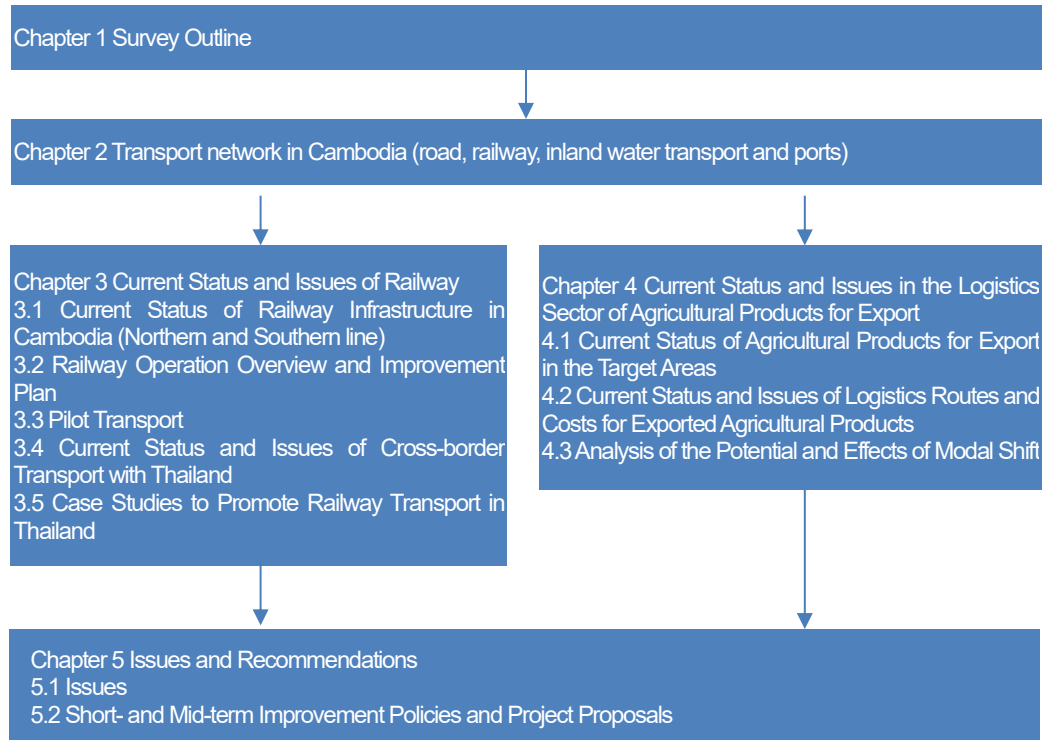
Table 1-2 Survey content and interviews conducted

Field	survey item	Summary of interview sites
Railway/ Logistics	Current Status of Freight Railway Transport	Local government agencies Railway operators SEZ Japanese Companies Japanese and local logistics providers
Railway /Logistics	Understanding the current status and issues in logistics	Port Authority Japanese Companies in PPSEZ Japanese-affiliated and logistics companies Private Dryport Management Company Trucking Association
Railway/ Logistics	Understanding the status of discussions and issues of the Cambodia-Thailand Bilateral Agreement	Local government agencies Customs authorities
Railway/ Logistics	Understanding Measures to Promote Freight Railways in Thailand	Thai government agencies State Railway of Thailand Thai Customs Supporting Organizations in Thailand
Transport of agricultural products	Understanding the current status and issues in transport and logistics of agricultural products	Rice miller Agricultural Association Warehousing and processing companies
Railways/Logistics	Organizing the conditions required for modal shift	Rice miller Logistics company handling agricultural products

Source: The JICA Survey Team

1.4 Structure of the Report

The structure of this survey is shown in Figure 1-3.

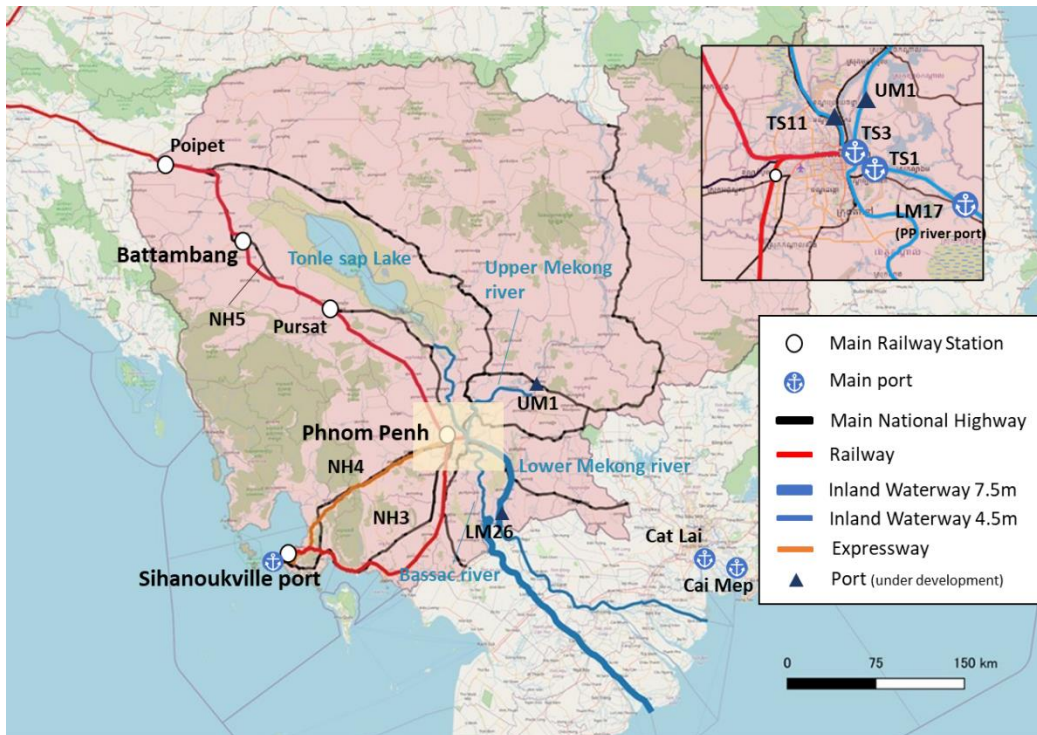


Source: The JICA Survey Team

Figure 1-3 Structure of this report

Chapter 2 Transport Network in Cambodia (road, railway, inland water transport and ports)

This chapter outlines the logistics and transport network in Cambodia. Since products for export are the main target of this survey, descriptions of ports that handle exported goods are also included. With regard to overland exports, it focuses on connections with Thailand, focusing on the National Highway: NH3, NH4 and NH5 that connect to Thailand. An overview of the network is shown in Figure 2-1.



Source: The JICA Survey Team, © Openstreetmap contributors

Figure 2-1 Logistics and transport network in Cambodia

2.1 Road

This section describes the national highways (Table 2-1) that are mainly used in parallel with Northern line and Southern line of railway.

Table 2-1 Major National Highways corresponding to railway network

Section	Road Name	Distance
Railway Northern Line Section (Poipet-Phnom Penh)	National Highway 5	Approx. 370 km
	National Highway 4	Approx. 210 km
Railway Southern line Section (Phnom Penh-Sihanoukville)	National Highway 3	Approx. 200 km
	Expressway	Approx. 190 km

Source: The JICA Survey Team

National Highway 5 (NH5), which is a parallel section to Northern Railway Line and connects Poipet to Phnom Penh, runs from Phnom Penh to the Thai border at Poipet via the major cities of Pursat, Battambang, and Banteay Meanchey. The route is used for export agricultural products harvested in the Battambang area to Phnom Penh

and for overland transport of cross-border cargo from and to Thailand. According to interviews with Poipet Customs, the annual truck traffic last year (January to December 2022) was 58,680 trucks from Thailand to Cambodia and 6,478 trucks from Cambodia to Thailand², with 9:1 import-to-export ratio, and most of the goods imported from Thailand were trucked to Phnom Penh via NH5. As of May 2023, transport time by truck from Poipet to Phnom Penh is generally 10-12 hours (Figure 2-2). In addition, NH5 is being rehabilitated by a yen loan project, with some sections already completed and the entire route expected to be completed by the end of 2023.

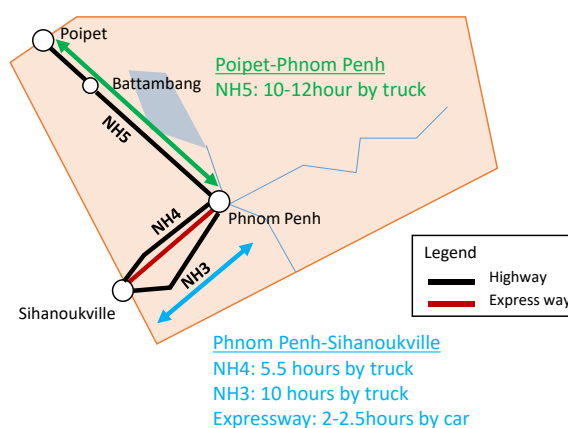
As for the section parallel to the southern railway line, the main routes connecting Phnom Penh and Sihanoukville are National Highway 4 (NH4) and National Highway 3 (NH3), plus an expressway that opened in 2022 (Figure 2-2). NH3 pavement is not in good condition at the junction with NH4 near Sihanoukville, and it takes about 10 hours to drive from Phnom Penh to Sihanoukville, so NH3 is basically not used for truck transport.³

The expressway has different tolls depending on the size of the vehicle, but as shown in Table 2-2, large trailers are not widely used for freight transport because of the high cost of USD 60 one-way.

Table 2-2 PP-SHV Expressway tolls

classification	Description	Unit price per distance	PP-SHV Rates
A	(1) Motorcycles of 600 CC or more (2) Passenger cars for 7 passengers or less (3) Trucks under 2 tons	0.064USD/km	12USD
B	1) Medium-sized buses for 8-19 passengers 2) 2-5 ton trucks	0.128USD/km	24USD
C	1) Large buses for 20-56 passengers 2) 5-10 ton trucks	0.192USD/km	36USD
D	1) 10-20 ton trucks	0.256USD/km	48USD
E	(1) Trucks over 20 tons and (including trailers for container transport)	0.32USD/km	60USD

Source: The JICA Survey Team



Source: The JICA Survey Team

Figure 2-2 Major transport segments and travel times

Restrictions on truck transport within Cambodia are shown in Table 2-3. The length of the truck shall not exceed 16 meters and the weight of the vehicle is limited to 40 tons. As for weight restrictions, weight scales are installed

²2022 data. (Based on data received from Poipet Customs)

³Information by Japanese logistics companies

on major national roads to ensure that the limits are being observed.⁴ Regarding the vehicle length limit, many imported vehicles exceed 16 meters, and there have been cases of remodeling vehicles to conform to the 16 meter limit by cutting or modifying them. An industry group (Cambodia Trucking Association) is urging the government to ease these restrictions.⁵

Table 2-3 Transport restrictions in Cambodia

Classification	Transport restrictions	Remarks
limitation of vehicle length	Length of semi-trailers not to exceed 16.0m	Road Traffic Law, Article 57
weight limit	Maximum weight is 40 tons	Penalty 300,000KHR/ ton

Source: The JICA Survey Team

2.2 Railway

There are two railway lines in Cambodia: Northern line connecting Phnom Penh and Poipet, and the Southern line connecting Phnom Penh and Sihanoukville. A summary of each is shown in Table 2-4.

Table 2-4 Overview of railways in Cambodia

Line	Northern line	Southern line
Distance	385 km (Phnom Penh~Thai border)	265 km (Phnom Penh to Sihanoukville port)
Number of Stations	28 stations (including privately owned stations invested by the private company)	19 stations
Passenger train speed (Note)	Average speed: approx. 42 km/h Maximum speed: approx. 68 km/h	Average speed 43 km/h Maximum speed: approx. 65 km/h
Passenger Timetable	Departure from Phnom Penh 6:40 Departure from Battambang 15:00	Departure from Phnom Penh 7:00 Departure from Sihanoukville 14:00
axle load	20 tons between Sisophon Poipet Other 15 tons	15 tons
track	single-track with non-electrified	
entrepreneur	Royal Railway PLC.	

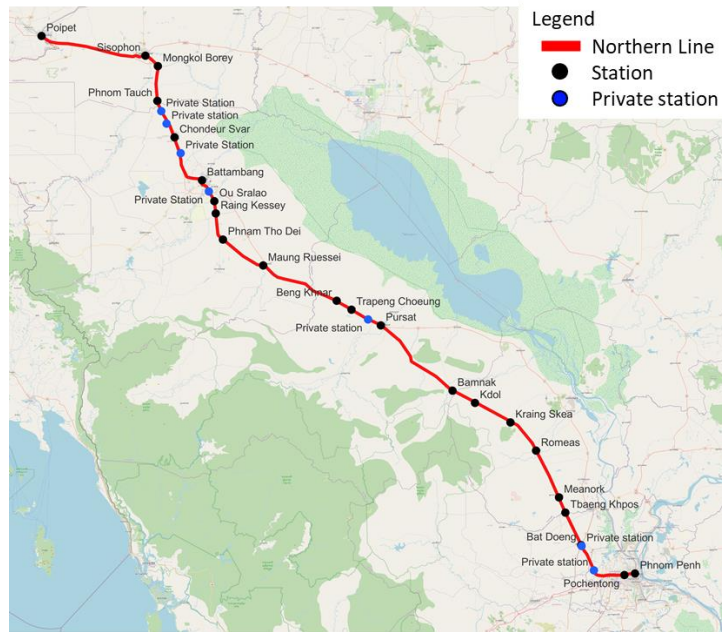
Note: Actual values measured during the survey team's ride

Source: The JICA Survey Team

As of May 2023, Northern line operates one round trip per day between Phnom Penh and Battambang, and the Southern line operates one round trip per day between Phnom Penh and Sihanoukville. For freight trains, no operating schedule has been established. According to Royal Railway Public Limited Company ("RR"), the Southern line makes 3 to 5 round trips per day, and the Northern Line operates according to demand, but the Poipet Station as the terminal station of Northern line is used once or twice a week for transporting fertilizer imported from Thailand and for completed cars. There are also privately owned stations around Battambang, and large rice millers and fuel companies have constructed their private spur lines and owned private stations to use the railway to transport their products. Interoperation of Northern and Southern lines is being operated from Battambang to Sihanoukville, and in the freight railway of agricultural products, for transport of rice is used primarily. (Some rice is transported in specialized containers modified by the miller, as shown in Figure 2-5).

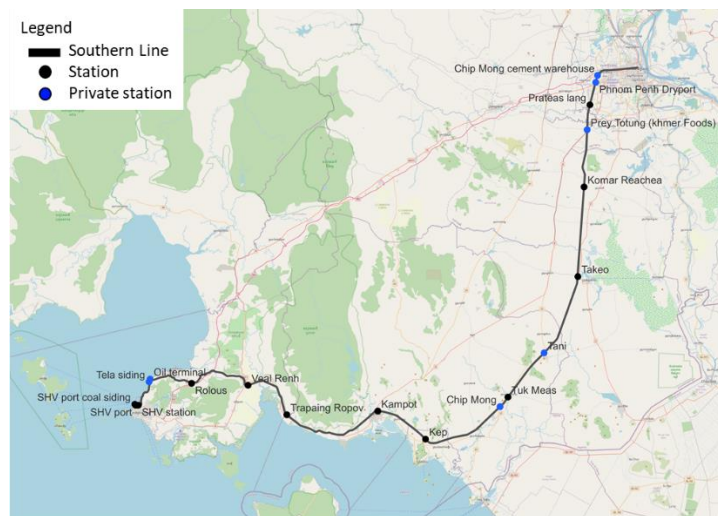
⁴In case of excess, a penalty of 300,00 KHR per ton will be imposed.

⁵Based on interviews with the Cambodia Trucking Association



Source: The JICA Survey Team based on materials provided by RR., ©OpentStreetMap Contributors

Figure 2-3 Locations of railway stations (Northern line)



Source: The JICA Survey Team based on materials provided by RR., ©OpentStreetMap Contributors

Figure 2-4 Locations of railway stations (Southern line)



Source: The JICA Survey Team

Figure 2-5 Containerized rice transport on Northern line, taken at a rice miller near Battambang

2.3 Inland Water Transport

This section describes the current status of inland waterway transport that implements containerized transport for export. As of 2023, Phnom Penh Port, located on the outskirts of Phnom Penh on the Tonle Sap River, is the only river port in Cambodia that can be used for exports, and is the export route for sea transport through Vietnam. Phnom Penh Autonomous Port ("PPAP"), which operates the river port, has jurisdiction over seven river ports, including those currently under development. In addition to port improvements, PPAP is dredging the river as well as port development. Figure 2-6 shows a map of the location of those improvements, and Table 2-5 provides an overview of the ports, including those under construction. The ports currently in operation are TS11 and LM17 (Phnom Penh Port).



Source: The JICA Survey Team, ©OpenStreetMap Contributors

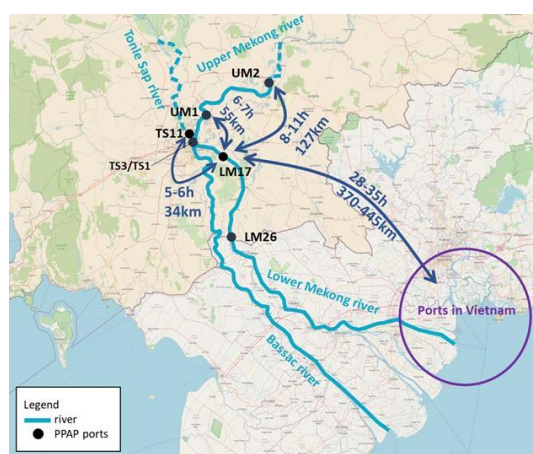
Figure 2-6 Location map of planned port development based on PPAP

Table 2-5 Summary of ports under PPAP jurisdiction

Item	UM2	UM1	TS11	TS3	TS1	LM17
Status	To be opened shortly	To be constructed as PPP	In operation	To be opened shortly	-	In operation
Terminal category	Sub feeder	Multipurpose Terminal	Multipurpose Terminal	Passenger Terminal	-	Container Terminal
Jetty.	12x46.9m	16x88m	12x60m	-	-	22x300m, 12x149m
Berth (Barges)	1	1	1	-	-	7
River Depth	4.5m	4.5m	4.5m	-	-	4.5m
Crane Productivity (MPH)	15-20	15-20	15-20	-	-	20-25
Port Capacity (TEU/year)	70,000	60,000	60,000	-	-	500,000
Barge Capacity (tons)	2,000-3,000	2,000-2,500	2,000-2,500	-	-	3,000-4,000
Reefer Plug	36 plugs	36 plugs	36 plugs	-	-	28-35 plugs
Land Size (Ha)	7	4	4	-	-	30
Warehouse	40x150m	30x130m	#1 1,848m ² #2 2,854m ²	-	-	24.4x60m

Source: PPAP

The distances between ports and the time required are shown in Figure 2-7. Transport to Ho Chi Minh takes about two days, and transit procedures at the port of Ho Chi Minh are required for imports and exports involving Transit procedure.



Note: Taking into account changes in routes due to seasonal fluctuations and variations due to the direction of operations, the times required between ports are approximate lower and upper limits.

Source: The JICA Survey Team based on materials received from PPAP, ©OpenStreetMap Contributors

Figure 2-7 Distance and operating time between ports

2.4 Port

International ports handling containers in Cambodia are Sihanoukville port and Phnom Penh port (LM17). The former is located in the southwestern part of the country and is Cambodia's only international port (Figure 2-1).⁶The Sihanoukville port is accessible from Phnom Penh by NH4 or NH3, or by railway, and PAS is responsible for the operation of the CY for Railway. It is a feeder port for Singapore ports and Chinese ports (Hong Kong, etc.). The operator of the port is Sihanoukville Autonomous Port (PAS), an affiliate of MPWT. Information on the facilities provided by the Port of Sihanoukville are shown in Table 2-6.

Table 2-6 Sihanoukville Port facility information

For Container facility		For General Cargo facility	
Item (unit or Ha)	Capacity	Item (unit or Ha)	Capacity
Container Handling Equipment		General Cargo Handling Equipment	
1-1. Quay Gantry Crane (5 units)	30.5 ton	3-1. low-bed trailer (1 unit)	50 tons
1-2. Rubber Tired Gantry Crane (18 units)	35-40 ton	3-2. Shore Crane (10 units)	10-50 tons
1-3. Super Stacker (12 units)	45 ton	3-3. Forklift (6 units)	5-10 tons
1-4. Empty Stacker (7 units)	7.5-10 ton	3-4. truck (17 units)	20-30 tons
Truck & Trailer (42 units)	30-39.6 ton	3-5. Port Mobile Crane (2 units)	50 tons
1-6. Forklift (10 units)	3-25 ton		
Container Storage Facility		General Cargo Storage Facility	
2-1. Laden Container (Yard B~D: 14.7 Ha in total)	14,039 TEUs	4-1. Open Yard for General Cargo (Multipurpose, for oil supply base and coal: 6.8 Ha in total)	150,000 tons
2-2. Empty Container (Yard A and S: 8.2 Ha in total)	7,961 TEUs	4-2. Warehouse (3.6 Ha)	72,000 tons
2-3. Reefer Container	192 Plugs		
2-4. Railway Yard (4.2 Ha)	900 TEUs		

Source: PAS

⁶The latter is omitted since it has already been explained in the previous section.

Table 2-7 and Figure 2-8 show the number of containers handled and the number and share of railway transport (Sihanoukville port only) at Sihanoukville Port and Phnom Penh Port.

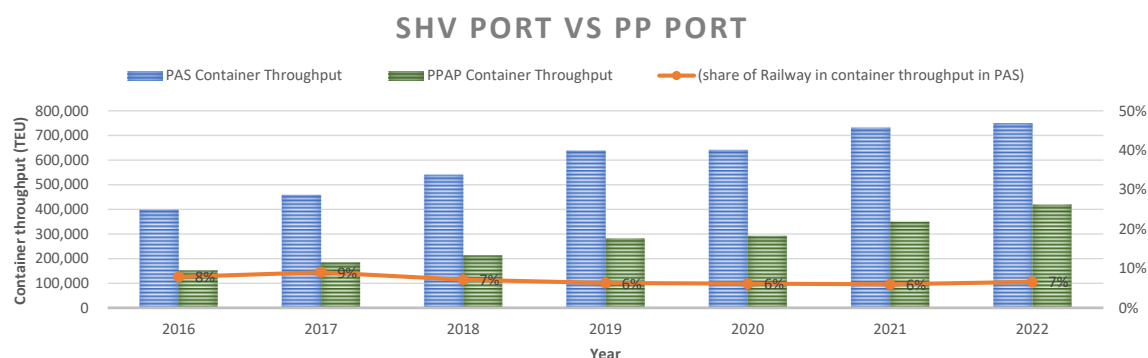
Sihanoukville Port has an approximately 87% increase in volume handled in 2022 compared to the volume handled in 2016. Similarly for Phnom Penh port, the volume handled in 2022 compared to 2016 has increased by 2.8 times, which shows that the volume of transport is increasing every year. On the other hand, the volume handled at Sihanoukville Port is about 1.8 times that at Phnom Penh Port, and it is no exaggeration to say that Sihanoukville Port is the international port that supports international logistics in Cambodia. On the other hand, railway transport at Sihanoukville Port has remained almost flat since 2017 in terms of volume handled, with a share of only 6~9%. This is a different trend from the increase in volume handled at Sihanoukville Port, which may not be taking advantage of the railway's advantage to transport large volumes.

Table 2-7 Number of containers handled at Sihanoukville and Phnom Penh Ports (2016-2022)

Name of Port	Category	2016	2017	2018	2019	2020	2021	2022
Sihanoukville port	Container Throughput	400,187	459,839	541,228	639,211	641,842	732,387	750,148
	of which, Railway sub total	31,523	41,598	38,722	40,494	39,437	43,854	49,589
	(share of Railway)	8%	9%	7%	6%	6%	6%	7%
Phnom Penh port	Container Throughput	151,781	184,805	213,571	281,045	290,857	348,898	417,696

Unit: TEU

Source: PAS, PPAP



Source: PAS, PPAP

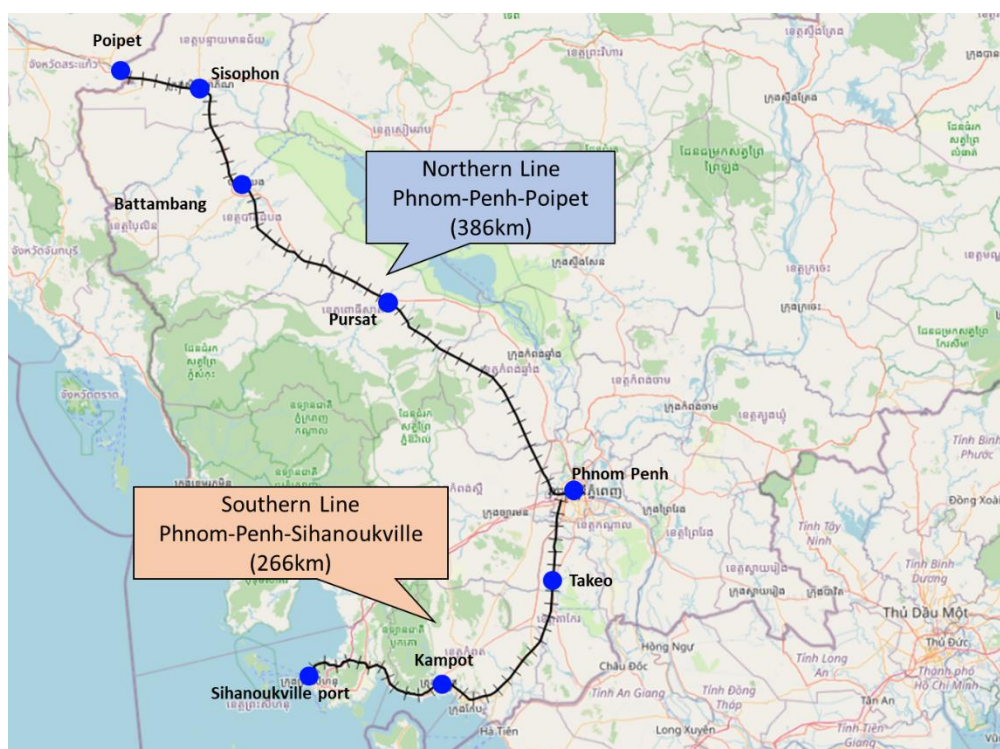
Figure 2-8 Number of containers handled at Sihanoukville and Phnom Penh Ports and railway share (2016~2022)

Chapter 3 Current Status and Issues of Railway

3.1 Current Status of Railway Infrastructure in Cambodia (Northern and Southern line)

3.1.1 Railway Facilities

The Cambodian railway network consists of Northern line and Southern line (Figure 3-1). Northern line was built about 100 years ago during the French colonial period, followed by Southern line in 1960. The Cambodian civil war of the 1970s ruined the railway infrastructure but it was rehabilitated between 2006 and 2018 using fund of the Asian Development Bank ("ADB") and Cambodia national budget. The following section describes the details of the rehabilitation.



Source: The JICA Survey Team, ©OpenStreetMap Contributors

Figure 3-1 Railway network in Cambodia

(1) Details of rehabilitation by fund of ADB

The rehabilitation of railway, ruined by Cambodia's civil war, has been carried out between 2006 and 2014 with a fund of ADB. The target section is the entire 255.5 km Southern line, 23 km Northern line (kilometer post: PK09+400 to PK32+000), and 42 km from Sisophon to Poipet (Figure 3-2), where the track was removed during the civil war and the route were disconnected. The original plan was for the entire Northern line to be rehabilitated, but the scope of the rehabilitation work was significantly changed due to lack of funding. Table 3-1 and Table 3-2 show the details of the rehabilitation.



Source: The JICA Survey Team based on Cambodia; Greater Mekong Subregion: Rehabilitation of the railway in Cambodia Project Completion report, ADB ©OpenStreetMap Contributors

Figure 3-2 Location map of rehabilitation funded by ADB

Table 3-1 Southern line improvements funded by ADB

Rehabilitation project	Description of works and the condition after completion of rehabilitation
Rehabilitation of Southern line	The following is implemented on all 255.5 km of Southern line. (1) Repair of embankment (2) Replacement of sleepers (3) Ballast reloading (4) Rehabilitation of structures including bridges, culverts, and drainage
Construction of passing loop	Construction of 7 passing loops
Increased train speeds due to ballast compaction	50 km/h on the entire Southern line
Improved connection to Sihanouville port, expansion of CY in Sihanouville port	Railway CY development in Sihanouville port (pavement of loading/unloading area, extension of track) completed.
Improvement of level crossing	Ancillary works at level crossing

Source: Cambodia; Greater Mekong Subregion: Rehabilitation of the railway in Cambodia Project Completion report, ADB

Table 3-2 Northern line improvements funded by ADB

Rehabilitation project	Description of works and the condition after completion of rehabilitation
Rehabilitation of Northern line	The following is being conducted at 23 km of Northern line near Phnom Penh. (1) Repair of embankment (2) Ballast reloading (3) installation of missing fittings (4) Rehabilitation of structures including bridges, culverts, and drainage
Increased train speeds due to ballast compaction	The above 23km section can be traveled at 50km/h
Improvement of level crossing	Introduction of level crossing appurtenances
Development of the missing link between Sisophon and Poipet	The following were carried out in the 42 km between Sisophon and Poipet. (1) Repair of embankment (2) Rehabilitation of roadbed (3) Rehabilitation of structures including tracks, bridges and culverts, and drainage The connection with Thailand is to be developed with Cambodia national budget.

Source: Cambodia; Greater Mekong Subregion: Rehabilitation of the railway in Cambodia Project Completion report, ADB

(2) Rehabilitation details by Cambodia national budget

As mentioned above, ADB has rehabilitated railways in Cambodia, but only a section near Phnom Penh of Northern Line has been implemented, leaving a wide area of the rest of Northern line in need of rehabilitation. Therefore, the Cambodian government decided to rehabilitate it with the national budget and carried out the rehabilitation shown in Table 3-3, which have been completed in 2018. The target section was mainly Northern line, which had not been rehabilitated by ADB, but Southern line was also improved where rehabilitation had been insufficient throughout the entire line. A map of the maintenance section and stations are shown in Figure 3-3.

Table 3-3 Details of rehabilitation funded by Cambodia national budget

target route	Description of maintenance and condition after completion of rehabilitation
Northern line	Rehabilitation of track north of PK32 Improvement of 18 stations (see Figure 3-3) and effective length of tracks at stations Rehabilitation of 516 bridges (the newly upgraded structures are designed for 20-ton axle load, while the rest are designed for track axle load (15 and 20 ton)). Improvement of 33 level crossings (from Poipet to suburban Sisophon)
Southern line	Track rehabilitation (ballast compaction, alignment modification, rail flaw testing, etc.) Improvement of level crossings and rehabilitation of bridges in the suburbs of Phnom-Penh.

Source: Rehabilitation of the railway in Cambodia, project completion report, MPWT.



Source: The JICA Survey Team based on Rehabilitation of the railway in cambodia peojct completion report, MPWT, ©OpentStreetMap Contributors

Figure 3-3 Left: Location map of development outline, Right: Location map of developed stations

Photos as of 2015 (before the rehabilitation) and as of 2023 are shown below.



Note: Comparison of photos taken in 2015 and 2023 at approximately the same location

Source: The JICA Survey Team

Figure 3-4 Comparison of before rehabilitation (2015) and current conditions (2023)

The condition of the route (axle load and design speed) after ADB and Cambodia national budget (as of 2018) is shown in Figure 3-5. The railway structures have been rehabilitated with ADB funds and Cambodia national budget, but due to limited budget, the rehabilitation works has been limited where can be physically traveled, and sufficient rehabilitation of the entire section has not yet been completed. In particular, along Northern line, most sections still have a 15 ton axle load and design speed of 30 km/h. RR has partially improved the track on their own budget, however MPWT(DoR) does not have clear information about the improvement. In order to implement full-scale freight transport, it is necessary to identify the section which needs to be rehabilitated and

implement the rehabilitation work, as well as improving safety devices at level crossings and improve the axle loads of bridges.



Source: The JICA Survey Team based on Rehabilitation of the railway in Cambodia project completion report, MPWT, ©OpenStreetMap Contributors

Figure 3-5 Condition of the railway network (axle load and design speed per section)

As of May 2023, Northern line is receiving used rails, sleepers, and fastening devices from Thailand, and RR is also independently improving the track and other equipment, so the condition of the track, speed at which it can run, and axle load need to be confirmed again.

3.1.2 Stations

The stations currently operated by RR are listed in Table 3-4. Stations developed by MPWT are passenger stations except S18 (Sihanoukville Port) and S19 (Sihanoukville port coal siding), and privately owned stations (8 stations on Northern line and 7 stations on Southern line) are for freight transport (including Phnom Penh Dryport, hereinafter "PP Dryport", maintained by RR). Dryport, hereinafter referred to as "PP Dryport"). The only stations with container yards and cargo handling equipment are S2 (PP Dryport) and S18 (Sihanoukville Port).

Table 3-4 Station list

Northern Line				Southern Line			
No.	Station Name	Chainage	Remarks	No.	Station Name	Chainage	Remarks
N1	Phnom Penh Central Terminal	PK0					
N2	Pochentong (Branch)	PK6 PK9.6					
N3	Oil station	PK14	Private sta.	S1	Chip Mong Cement Warehouse	PK12.5	Private sta.
N4	Boral Cement station	PK17	Private sta.	S2	PP Dryport	PK15	Private sta.

Northern Line				Southern Line			
N5	Oil station (Tela)	PK31	Private sta.	S3	Prateas Lang	PK22	
N6	Bat Doeung	PK32		S4	Prey Totung	PK29	Private sta.
N7	Tbeng Khpour	PK47		S5	Komar Reachea	PK48	
N8	Meanork	PK55		S6	Takeo.	PK75	
N9	Romeas	PK76		S7	Tani (Ballast station)	PK101	Private sta.
N10	Kraing Skea	PK94		S8	Touk Meas	PK118	
N11	Kdoal.	PK111		S9	Chip Mong (Cement)	PK121	Private sta.
N12	Barnak.	PK124		S10	Kep.	PK149	
N13	Pursat	PK165		S11	Kampot.	PK166	
N14	Rice mill station	PK168	Private sta.	S12	Trapaing Ropov	PK198	
N15	Trapeang Chomg	PK179		S13	Veal Rinh	PK217	
N16	Beng Khnar	PK187		S14	Rolous.	PK239	
N17	Muang Russey	PK223		S15	Oil terminal	PK253	Private sta.
N18	Phnom Thipdet	PK244		S16	Oil station (Tela)	PK254	Private sta.
N19	Oil station (Sokimex)	PK270	Private sta.	S17	Sihanouville station	PK262	
N20	Battambang	PK273		S18	Sihanouville port	PK264	
N21	Otaki Rice mill station	PK283	Private sta.	S19	Sihanouville port coal siding	PK265	
N22	Chondeur Svar	PK298					
N23	Rice mill station	PK303	Private sta.				
N24	Oil station	PK308	Private sta.				
N25	Phnom Tauch	PK316					
N26	Mongko Borey	PK330					
N27	Sisophon	PK337					
	(Stung Bot (Plan))						
N28	Poipet	PK384					
	(Border Bridge)	PK385.2					
T1	Klongluk	PK385.4					
T2	Ban Dong Ngu	PK386.6					
T3	Aranyaprathet	PK390.6					

Source: The JICA Survey Team

3.1.3 Line Capacity

All railways in Cambodia are single-track and require passing loops. Most sections of Northern line currently operate only one or less freight train every few days, but the maximum number of trains per day (line capacity) will become an issue if the number of operations increases in the future. In this section, based on the station list, the bottleneck sections for increasing the number of operations were identified. The simplest formula for determining the track capacity of a single-track section is as follows; which is called the simplified formula for line capacity of a single-track section.⁷

$$N = \frac{1440}{t + s} \times f$$

N: Line capacity (Nos./day/one way)

t: Average operating hour between stations. The average speed of the trains from PP Dryport to Poipet is approximately 20 km/h, including the station stop time, so *t* is estimated based on this speed⁸.

⁷ Illustrated Guide to Railway Engineering (Maruzen Corporation Kozo Amano, Yasutaka Maeda, Toshihide Miwa 2001)

⁸ In the pilot transport, the cargo was reloaded at Battambang. If the average speed of the pilot transport was used, the time spent at Battambang for the normal handling between PP Dryport and Poipet could not be taken into account, and a faster than normal scheduled speed would be used for the evaluation. Therefore, the maximum scheduled speed was set to 20 km/h, following the maximum scheduled speed of 19.5 km/h in the actual results provided by RR (operation section: Phnom Penh Dryport-Poipet (described in 3.3.2(6)).

s: Train handling time and minute. The time required from the time a train passes a turnout/signal to the time it is ready to depart. Although 2.5 minutes is normally used for non-automatic signalized sections, 5 minutes is used for this line because no signal equipment has been installed.

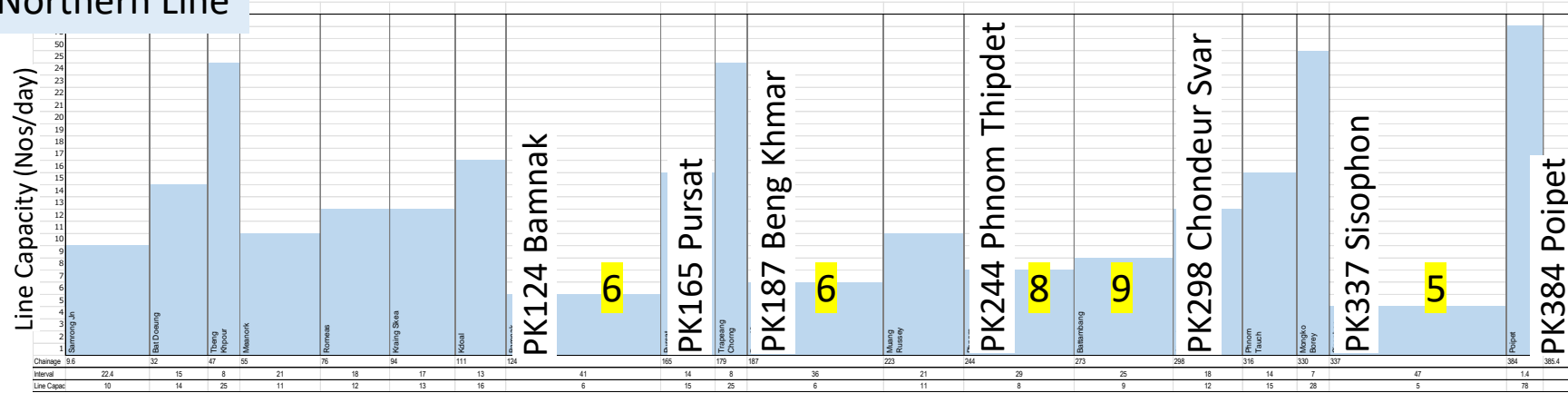
f: Train utilization. Percentage of the 24-hour day during which trains should operate. Given the current need for track improvements, this survey assumes 0.5, taking into account that half is devoted to maintenance, etc.

The line capacity is calculated based on the principle that only one train is allowed to pass between train switching facilities (blockage), and while this principle is a basic idea to ensure safety, for example, RR operates more than five round trips on Southern line during peak season.⁹

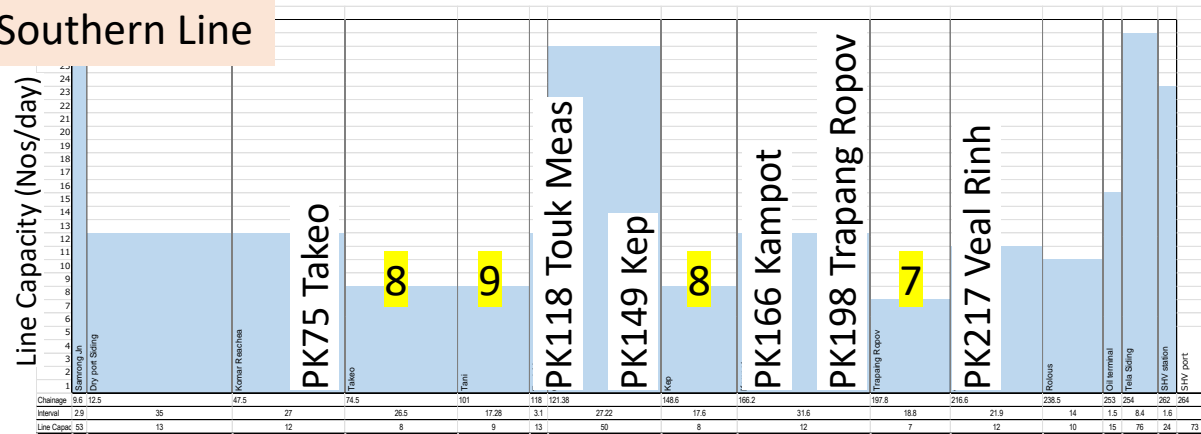
The calculation results are shown in Figure 3-6. On Northern line, the Sisophon and Poipet section are the smallest, with a capacity of 2.5 round trips/day (5 round trips/day even without considering maintenance time (*f*)). Considering the track record of Southern line, it is necessary to ensure a capacity of at least 5 round trips/day, so it is desirable to install a new station or develop a passing loop in the section where the line capacity is less than 10 (highlighted in yellow in the figure). On the other hand, RR intends to construct new stations along the entire line in the future, and once these are in place, track capacity is expected to improve significantly.

⁹According to the interview with operation personnel at PP Dryport, RR

Northern Line



Southern Line



Note: Vertical axis indicates number of one-way shipments per day
 Source: The JICA Survey Team based on materials received from RR.

Figure 3-6 Line capacity calculation results

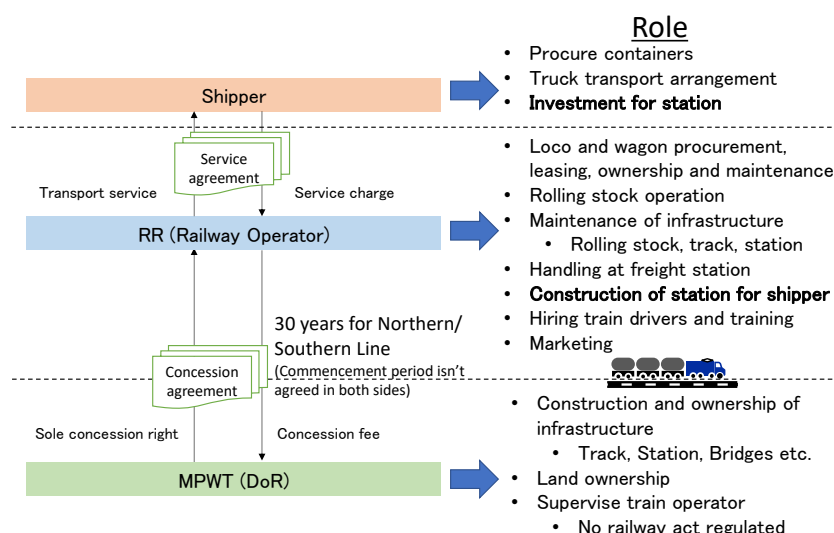
3.2 Railway Operation Overview and Improvement Plan

3.2.1 Organization Structure

(1) Operation Scheme

As mentioned in Section 3.1, railway network in Cambodia consists of 386 km Northern line and 265 km Southern line, but the infrastructure was devastated by the civil war in the 1970s, resulting in reduced travel speeds and a decline in the level of service due to damage to bridges and other track facilities. The railway was operated by the national railway (so-called “Royal Railway of Cambodia”) until 2007, but the volume of traffic had declined to about 320,000 ton in 2007, and there was a serious decline in the number of users. The Cambodian government has also implemented the Greater Mekong Subregion (GMS) Rehabilitation of the Railway in Cambodia Project for the entire line with the support of ADB since 2006. Although the project completed the rehabilitation of Southern line (including Sihanoukville CY development) in 2015, the scope was reduced due to lack of funds to rehabilitate Northern line, and the project was finished in 2016 without completing the rehabilitation of the entire Northern line.¹⁰¹¹

As a condition of its financial support, ADB requires the transition from Royal Railway of Cambodia to a concession contract with a private company, and a concession contract was signed in 2009 between the Department of Railway (DoR), under MPWT, and Toll Holdings Limited (at that time) (details not disclosed). After selling its shares to Royal Group in 2014, Toll Holdings limited withdrew from the concession agreement, and as of 2023, Royal Railway Public Limited Company (RR) is responsible for the operation. The division of roles among shippers, RR (concessionaires), and MPWT (DoR) in railway operations is shown in Figure 3-7.



Source: The JICA Survey Team

Figure 3-7 Division of roles among shippers, RR and DoR

¹⁰Approx. 57% of the peak year of 2002 (approx. 560,000 ton)

¹¹Statistically, after a period of transport disruption from 2008-2016, transport has resumed since 2017 (Northern line resumed in 2018).

In Cambodia, the MPWT (DoR) is responsible for the development of infrastructure such as tracks and stations, while the concessionaires are responsible for train operations and rolling stock maintenance. The concession contract is unique in that it is for 30 years and covers the entire Northern and Southern lines, with privately owned stations to be developed by RR with investment from the shipper. As shown in Figure 3-8, many of the privately owned stations are connected to cement and oil plants and rice mills by spur line.



Source: The JICA Survey Team

Figure 3-8 Examples of privately owned stations (left: oil factory, right: rice mill)

(2) Business Overview

RR signed a concession agreement in 2009 and began operation of railway in 2017 (at that time, Toll Royal Railway). Since then, the company has not disclosed its financial statement, but since it was listed on the Cambodia Stock Exchange in 2022, the details of the financial statement have been disclosed from 2021. Table 3-5 shows revenues and their breakdown from 2020 to 2022 (no breakdown for 2020).

Table 3-5 Revenue breakdown of RR (2020-2022)

	2020		2021		2022	
	Amount in Riel (Mil)		Amount in Riel (Mil)	%	Amount in Riel (Mil)	%
Revenue						
Southern line:						
Rail freight			34,486	84.16%	24,010	53.33%
Train related value-added services			2,044	4.99%	2,418	5.37%
Passengers' fare			275	0.67%	1,704	3.78%
Transportation			134	0.33%	245	0.54%
Other revenue			244	0.60%	96	0.21%
Sub total	A		37,184	90.74%	28,472	63.23%
Northern line:						
Rail freight			941	2.30%	12,343	27.41%
Passengers' fare			-	0.00%	800	1.78%
Train related value-added services			2	0.00%	63	0.14%
Transportation			-	0.00%	4	0.01%
Other revenue			-	0.00%	126	0.28%
Sub total	B		943	2.30%	13,337	29.62%
Other operating income						
Warehouse rental income			2,839	6.93%	2,279	5.06%
Finance income			1	0.00%	95	0.21%
Others income			11	0.03%	843	1.87%
Sub total	C		2,851	6.96%	3,217	7.14%
Total revenue	A+B+C	37,677	40,978	100%	45,026	100%
PROFIT / (LOSS) BEFORE INCOME TAX						
Revenue on railway operation	D: A+B		38,126		41,809	
Cost of services			-36,373		-50,109	

Gross (loss)/profit	F: D+E	1,754	-8,300
Other operating income	C	2,851	3,217
Operating and administrative expense	G	-6,705	-8,757
Allowance for impairment losses on trade receivables	H	107	-939
Minimum tax expense	I	-409	-443
Operating loss	J: F+C+G+H+I	-2,402	-15,223
Finance costs	K	-644	-1,610
Loss before income tax	L: J+K	-795	-3,046

Note: Breakdown for 2020 is not disclosed. Some totals do not match due to rounding off of fractions.

Source: Annual Report 2022, Royal Railways PLC.

Revenues are increasing from 2020 to 2022, with the most recent comparison between 2021 and 2022 showing an increase of approximately 10%. In 2021, about 90% of revenues are related to Southern line, whereas in 2022, 30% of revenues are related to Northern line and 62% to Southern line, indicating a change in the revenue structure. Passenger revenue on all routes is small (2-5% of total revenue), with the majority of the revenue associated with the freight transport (over 85%). Despite the increase in revenues, the net loss before taxes, after expenses and other items, increases significantly from 2020 (approx. KHR800 million) to 2022 (approx. KHR16.8 billion).

The organizational chart of RR is shown in Figure 3-9, with a total of about 700 people. The Operation Department, with more than half of its 442 employees, is the key to train operations. The Infrastructure Department, which maintains the track facilities, has 226 employees, about half of the total number of employees on Southern and Northern lines, with a staffing ratio of approx. 1:2. Since the personnel ratio of Southern line to Northern line is generally 1:1.5, more personnel are located on Northern line, possibly due to the poor track condition of Northern line. On the other hand, Northern line has fewer workers for security guards at level crossing when a train passes, 22 compared to 108 on Southern line. In addition, there is no department manager in charge of safety, and the department is small, with nine members.

In light of the current situation where many accidents occur at level crossings, it is desirable to consider measures such as assigning personnel and installing new level crossing warning devices on Northern line in anticipation of a future increase in the number of trains.

CEO			1
CEO Assistant			Vacant
Subtotal			Nos.
442 Operation Dept.			
54 Passenger services			
Manager		1	
Customer Service Officers		17	
Other		4	
Station services		27	
Train service		5	
144 Train Control			
Daily Operation Manager			
Station master		2	
Train control supervisor		1	
Train controller		10	
Admin Officer		1	
Level Crossing Leader			
Worker_SL		108	
Worker_NL		22	
9 Construction	Maintenance manager	1	
	Employees	8	
3 Operation Manager	Operation Manager	1	
	Officer, terminal operator	2	
7 Sihanoukville Port	Terminal manager	1	
	Terminal operator, etc.	6	
49 Dry Port Phnom Penh	Terminal manager, Financ	2	
	Workers	47	
176 Workshop Manager		Vacant	
Wagon Workshop	Supervisor	1	
	Workers	77	
Loco Workshop	Supervisor	5	
	Workers	93	
Subtotal			701
Subtotal			Nos.
226 Infra. Dept.	Chief Infra. Officer		1
	Chief civil engineer/ Tech. officer		Vacant
	Others		2
	SL Eng., etc		2
	Operator, etc.		11
	Workers		64
	NL Eng.		2
	Operator, etc.		N/A
	Workers		144
9 Safety Dept.			
	Safety Manager		Vacant
	Workers		9
2 Logistics	Manager		1
	Admin		1
1 Admin Containers manager			1
1 Commercial Dept. Director			Vacant
	Executive		1
2 Procurement manager			1
	Admin		1
8 Admin & Gov't rel. Admin Manager			1
	Worker		7
9 Financial Dept.	CFO		1
	Admin		8
Total			701

Source: Annual Report 2022, Royal Railways PLC.

Figure 3-9 RR organization chart (2022)

(3) Issues related to railway operation

MPWT (DoR) continued the rehabilitation of Northern line track from 2015 to 2018 with Cambodia national fund and completed the entire Northern line in 2019. However, the rehabilitation is limited and that the Effective Date for the start of the concession has not yet been met, which means the operation rights of Northern line has been provisionally handed over to RR. The concession fee has not been paid by RR to MPWT (DoR), but in this regard, RR claims that it is not yet obliged to pay the fee because the Effective date has not been reached as mentioned above.¹² On the other hand, MPWT (DoR) claims that RR is obliged to pay the concession fee as it is operating even provisionally¹³, and there is a discrepancy between the perceptions of MPWT (DoR) and RR.

Currently both the Northern and Southern lines are operated by RR, but there is no accident reporting system in place and MPWT (DoR) is not aware of the actual status of accidents. The situation of assets held by MPWT (DoR) also needs to be sorted out, and there is an urgent need to change (or cancel of the contract) the concession contract according to the actual situation.

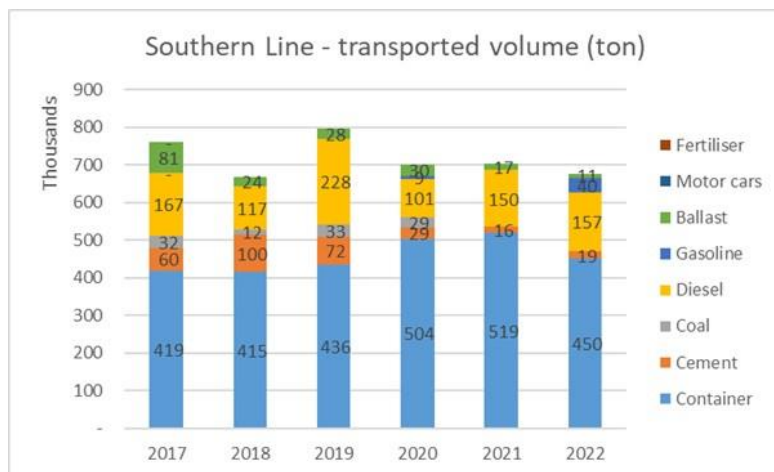
¹² Financial Statements for the year ended 31 December 2022 and Report of the Independent Auditors, RR

¹³ According to the interview with MPWT (DoR)

3.2.2 Operation Result

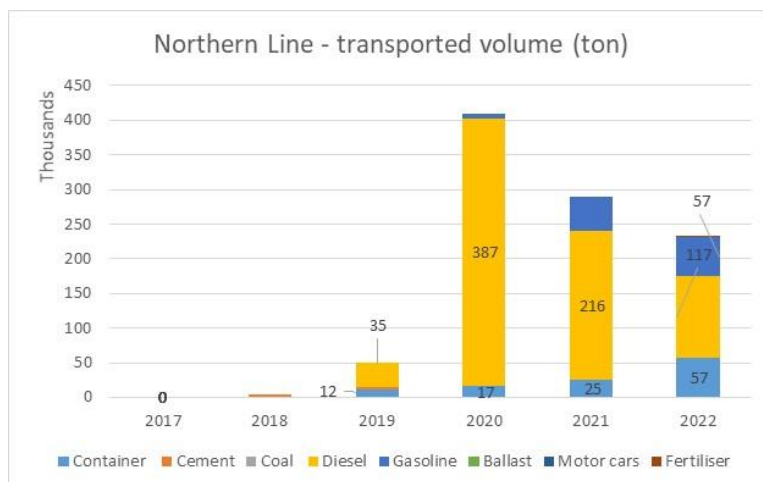
(1) Outlook

As of 2023, freight trains operated by RR on North and Southern lines (Figure 310). In 2022, Southern line have transported 680 thousand ton (1,500 trains) of freight, while Northern line will transport 230 thousand ton (400 trains), making Southern line approximately four times the freight volume of Northern line. Containers were the main transported cargo on Southern line, accounting for 67% of the total transport volume (in ton) in 2022. In addition, Northern line has mainly transported diesel oil since the start of cargo transport in 2018, but the volume of container transport has been growing each year, with container transport accounting for 25% of the total transport volume (ton) in 2022. In addition, the transport of completed cars and fertilizers imported from Thailand using Northern line has begun in 2022. Currently, there are only 1-2 flights per week, but the volume of transport is expected to grow in the future.



Source: The JICA Survey Team based on RR transport performance statistics data.

Figure 3-10 Time series of transport volume (ton) on Southern line

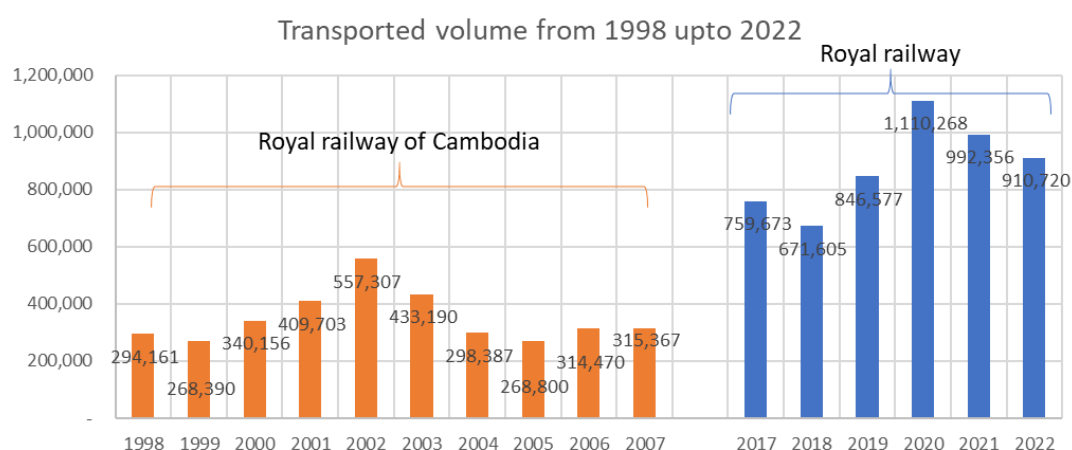


Source: The JICA Survey Team based on RR transport performance statistics data.

Figure 3-11 Time series of transport volume (ton) on Northern line

(2) Comparison between the RRC era and the present (operated by RR)

Cambodia's railways were operated as a national railway before concessionaire (RR) in railway operation (by RRC). A comparison of freight traffic during the RRC era and present (operated by RR) is shown in Figure 3-12. According to the report, the average transport volume during the RRC period 1998-2007 was about 350 thousand ton, while the average transport volume during 2017-2022 by RR was 850 thousand ton, an increase of approximately 2.4 times. As shown in Table 3-6, RR began containerized transport in 2017, which is believed to have been driven by demand growth in response to the global trend toward containerization.



Source: The JICA Survey Team based on RR transport performance statistics data.

Figure 3-12 Comparison of transport volume (ton) between the RRC era and the current situation (operated by RR)

Table 3-6 Top 5 items during the RRC era and present

No.	Royal Railway of Cambodia (1949-1987)	No.	Present (Operated by Royal Railway)
1	cement	1	container
2	gasoline	2	diesel oil
3	consolidation	3	cement
4	public works	4	ballast
5	rice products	5	gasoline

Source: RR transport performance statistics data.

3.2.3 Current Status and Issues in Railway Transport

(1) Current Status of Container Transport (General Cargo) and Issues

Figure 3-13 shows a breakdown of container transport. In 2022, the largest volume of containerized transport is export cargo (from the Port of Sihanoukville) using Southern line (344 thousand ton), followed by import cargo (106 thousand ton) using Southern line. On Northern line, imports accounted for 53,000 ton versus 5,000 ton for exports, with imports accounting for about 10 times as much as exports.



Source: The JICA Survey Team based on RR transport performance statistics data.

Figure 3-13 Breakdown of container transport in ton

Based on interviews with local logistics providers, shipper companies' expectations and concerns about railway are shown in Table 3-7.

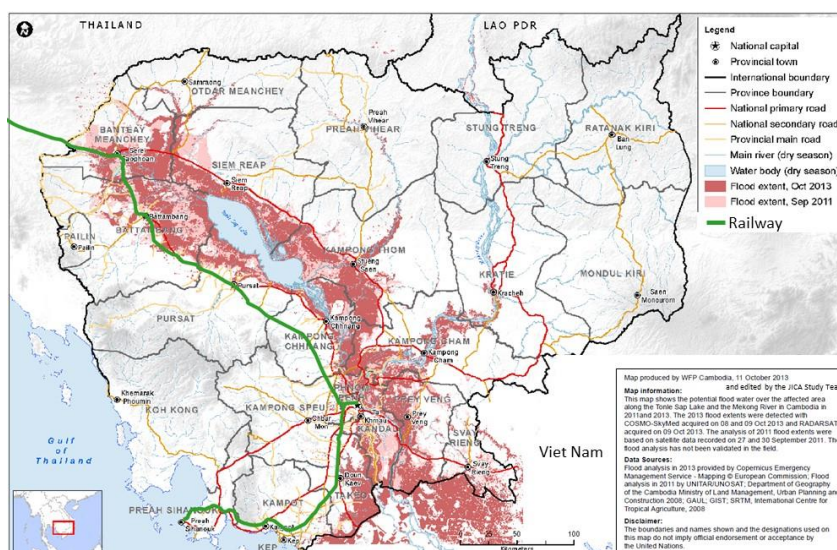
Table 3-7 Shippers' expectations of and concerns about railways

Expectation	Concern
Cost reduction	Lead time
Mass transport (compliance with trucking regulations: weight restrictions, etc.; can't carry a lot) Can't put more on the truck)	Punctuality
Expectations for use as an alternative means of transport in the event of flooding	Safety
Relatively low risk of theft	-
Arrangement of empty containers	-

Source: The JICA Survey Team

Expectations. Cost is the selection criterion for transport¹⁴, and some expressed expectations for railways to be able to transport large volumes as trucks are subject to stricter weight regulations. The main lines between Phnom Penh and Sihanoukville and between Phnom Penh and Poipet are NH4 and NH5, respectively, and the railway lines are formed on different routes than the main roads. The railway line is also evaluated for its potential use as an alternative transport option in the event of flooding (Figure 3-14).

¹⁴ As a result of conducting interviews with 10 Phnom Penh-based companies (manufacturers, logistics companies and rice millers) on the items they consider important in selecting a transport mode : cost, transport time, time punctuality, frequency of operation, prevention of cargo collapse due to vibration, temperature and humidity control, cargo damage due to direct sunlight and contribution to the SDGs, (for each The results of the survey (three options for each item: 'particularly important', 'important' and 'not important') showed that the items most frequently answered as 'particularly important' were 'cost' and 'transport time' by the companies that answered 'particularly important' (8 responding companies).



Source: World Food Programme data, survey team edited.

Figure 3-14 Actual flood damage in Cambodia (2012 and 2013) and railway routes

In addition, since transport by railway does not, in principle, stop except of stations, the risk of theft is evaluated relatively low compared to truck transport by shippers. Some respondents companies also expected to arrange for empty containers by railway, which can be transported in large volumes, as marine containers are not easy to arrange in inland areas.

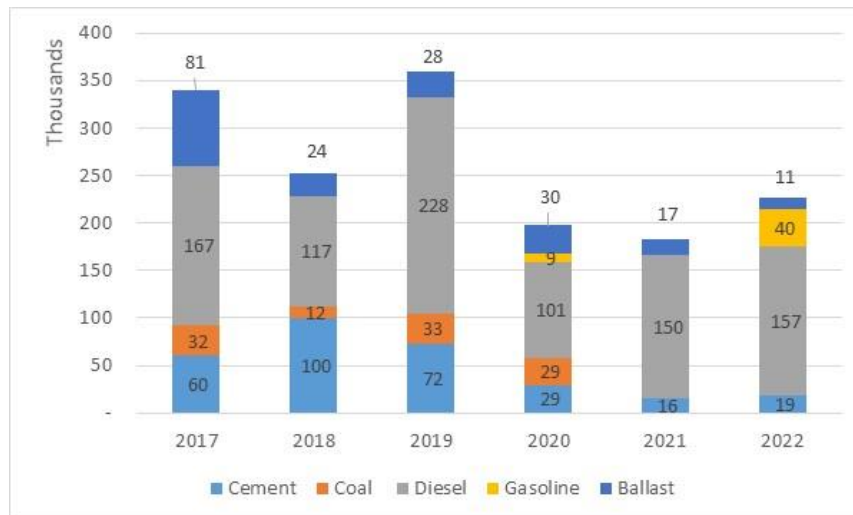
Concerns. Some expressed concern about the longer lead time compared to trucks and uncertainty about whether they would be transported on time. In addition, accidents on the railway have been widely reported in Cambodia, and the high frequency of accidents is a concern.¹⁵

Since railway transport must rely on truck transport for terminal transport, it is difficult to maintain the comparative advantage of truck transport in terms of transport time. On the other hand, in the case of export-oriented transport, it is necessary to adjust to the schedule of the vessel in the case of ocean transport and to the schedule of the connecting truck in the case of land transport, and the opinion was raised that the impact on the manufacturing process can be minimized if the transport time is on schedule, even if the transport time is long.

(2) Current Status and Issues in Bulk Transport

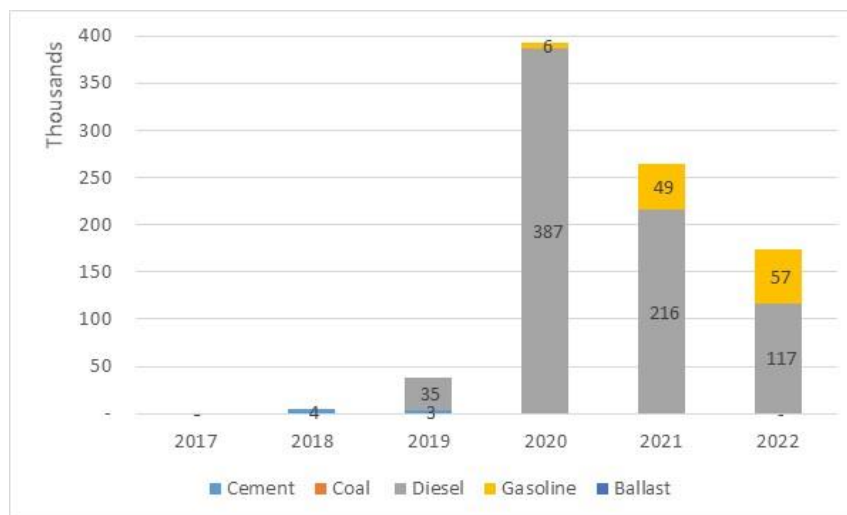
Figure 3-16, respectively. According to the report, the major cargo on both North and Southern lines as of 2022 is diesel oil. Major fuel companies use their own funds to build pull lines and stations on private property for railway use, and regular and bulk quantities are transported. Although the volume of oil transported on Northern line is declining, shippers are demanding more transport (approximately 20% more than the current level), confirming the existence of a demand need for Northern line in oil transport.

¹⁵For example, February 2023 fire incident <https://www.khmertimeskh.com/501032014/train-catches-fire-in-p-sihanouk-after-near-collision/> (accessed May 2, 2023)



Source: The JICA Survey Team based on RR transport performance statistics data.

Figure 3-15 Breakdown of bulk shipments (Southern line) in ton



Source: The JICA Survey Team based on RR transport performance statistics data.

Figure 3-16 Breakdown of bulk shipments (Northern line) in ton

The current issues obtained from the interviews with major local oil producers are shown below.

1) Long cycle time

Currently, the cycle of transport is four days: two days for transporting loaded wagons from Sihanoukville to Battambang and unloading fuel from tank wagons at the station, and two days for transporting empty wagons from Battambang to Sihanoukville and filling tank wagons at the seaside area. The cycle of transport is four days. Shippers are not satisfied with this number of days and expect further reduction in the number of days.

2) Wagons provided are old and in need of repair

Shippers are required to use tank wagons provided by RR. The wagons are old and frequently leak fuel during the filling and fuel release operations, which is interfering with their operation.

(3) Current Status and Issues

1) infrastructure

Based on interviews with shippers with potential modal shift to railway and major oil suppliers with transport experience, the current status and issues in infrastructure are shown in Table 3-8.

Table 3-8 Current infrastructural aspects and issues in railway transport

No.	Current Status	Issue
1	Current status of line facilities is unknown.	The current status of facilities is not monitored (asset management)
2	Limited axle load (15 ton)	Improvements to track, bridges, culverts, and other line facilities are yet to be conducted
3	Accidents occurring	Warning devices at level crossing are not installed. Accident reporting system is not established. The residents and truck drivers are not aware of danger of railway.

Source: The JICA Survey Team

Firstly, RR may be maintaining its own track, sidings, and stations at present, and MPWT (DoR) is not aware of the latest status of track equipment (track, bridges, culverts) and rolling stock as MPWT. The issue is to understand the current status of the assets held by MPWT and to develop a plan for their maintenance.

Secondly, the improvement from 15 ton of axle load (60 ton of total weight including wagon) to 20 ton of axle load (80 ton of total weight including wagon), which was scheduled for maintenance under the ADB budget, has not yet been completed. The axle load in Thailand, which are connected by railway, weigh 20 ton, and the cross-border transport from Thailand to Cambodia would lose the opportunity to transport axles load 5 ton (20 ton of total transportable weight including wagon). The issue is to improve the axle load across the entire route.

Thirdly, accidents are occurring. Measures on the infrastructure side include the maintenance of level crossing warning devices and fences to prevent animals, vehicles, and people from entering the track. There have been cases of trucks forcibly entering level crossings and collide with vehicles even when the crossing is closed with a bar. Many residents illegally set up level crossings, and it is important to educate and enlighten drivers and residents in the vicinity to prevent entry into the tracks.¹⁶¹⁷

2) Operation

The current status and issues related to operations are shown in Table 3-9. As a result of interviews with RR and logistics companies, it was found that in terms of operations, the operation schedule is not prepared in advance, the schedule is set by RR at the timing of train dispatchment. The schedule is not announced in advance to shippers, and delays from the schedule notified at the time of train departure, were found to be the case.

¹⁶For example, January 2023 grade crossing accident <https://www.khmertimeskh.com/501221803/truck-and-fuel-train-crashes-into-each-other/> (accessed May 2, 2023)

¹⁷Some information indicates that there are about the same number of illegal crossings as there are legally established crossings (based on interviews with DoR)

Table 3-9 Current status and issues in operations

No.	Current Status	Issue
1	There is no published schedule that can be referenced by freight railway service users.	Difficulty in planning schedules to use railway (need to have RR show schedules each time, resulting in waiting time).
2	Often delays from the schedule communicated at the time of use.	Frequent work schedule reviews on the arrival station side due to train delays.

Source: The JICA Survey Team

3.2.4 Improvement Plan

(1) Rehabilitation of track and improvement of axle load

The transfer of used rails and sleepers for 140 km long from Thailand to Cambodia has started in October 2021 for the rehabilitation of Northern line tracks by MPWT (DoR) and RR. There are approximately 310 km of track facilities that need to be repaired in total, and although materials for 140 km long have been secured through the transfer from Thailand, the remaining 170 km long has yet to be completed. The survey team also confirmed that there is a lack of budgetary resources for construction costs. Before the rehabilitation, the axle load was 15 ton, but for the improved section, the axle load is currently 20 ton.



Source: The JICA Survey Team

Figure 3-17 View of unimproved section of track (left) and rails and sleepers stored at Battambang station (right)

(2) Improvement of freight stations

RR plans to rehabilitate and improve the existing freight station and construct a dry port, including a new freight station. At PP Dryport, an existing freight station, the cargo handling space was expanded from 30m (equivalent to two wagons) to 180m (equivalent to 13 wagons), and drainage facilities were installed in the dryport to prepare for the rainy season. At PP Dryport, as of April 2023, loading and unloading is taking place on the main line, and it obstructs other traffic of main line during loading and unloading works. RR plans to construct a new loading line to avoid loading using main line and pave the container yard, which is still unpaved, to improve work capacity.



Source: The JICA Survey Team

Figure 3-18 Expansion of loading/unloading space (left) and drainage facilities (right)

There are also plans to build a new dry port in the Poipet area in anticipation of international train operation to Thailand, and a new dry port in the Battambang area in anticipation of demand for rice and other agricultural products. RR is in the process of applying to the Cambodian government to develop these stations.

(3) Procurement of Vehicles

RR raised 24 million USD from GuarantCo¹⁸ in December 2022. With the funds raised, the company plans to purchase locomotives and wagons as well as materials such as engines and wheels. Assuming double-stack wagons, the company plans to purchase a total of 320 well cars with a low center of gravity, as shown in Figure 3-19. The maximum axle weight for a double stack is 22 ton¹⁹, but according to interviews with RR, the maximum axle weight in Cambodia is 20 ton, so the weight of containers will be adjusted and the plan is to start operations on the south line, where there are no obstacles in the overhead clearance, for the time being, and to assume container transport with a double stack on the north line after the bridge has been replaced.



Source: <https://www.seaandjob.com/worlds-1st-electrified-double-stack-container-tunnel-near-haryana-may-be-operational-in-a-year-official/>

Figure 3-19 Example of a wagon dedicated to double-stacking

¹⁸ An organization that provides infrastructure funding to low-income countries in Africa and Asia.

¹⁹ Assuming two 20FT containers for the first tier and one 40FT container for the second tier, 10 ton of freight wagons and two-axle wagons.

3.3 Pilot Transport

3.3.1 Plan

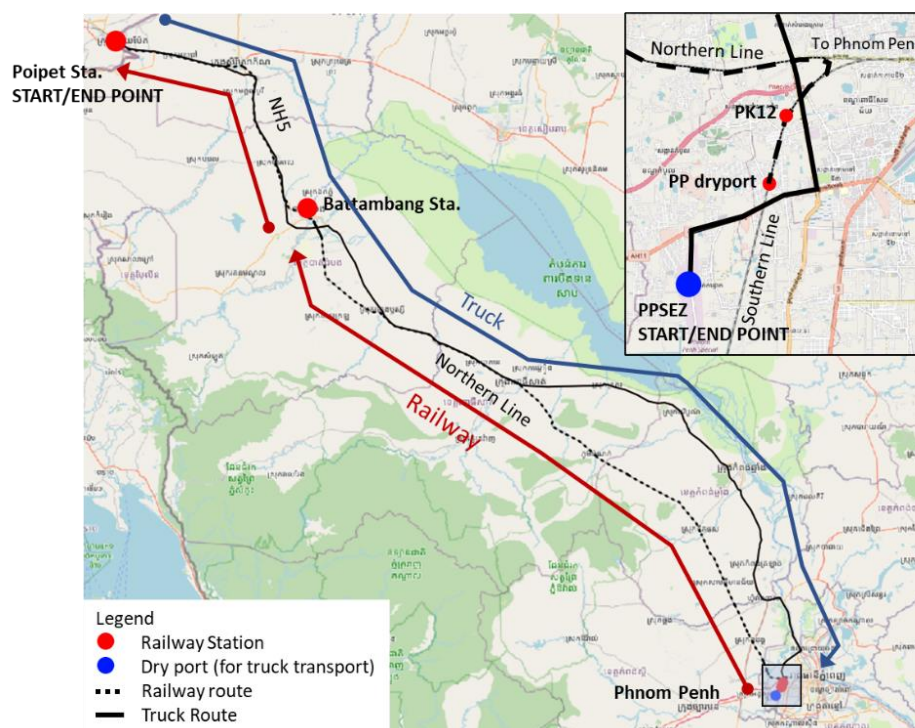
(1) Summary

In this survey, pilot transport using railway and truck transport was conducted on the whole section of Northern line to confirm procedures and service levels (time, cost, transport quality, etc.) in actual transport, and to compare railway and truck transport. Freight railway transport was provided by the railway operator RR, and truck transport was provided by local trucking companies and dryport operators. Arrangements for use procedures and coordination among railway and trucks were made by the subcontractor, Trancy Logistics (Cambodia) Co.

(2) Route

In this survey, the entire Northern line will be subject to pilot transport. The route of pilot transport will begin and end at dryport in Phnom Penh SEZ ("PPSEZ"), an industrial park in Phnom Penh where many Japanese companies are concentrated, and end at Poipet Station on the border with Thailand. Figure 3-20 shows the location diagram.

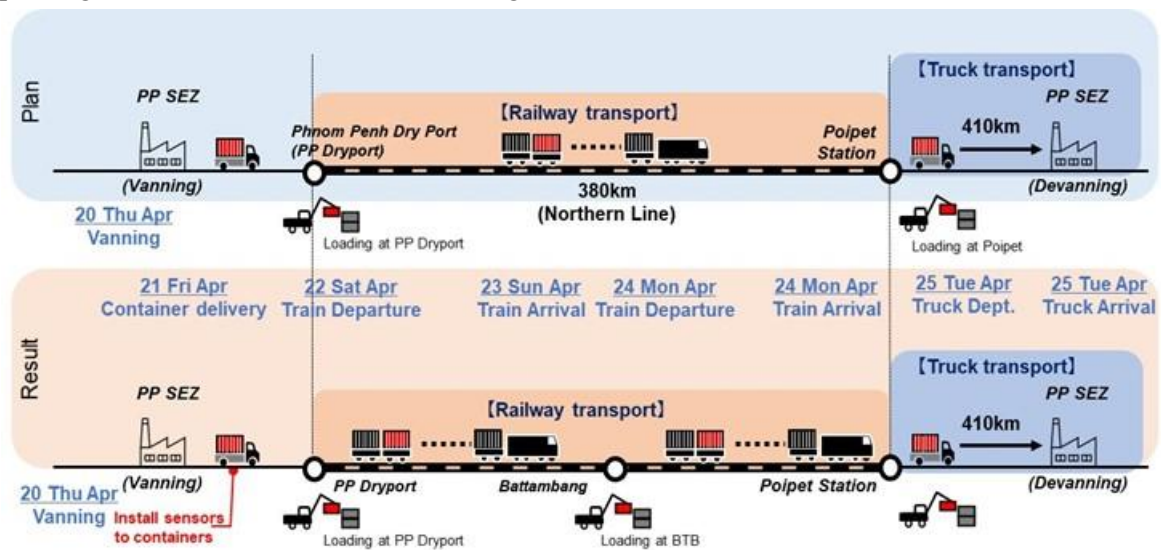
The outbound route from the dry port in PPSEZ to the PP Dryport by truck and from PP Dryport to the Poipet station by railway is defined as "railway transport" and the return route from Poipet station to the dry port in PPSEZ by truck (via NH5) is defined as "truck transport".



Source: The JICA Survey Team, ©OpentStreetMap Contributors

Figure 3-20 Location map of pilot transport implementation

During train transport, there was a problem with a sudden change of train destination, so the train transport was suspended at an intermediate station (Battambang) and resumed on the next day. The schedule at the time of planning and the actual schedule are shown in Figure 3-21.



Source: The JICA Survey Team

Figure 3-21 Transport sections in pilot transport (top: planned, bottom: actual)

The original plan was for direct transport from PP Dryport to Poipet, but once the pilot container was unloaded from the train at Battambang station on the way, the container was left at a nearby parking lot for the day, and then transported again by railway from Battambang to Poipet on the next day's train.

(3) Cargo and Package

Since this pilot transport initially targeted the transport of rice, the main export agricultural product of Northern line, one 20FT container, which is close to the actual operation, was planned to use as the cargo for pilot transport. On the other hand, as shown in Chapter 4, it is revealed that transport of rice to Thailand, including Transit transport, is not possible. On Northern line section, cargo such as auto parts and beverages are transported by truck in 40FT containers, and the survey team decided to use 40FT containers instead of 20FT containers, assuming that they will be shifted to railway transport. In addition, in order to determine a reasonable transport weight, concrete blocks weighing approximately 17 ton, which is the average weight transported by RR, were loaded into a container, and plastic pallets were loaded into a container for transport to check for cargo collapse.

Table 3-10 and Figure 3-22 shows the specifications and photographs of the actual transported cargo, respectively.

Table 3-10 Specifications of transported items

No.	Name	Specification
1	40FT ISO Container	External dimensions (mm): L 12,192 x W 2,438 x H 2,591
		Internal dimensions (mm): L 12,032 x W 2,352 x H 2,385
2	Plastic pallets	Internal volume (m3): 67.6
		Maximum payload (kg): 26,760
3	Concrete blocks	Dead weight (kg): 3,720
		Maximum gross weight (kg): 30,480
2	Plastic pallets	Size (mm): 1100 x 1200 x 130
		Weight (kg): 10 - 15/ piece
3	Concrete blocks	Quantity: 10 pieces
		Size (mm): L 200 x W 100 x H 50
3	Concrete blocks	Dead weight (kg): approx. 2,400 (individual differences exist)
		Quantity: 7 pcs. Total weight (kg): 17,000

Source: The JICA Survey Team



Source: The JICA Survey Team

Figure 3-22 Actual transported cargo (left: 7 concrete blocks, right: plastic pallets)

(4) Collected information

In this pilot transport project, equipment were installed and data was collected in order to quantitatively examine the actual transport situation and transport quality. These sensors were used to identify the location and speed of trains and trucks, and to identify the locations where vibrations were occurring.

Table 3-11 Installed equipment and the specifications

No.	name	specification
1	GPS (IDEA: K-18U GPS Data Logger)	Records location information (latitude and longitude), altitude, time, speed, and direction of travel Location information is acquired every second
2	GPS (Smartphone application: Geographica)	Records location information (latitude and longitude), altitude, time, speed, and direction of travel Location information is acquired every 5 seconds
3	Sensor (Fujita Electric Manufacturing: Watch Logger KT-295F)	Detects temperature (-40 to 80 centigrade), humidity (0% to 99%), and shock (+/-5G to 75G, X/Y/Z axis). Recorded when the threshold value +/-7G or more is observed.
4	Sensor (Slick Corporation: G-MEN GR20)	Detects temperature (0 to 50 centigrade), humidity (30% to 90%), and shock (acceleration sensor max. 20G, X/Y/Z axis). Measured every 5 seconds.

Source: The JICA Survey Team

Since this pilot transport time was long and it might cause the failure of being recorded, two equipment for measuring the same type of data were installed to supplement the information. An image of the equipment is shown in Figure 3-23.



Source: The JICA Survey Team

Figure 3-23 Equipment installed in and outside container

3.3.2 Results

(1) Outline of the pilot transport

This section discusses the results of the pilot transport and the analysis of the measured data. The time schedule is as follows:

Table 3-12 Time schedule for pilot transport

Date	Time	Activity
11 th April TUE		Booking and negotiation started
20 th April THU	12:30	Booking confirmed by RR
	16:00	Vanning at Dryport (PPSEZ)
21 st April FRI	9:30-9:43	Deliver to RR PP Dryport
22 nd April SAT	8:30	Loading to wagon
	11:30	Train Departure from PP Dryport
23 rd April SUN	5:00	Train Arrival at Battambang
	10:20	Loading from wagon to truck
24 th April MON	16:15	Loading from truck to wagon
	17:00	Train Departure from Battambang
	22:00	Train Arrival at Poipet
25 th April TUE	9:30	Loading from wagon to truck
	10:00	Truck Departure from Poipet
	22:00	Truck Arrival at Dryport (PPSEZ)
26 th April WED	15:00	Devanning at Dryport (PPSEZ)

Source: The JICA Survey Team

1) Vanning and Delivery to Dryport

On 20th April, a vanning of cargo into 40 FT ISO containers was performed at the Dryport in the PPSEZ. The next day, 21st April, in addition to the installation of sensors, the location of the cargo was marked prior to transport to visually confirm the collapse of the cargo. The trucks were then delivered to PP Dryport. At the time of vanning on the evening of the 20th, RR informed us that the container should be delivered to PP Dryport by 10:00 on 21st to be placed on the train on 22nd April. These are shown in Figure 3-24.



Loading concrete blocks



Inside a container that has been loaded



Sensor installed on the floor inside the container



GPS installed on the outer wall surface of the container



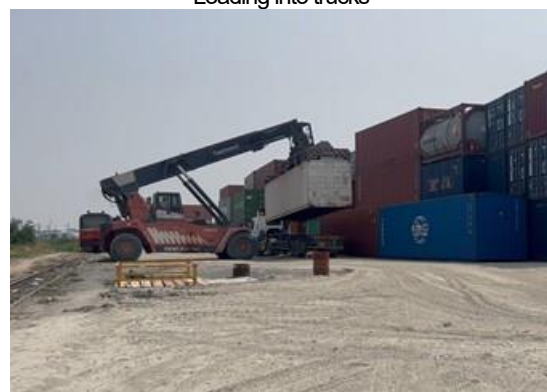
Cargo location marking



Loading into trucks



Trucking to PP Dryport (Route 4)



Container unloaded at PP Dryport

Source: The JICA Survey Team

Figure 3-24 During pilot transport (vanning - Dryport delivery)

2) Loading onto wagons and transport by train

On the morning of 22nd April, the day after the container was delivered to PP Dryport, it was loaded onto a wagon along with other containers and departed PP Dryport. At the time the containers were delivered to PP Dryport (21st April) the train was scheduled to depart early in the morning around 4:00 a.m. However, the train departed at 11:30 a.m. because a failure of wagon of the heading train was found. In addition, after departing PP Dryport, the containers were detained at a freight station called PK12 next to PP Dryport, where it had to wait for other wagons going to Poipet with Pilot transport train.

Later in the evening, for the order of another cargo customer coupled with the wagon of pilot transport was changed to a termination at Battambang station, instead of the originally scheduled at Poipet station. Therefore, the schedule had to be changed so that the containers were unloaded from the train at Battambang on 23rd April, and were parked with the track at a nearby parking lot, and then loaded back onto the train on 24th April. In the late afternoon of 24th, the train with pilot container left Battambang for Poipet. These are shown in Figure 3-25.



Cargo handling at PP Dryport



Train Departure (PK12)



Container unloading at Battambang station



Running train with containers (near Ou taki)

Source: The JICA Survey Team

Figure 3-25 During pilot transport (loading onto wagon - train transport)

3) LOLO at Poipet station and Truck Transport

The train departed Battambang evening on 24th and arrived at Poipet station around 22:00 on the same day. Since the train arrival was already in nighttime, loading and unloading operations and truck transport were conducted the following day, 25th April. The container was loaded onto trucks at the plaza inside Poipet station around 9:30 a.m. on 25th. The trucks left Poipet around 10:00 a.m. and arrived at dryport in PPSEZ by the same day. Since this one also arrived at night, devanning work took place the following day, 26th April, in the afternoon. These are shown in Figure 3-26.



LOLO of Container from train to truck



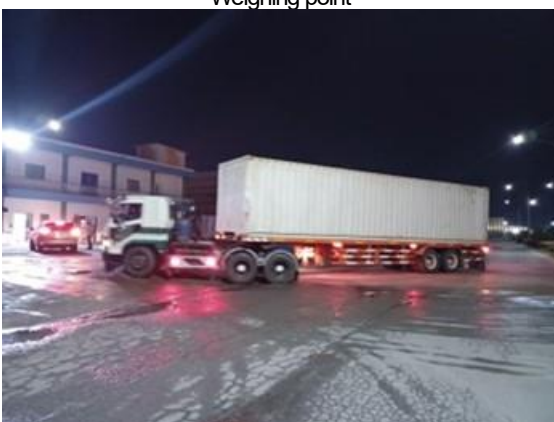
Truck Departure



Weighing point



Truck stopped at a checkpoint



Truck arriving at PPSEZ



Inside the container before devanning

Source: The JICA Survey Team

Figure 3-26 During pilot transport (Loading to truck - truck transport)

(2) transport costs

The costs incurred in this pilot transport are shown in Table 3-13. The total cost of railway transport (2-7) was 575 USD, while the cost of truck transport (11) was 750 USD, making railway transport 175 USD cheaper. In view of percentage terms, railway transport costs are approximately 76% of truck transport costs, indicating a cost advantage in railway use.²⁰

Table 3-13 Cost of transport

No.	Item	payee	Classification	Expense
1	Banning at PP SEZ	Local subcontractor	Railways & Trucks	210USD
2	Trucking (PP SEZ ~ PP Dryport)	Local subcontractor	Railway	100USD
3	LOLO at PP Dryport	RR	Railway	15USD
4	Railway transport fee (PP Dryport ~ Poipet)	RR	Railway	350USD
5	fuel surcharge	RR	Railway	5USD
6	LOLO at Poipet Station	RR	Railway	45USD
7	Fees for railway use	Local subcontractor	Railway	60USD
8	LOLO in Battambang	RR	Railway	100USD
9	Trucking arrangement and transport (Battambang~Parking lot for detention)	Local subcontractor	Railway	350USD
10	Standby Trucks	Local subcontractor	Railway	50USD
11	Trucking (Poipet~ PP SEZ)	Local subcontractor	Truck	750USD
12	Devanning at PP SEZ	Local subcontractor	Railway & Truck	160USD
13	Container Rent	Local subcontractor	Railway & Truck	250USD
14	Pallet rent (60PCS)	Local subcontractor	Railway & Truck	60USD
15	Arrangements for delivery of concrete blocks, etc.	Local subcontractor	Railway & Truck	1,470USD

Note: (VAT 10% extra). Red shaded area: railway, blue shaded area: truck, yellow shaded area: temporary expenses due to changes in railway transport destinations.

Source: The JICA Survey Team

The following two items are considered as possibilities for further cost reduction in railway use.

1) Truck transport (PPSEZ~PP Dryport) fee

Truck transport from PPSEZ to PP Dryport was not regularly used and trucks were arranged on a case-by-case basis, so transport costs were 100 USD for a distance of only 5 km. if demand for transport of containers between PPSEZ and PP Dryport increases, piston transport between the two points will be possible and Cost reductions are expected.

2) Truck transport fee (PPSEZ~PP Dryport)

LOLO at Poipet station is carried out locally by RR, with RR requesting a subcontractor to carry out the cargo handling work, and the subcontractor arranges for a crane each time a cargo arrives. This is also expected to reduce costs if the use of railway for cargo expands and the number of container loading and unloading increases, as the utilization rate of loading and unloading equipment improves and the equipment is used on a regular basis.

²⁰The costs in (8-10) are not included in the comparison because they are costs associated with destination changes. The same is true for banning and debanning, container rent and cargo arrangement costs (1, 12-15).

(3) Speed and stop location

1) Railway

The average speed between Phnom Penh and Battambang was 27 km/h, with a maximum speed of 46 km/h and a travel time of approximately 12 hours, while the average speed between Battambang and Poipet was 24 km/h, with a maximum speed of 37 km/h and a travel time of approximately 5 hours. This speed is slower than that of trucks, which will be discussed later, and trucks currently have the advantage in terms of transport time. The velocity distribution during railway transport is shown in Figure 3-27 and Figure 3-28.²¹

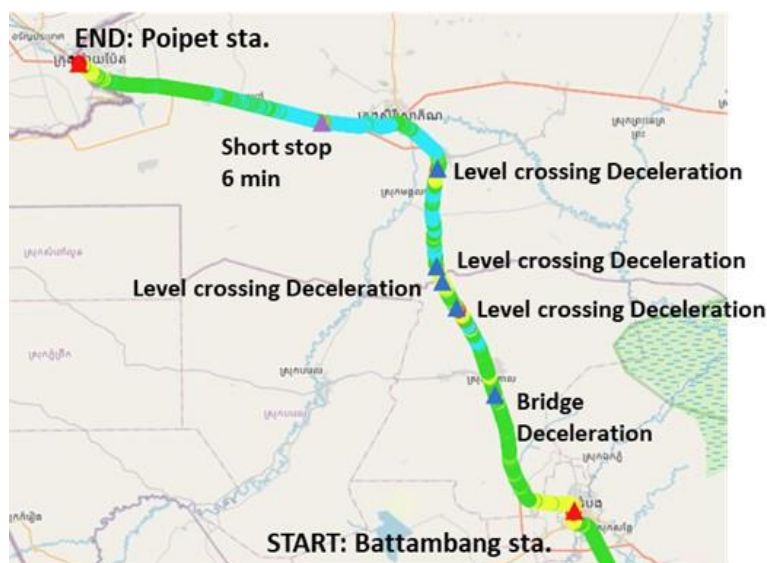


Source: The JICA Survey Team, ©OpentStreetMap Contributors

Figure 3-27 Speed distribution and stop locations between PK12 and Battambang

After departing from PK12, the train stopped for 40 minutes at Romeas station 1 hour and 40 minutes at Kdol stations, where other train could pass each other on the way. There were also some slowdowns in front of level crossings, but the number of slowdowns was probably small due to the nighttime running time. As for the arrival time, it was 5 hours earlier than originally reported by RR.

²¹Due to the long waiting time at PK12 after leaving PP Dryport, average mph was calculated for the trip between PK12 and Battambang.



Source: The JICA Survey Team, ©OpenStreetMap Contributors

Figure 3-28 Speed distribution and stop locations between Battambang and Poipet

The transport from Battambang to Poipet has not been stopped long at intermediate stations. This may be the reason why trains rarely heading each other between Battambang and Poipet, since the trains that currently, both passenger and freight, mainly terminated at Battambang station.²²

Regarding deceleration, many decelerations were observed in front of the crossing and at the bridge location. The reason for this is that there are many level crossings along Northern line that do not have safety devices, and there are places and times when RR personnel are not available to direct traffic, so train drivers must run slowly and sound their whistles.

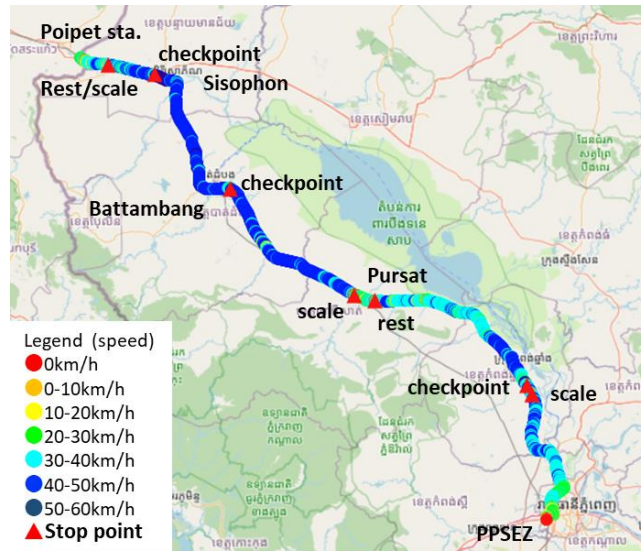
As for travel time, the train arrived at Poipet station in about five hours, as informed by the Poipet station manager that it takes about five hours from Battambang to Poipet.

2) Truck

Figure 3-29 shows the results of truck transport. The average speed of the trucks was about 30 km/h, the maximum speed was 54 km/h, and the running time was about 12 hours including stops. Since this is a long drive, it includes a break for the driver (about 35 minutes), and there are several customs checkpoints along NH5 where the items being transported and their destinations will be verified.

There were also weigh scales along the way to control on overweight trucks, and a total of six stops were observed: three at weigh stations and three at checkpoints. NH5 is currently undergoing road improvement through a yen loan project, but low speeds were observed on the section south of Pursat where the improvement work has not been completed.

²²According to RR's Poipet station manager, there are 1-2 trains a week coming to Poipet.



Source: The JICA Survey Team, ©OpenStreetMap Contributors

Figure 3-29 Speed distribution and stop locations between Poipet and PPSEZ

(4) Vibration

In this section, the effects of vibration during railway transport, truck transport, and cargo handling are discussed through analysis using visually confirmed items and measured data.

1) Visual Observation

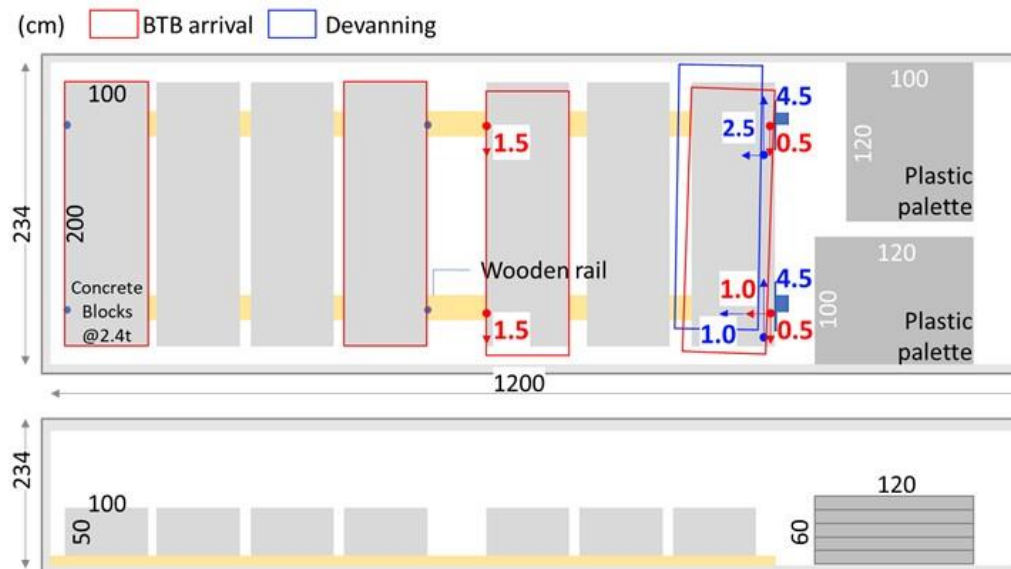
Figure 3-30 shows the movement of the cargo as determined by the displacement of the markings indicating the cargo's location. The centrally placed concrete block at Battambang was found to have moved 1.5 cm, as shown in Figure 3-30.



Source: The JICA Survey Team

Figure 3-30 Movement of concrete blocks at Battambang station

In Figure 3-31, the red line shows the movement during the transport from vanning at PP SEZ to Battambang and the blue line shows the displacement during the truck transport from Poipet to PPSEZ. No visible movement of concrete blocks was observed after train transport from Battambang to Poipet.



Source: The JICA Survey Team

Figure 3-31 Movement of concrete block in container

Concrete block movement was observed only at the rear between PP Dryport - Battambang. This movement may have been influenced by weight bias, as four were placed at the back of the container and three at the front (Figure 3-32). No movement of concrete blocks was observed between Battambang and Poipet, so it might be moved during loading and unloading.



Source: The JICA Survey Team

Figure 3-32 Loading and unloading at PPSEZ

In addition, the movement of the concrete blocks at the rear of the chassis is noticeable in the track movement between Poipet - PPSEZ. This may be due to the structure of the trailer, which causes greater displacement of the rear of the chassis when turning.

2) Analysis

The results of the analysis of the vibration data measured with the vibrometer are discussed in this sub-clause. The vibration data obtained during the entire pilot transport (during transport, loading and unloading, and detention) are shown in Figure 3-33.

There are three types of data: X-axis direction, Y-axis direction, and Z-axis direction. The maximum value for the entire section was observed during the detention time at PK12, where operations such as the shunting of wagons were underway, and a large impact may have occurred during this works. When comparing trucks and trains in terms of maximum values during travel, the vibration of trains was greater in the X- and Y-axis directions, while that of trucks was greater in the Z-axis direction.²³



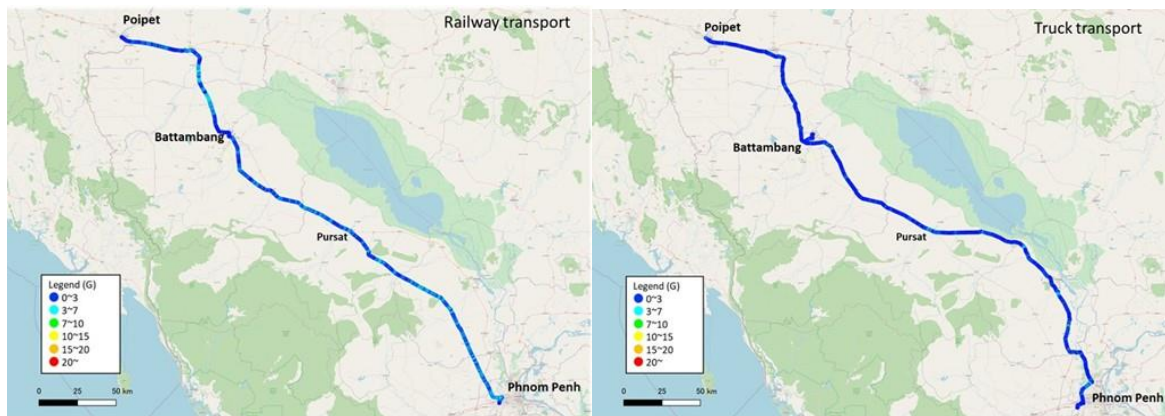
Source: The JICA Survey Team

Figure 3-33 Vibration measurement results from a vibrometer

A color-coded diagram of the magnitude of combined 3-axis railway and truck transport is shown in Figure 3-34. Vibrations of 7 G or less were continuously observed during both railway and truck transport, but it was found that vibrations of 3~7 G were more frequent and widespread during railway transport than during truck transport. This may be due to frequent up-and-down vibrations in poor track conditions such as joint depression (Figure 3-35).²⁴

²³X-axis direction: direction of travel, Y-axis direction: left/right, Z-axis direction: up/down. Although positive and negative values are measured starting from 0, the direction is not covered in this survey, so absolute values are displayed in the graph.

²⁴Combined force(G)=(X(G)²+Y(G)²+Z(G)²)(1/2)



Source: The JICA Survey Team, ©OpenStreetMap Contributors

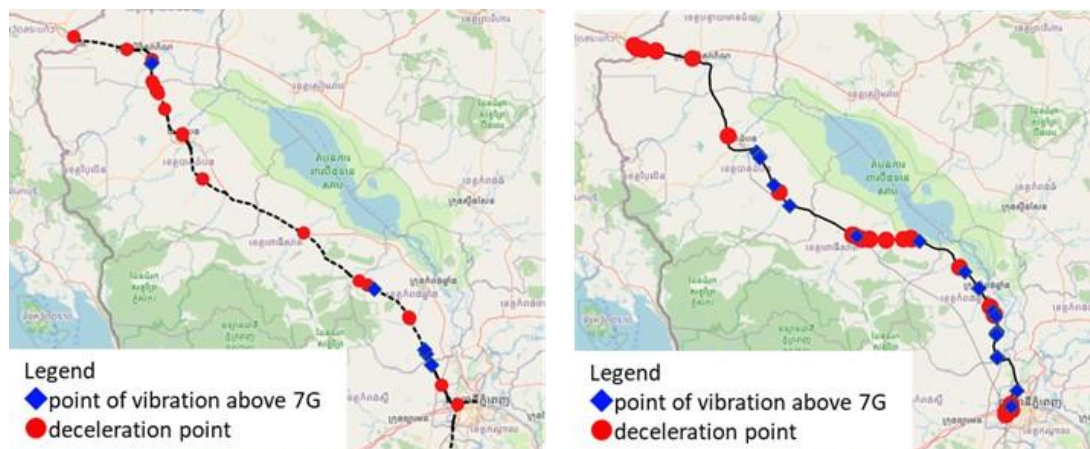
Figure 3-34 Combined G (left: railway transport right: truck transport)



Source: The JICA Survey Team

Figure 3-35 Track in poor condition near Battambang

On the other hand, the number of occurrences of larger vibrations (7 G or more) that impact the cargo more was about three times greater during truck transport than during railway transport. In Figure 3-36, the locations where 7G or higher occurs are marked in blue and the deceleration and stopping locations are marked in red, indicating that the vibration of 7G or higher occurs during driving, not during deceleration or stopping.

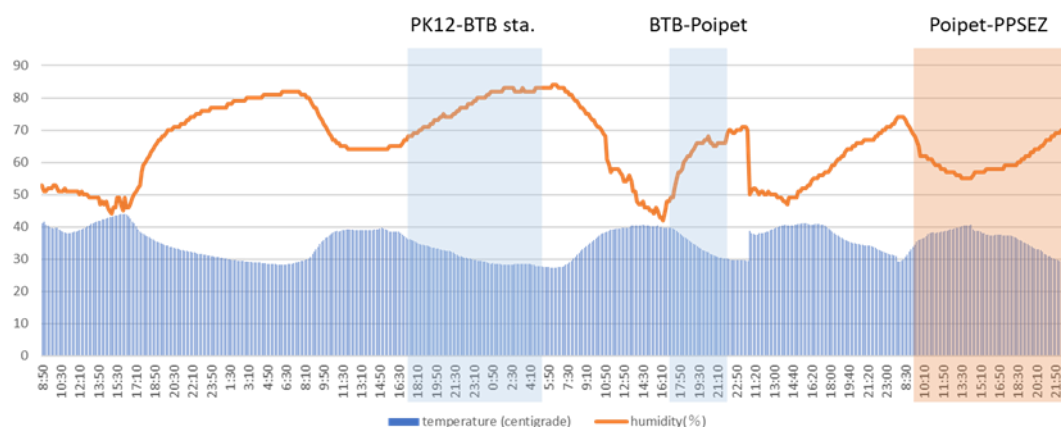


Source: The JICA Survey team, ©OpenStreetMap Contributors

Figure 3-36 Vibration observation points (Z-axis direction) above 7G (left: railway, right: truck)

(5) Temperature and humidity

Figure 3-37 shows the results of the temperature and humidity measurements taken by the thermometer installed inside the container. No significant variation by mode of transport was observed, with a trend toward higher temperatures during the day and higher humidity in the evening and night. The pilot transport was conducted from 21st April to 25th April, and with the exception of an evening shower on 25th, the weather was clear, and the dry season was one of the warmest of the year, but the maximum temperature inside the containers was 44 centigrade (at PP Dryport) and the maximum humidity was 84% (at Battambang Station). From PK12 to Battambang, the train ran at night, with an average temperature of 31 centigrade and a maximum of 38 centigrade. In fact, in interviews with rice millers, they testified that they transport rice at night to maintain rice quality. However, when small-lot customers use the railways, they are often left at freight stations until the cargo volume collected good enough for train operation. This means that the cargo may not be transported at the desired time. Also the cargo left at dry ports under the scorching sun for nearly a day long because the cargo needs to be delivered into the freight station one day before the train departs. Those are concerns to use freight railway.



Source: The JICA Survey Team

Figure 3-37 Temperature and humidity fluctuations during pilot transport

(6) Transport time (actual timetable)

The pilot transport train left PP Dryport at 17:00 on 22nd April and arrived in Poipet at 22:00 on 24th April. The time required was 53 hours, but due to the schedule change, the train had to unload and load containers at Battambang (36 hours), so the train ran for 17 hours.

Table 3-14 shows actual transport data between PP Dryport and Poipet obtained from RR. The average transport time is 21 hours and 10 minutes, which is 1.75 times longer than the truck transport time of 12 hours.

Table 3-14 Performance data of transport time from PP Dryport to Poipet

No.	Train	Phnom Penh Dryport	Poipet	Transport time	Remark
	Trial Train	17:00 22 Apr 2023	22:00 24 Apr 2023	53:00	Stay in Battambang 36:00
1	Cement train	01:00 24 Apr 2023	22:00 24 Apr 2023	21:00	Same as No.1 after Battambang
2	Lime Train	6:00 17 Apr 2023	1:30 18 Apr 2023	19:30	
3	Car Train	9:00 10 Apr 2023	8:00 11 Apr 2023	23:00	
Average 1-3				21:10	

Source: The JICA Survey Team

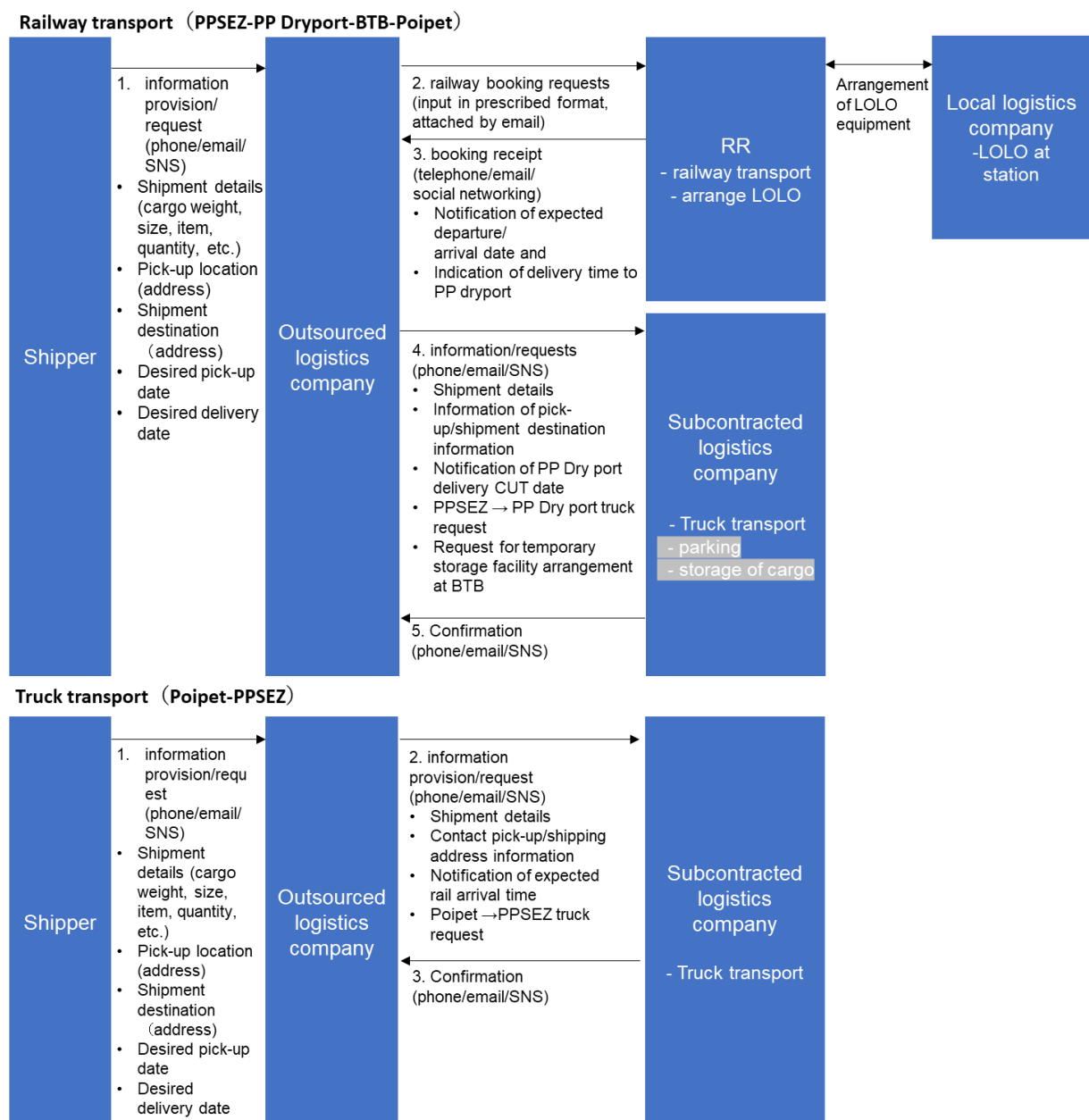
(7) Comparison of transport procedures

Figure 3-38 shows the flow to apply pilot transport for both outbound (railway transport) and return (truck transport).

In view of the perspective of shipper, the instructions to the outsourced logistics company that coordinates with the subcontracted logistics company responsible for the actual transport of RR and trucks is the same for railway and truck transport, and the arrangement burden on the shipper remains the same when the outsourced company is available for shipper.

On the other hand, from the perspective of an outsourced logistics company, the railway operator (RR) responsible for actual railway transport is added to the coordination target for railway transport, making coordination between RR and the subcontracted logistics company more complicated. Although RR arranges the LOLO works at the station, it is necessary to arrange trucks in expected of arrival and LOLO start timing, and instructions must be given to the subcontracted logistics company timely if train arrival time changed.

In actual operation, it is assumed that there is no outsourced logistics provider to act as an intermediary, in which case shippers will be forced to coordinate directly with RR and subcontracted logistics company. The presence of an outsourced logistics company is important to ensure a coherent volume of goods and to make it a priority (for RR).



Note: The gray-highlighted areas are not comparable because they are procedures that were not originally envisioned.
Source: The JICA Survey Team

Figure 3-38 Flow of railway and truck transport application

3.3.3 Issues

(1) Infrastructure

Issues in view of infrastructure identified through pilot transport were organized in terms of "CY," "track," and "safety". Each of these issues is shown in Table 3-15.

Table 3-15 Infrastructural issues in pilot transport

No.	Category	Issue
1	CY	Fewer CYs available Low quality of loading and unloading (crane loading) Waiting for work at CY (loading/unloading on main line, refueling)
2	Track state	Continuous vibration when running
3	Safety (level crossing)	Stopping at level crossings

Source: The JICA Survey Team

As for CY, the only freight station in Cambodia with cargo handling equipment in place and work space is PP Dryport on Northern line. At Battambang and Poipet stations, RR requested the operator to make arrangements as needed, and the work equipment used was a crane. The LOLO time is about three times longer than that of a reach stacker, resulting in low work efficiency.²⁵

In addition, logistics providers require CYs to be located close to shippers, and it is desirable to develop several CYs with cargo handling facilities to enhance convenience. Improving CY functionality is also an issue. PP Dryport, the sole CY in Phnom Penh owned by RR, does not have a loading line or side lines for fueling. As a result, train passage is not possible during loading and unloading operations and refueling, resulting in waiting time for those operations.²⁶

The PP Dryport workspace and container detention area are unpaved, so trucks and reach stackers loaded with containers are coming and going on the site in an unstable condition, and there is a risk of overturning. In addition to the pavement of the loading platform, there is not enough space for loading and unloading operations relative to the length of train, and wagons are frequently moved in and out of the platform in small shifts.

The railway is currently obstructing traffic at the level crossing adjacent to the facility during these operations, and it is desirable to improve the side lines for loading and unloading lines and fueling, pave the loading platform, and change the alignment so as not to obstruct the level crossing when wagons are changing over.



Source: The JICA Survey Team

Figure 3-39 Handling works by cranes (left) and locomotive refueling on the main line (right)

²⁵About 2 minutes/container with reach stacker (measured at PP Dryport), about 6 minutes/container with crane (measured at Battambang station)

²⁶Based on interviews with Cambodia Logistics Association



Source: The JICA Survey Team

Figure 3-40 Unpaved loading platform (left) and wagon entry/exit that obstructs level crossing (right)

Regarding the track condition, vibrations of about 5~7G were continuously observed during the train movement in railway transport. The rails on track on Northern line are short, about 25 m, and the rail head surface is depressed at the rail joints (so-called joint drop-off. Example: Figure 3-41). It is desirable to reduce vibration during vehicle travel by reducing the number of joints through welding (long rail), but long rail has already been implemented in some sections. Since the track is partially maintained by RR, MPWT does not know the condition of the track across the entire line. In addition to performing ballast thrusting at the proper frequency and maintenance to compensate for track irregularity it is desirable to conduct an inventory survey of railway track equipment, including the track, to determine the condition of the track for the entire line.



Source: The JICA Survey Team

Figure 3-41 Example of a section where the track has a joint depression

(2) Operation

Issues related to "freight train operation," "container handling at CY," and "safety" that were identified through the pilot transport are described. Each of these issues is shown in Table 3-16.

Table 3-16 Operational issues in pilot transport

No.	Category	Issues	
1	Freight train operation	The work site cannot monitor of the day's work. Priority is given to Southern line.	Difficult to transport small lots
2	Container loading and unloading at CY	Unloading wagons by moving many times	Container loaded by cranes
3	safety	Inspection of trains upon departure/arrival and measures to prevent wagons from being diverted	Safety gear worn by workers

Source: The JICA Survey Team

For freight train operations, the "control room" in Phnom Penh planned the next operation each time and instructed each work site, making it impossible for the work sites to know in advance which operations to perform on the day of the operation. In addition, because priority was given to train operations on Southern line, which connects to maritime transport, work related to trains on Northern line tended to take lower priority. Furthermore, because few customers use railway transport at this time, customers wishing to transport "one" container by railway had to wait for large customer demand to organize a train.

As for container loading and unloading at CY, even after the expansion of the loading platform at PP Dryport, loading and unloading still took time due to the small movements of wagons. In addition, cranes are used at Battambang and Poipet stations for container loading and unloading, and there are concerns about safety during loading and unloading and the impact on cargo caused by container tipping during the works.

Regarding safety, the locomotives, wagons, and containers were not sufficiently inspected upon train departure and arrival, and manual brakes and other measures to prevent wagons from overturning were not applied when wagons were left at the station. Regarding the safety gear of workers involved in train operations and container loading and unloading, most workers were wearing safety vests, but not helmets, work shoes, or gloves.

3.4 Current Status and Issues of Cross-border Transport with Thailand

3.4.1 Background

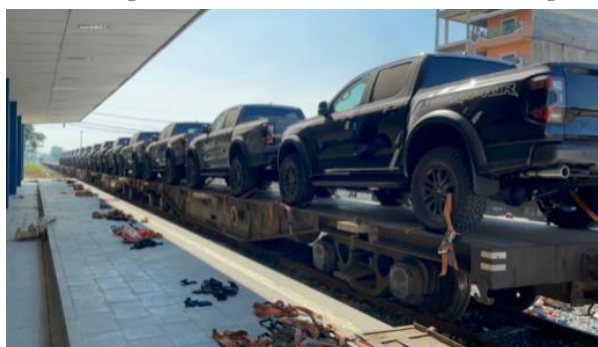
Northern line of railway in Cambodia borders Thailand and the international train used to in operation between Cambodia and Thailand. Due to the civil war in the 1970s and 1980s, about 8 km near Poipet became the missing link and was out of service for a long time, but MPWT (DoR) completed resettlement and track maintenance with Cambodia national budget by 2018, and in 2019, the State Railway of Thailand presented MPWT with a passenger train, In 2019, a commemorative train ran from Bangkok to Phnom Penh, increasing momentum for commencement of international train operation.

Since then, there has been no international train on regular basis, but track materials continue to be transported from Thailand to Cambodia on demand basis. Discussions between Thailand and Cambodian governments regarding the international train operation are ongoing, and there have been multiple reported of the possibility of resuming of international train operation²⁷.

RR has started transporting completed cars from Poipet to Pursat in July 2022. (Figure 3-42) In this case, completed cars are transported by truck from the assembling plant in Rayong, Thailand to Poipet and transshipped by railway at Poipet. The customs value of completed car transport is the largest import item at Banteay Meanchey Customs and the largest export value trade item for the Thai side (Sa Kaeo Customs). If the international train

²⁷For example, <https://www.railwaygazette.com/asia/thailand-cambodia-railway-to-open-this-month/48331.article#:~:text=ASIA%3A%20The%201%C2%B73%20km,in%20Bangkok%20on%20April%204,2023>. (accessed May 2, 2023)

operation is launched in the future, the cost advantage will increase as LOLO at Poipet station will no longer be necessary, and as a result, the railway may be used by other car manufacturers to transport completed cars. In addition, interviews with Japanese shippers confirmed that many packaging materials, beverages, machinery products, etc. were imported from Thailand. If international train operation is realized, it is expected to stimulate further demand for completed car transport, as well as a modal shift of these shipments from truck to railway.



Source: The JICA Survey Team

Figure 3-42 Transport of completed cars at Poipet station

3.4.2 Cross-border Railway Agreements and International Train Operation

(1) Cross-border railway agreements

Thailand is connected by railway to Malaysia, Laos, and Cambodia as shown in Figure 3-43. The connecting railways are all 1,000 mm, allowing for interchange of vehicles. For the international train operation, Thailand has already concluded agreements with Malaysia, Laos, and Cambodia, respectively, between their governments as shown in Table 3-17.

As of May 2023, international train operation is underway on a commercial basis between Thailand and Malaysia and between Thailand and Laos for both freight and passengers. On the other hand, although a commemorative direct transport between Thailand and Cambodia was only implemented in April 2019 with Prime Minister Hun Sen on board, and used rails and sleepers are being transferred without customs clearance, international train operation for commercial purposes is still being prepared by officials in both countries.



Note: Dotted lines are planned lines (construction already started) and the other line are line in operation
Source: The JICA Survey Team, ©OpenStreetMap Contributors

Figure 3-43 Railway network in Thailand and neighboring countries

Table 3-17 Current railway cross-border agreements between Thailand and neighboring countries

Section	The year of MOU between governments signed	situation	border station
Thailand - Malaysia	1954	being carried out	Padang Besar, [Thailand/Malaysia] Sungai Kolok
Thailand - Laos	2008	being carried out	[Thailand] Nong Khai [Laos] Thanaleng
Thailand - Cambodia	2019	in preparation	[Thailand] Ban Klong Leuk [Cambodia] Poipet, Stung Bot

Source: The JICA Survey Team

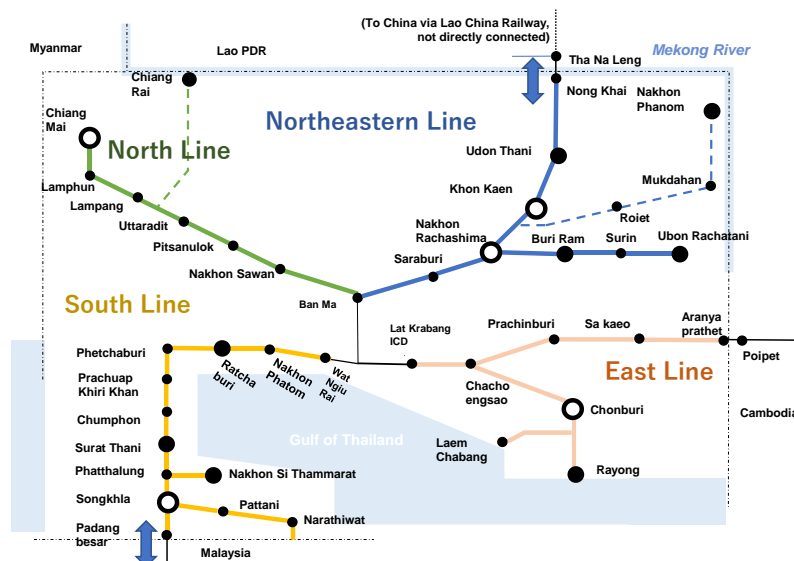


Source: The JICA Survey Team (left figure), SRT (right figure)

Figure 3-44 Thailand-Malaysia border Padang Besar (left) and Laos border Friendship Bridge (right)

(2) International Train Operation

As shown in Figure 3-45 the State Railway of Thailand (SRT) lines serve the Northeast Line to Tha Na Leng Station in Vientiane, Laos, and the South Line to Padang Besar Station in Perlis, Malaysia, and cross-border freight transport is conducted on these sections of the line. The operational status is shown in Table 3-18.



Note: Arrows in the figure indicate that cross-border transport is being implemented.

Source: The JICA Survey Team based on Feasibility Study of Railway O&M Business and Railway -related Business (Ministry of Land, Infrastructure, Transport and Tourism Japan, Railway Department).

Figure 3-45 Cross-border railway map between Thailand and neighboring countries

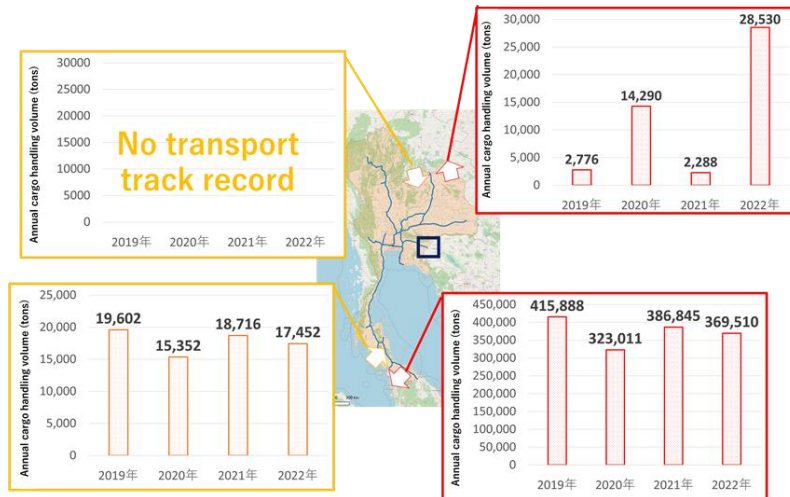
Table 3-18 Current status of international train operation between Thailand and neighboring countries

Item	Thailand – Malaysia	Thailand – Lao PDR	Remarks
train operation frequency	<ul style="list-style-type: none"> 2 round trips / day (passenger trains) On-demand operation (freight trains) 	2 round trips / day (mixed passenger and cargo transport)	
Operation of rolling stock	<ul style="list-style-type: none"> Operation between Thailand and Padang Besar (Malaysia) for passenger trains Locomotive is exchanged at Padang Besar station (Malaysia), wagons of Malaysia are used inside Malaysia and Thailand (Freight trains) 	Rolling stocks of Thailand are used in Thailand and Lao PDR.	
Freight stations in the border area (main function and size of facilities)	Padang Besar Station (Malaysia): One-stop freight cross-border processing, exchange of locomotives, CY size: 13Ha. *Padang Besar Station of Thailand (same name) in Thai side has no freight station facilities for cross-border freight operation.	<ul style="list-style-type: none"> Nong Khai Station: import-export procedures on the Thai side, CY size: 13Ha. Tha Na Leng Station; import-export procedures on the Lao side, CY size: 45Ha. 	Customs clearance <ul style="list-style-type: none"> Thailand-Malaysia: carried out at Padang Besar Station (Malaysia) Thailand-Lao: carried out at Nong Khai station and Tha Na Leng stations respectively.

Source: The JICA Survey Team

Cross-border freight transport performance by railway is shown in Figure 3-46. Thailand has the most exports to Malaysia in any year (more than 10 times more than cross-border railway transport at other points). The import volume to Thailand in the same section is a few percent of the export volume, and the export volume to Malaysia is larger than the import volume. Although the amount of exports to Lao PDR is not large, it is clear that it has been increasing over the years, but the import volume from Lao PDR is statistically zero²⁸.

²⁸ Feasibility Study of Railway O&M Business and Railway -related Business (Ministry of Land, Infrastructure, Transport and Tourism Japan, Railway Department, 2023)



Note: Yellow figures: actual imports to the Thai side; red figures: actual exports from the Thai side.

Source: The JICA Survey Team based on Feasibility Study of Railway O&M Business and Railway -related Business (Ministry of Land, Infrastructure, Transport and Tourism Japan, Railway Department).

Figure 3-46 Cross-border freight transport performance

3.4.3 Current Status of Facilities in Cambodia and Thailand on the International Train Operation

(1) Status of Preparation of Relevant Organizations in Both Countries

As of April 2023, both countries have completed domestic railway transport across their borders, with two round trips per day to Bangkok in Thailand (passenger trains only) and no passenger train service running through the Poipet region in Cambodia, only freight railway transport (on demand basis) is operated as shown in Figure 3-47.



Source: The JICA Survey team, ©OpentStreetMap Contributors

Figure 3-47 Location of Cambodia-Thailand border facilities

International train operation between Thailand and Cambodia is being prepared in both countries with the goal of starting by the end of 2023. Preparations between the governments have been completed and the situation requires coordination between Thai and Cambodian railway operators and between Thai customs authorities and railway operators. The status of response each organization is shown in Table 3-19.

Table 3-19 Status of responses of relevant organizations in Thailand and Cambodia

Relevant organizations	Thailand	Cambodia
Government Organization (Railway)	Department of Transport, Bureau of Railways already prepared	Department of Public Works, Ministry of Transport, Railway Bureau already prepared
Railway operators	Thai National Railways (1949-1987) Need to prepare facilities to handle customs clearance in border areas Technical coordination with Royal Railway required.	RR Poipet station provisional use prepared Requires agreement between operators and Thai National Railways
Government organization (customs clearance)	Aranyaprathet Customs Pending approval from customs authorities (main office)	Poipet Customs Poipet station provisional use prepared

Source: The JICA Survey Team

(2) Status of cross-border transport facilities on Cambodian side

The border station, Poipet Station, does not currently handle passenger trains, but rather freight railway trains to and from Phnom Penh on an on-demand basis to meet demand for completed cars and fertilizers transported from Thailand to Cambodia. Preparations are underway for the future implementation of cross-border transport, both for freight and passenger transport as shown in Figure 3-48 and Figure 3-49.

In addition, to improve connectivity between Thailand and Cambodia, Cambodia is constructing the Thai-Cambodian Friendship Bridge and the new Stung Bot border (Figure 3-47) at 8.5 km west of the border with financial assistance from Thailand. At this time, Stung Bot is a facility intended for trucks, and railway transport is not envisioned, but MPWT (DoR) intends to add railway transport capability to Northern line neighborhood. Therefore, cargo handling at Poipet, which is already constructed, will be used on a temporary basis, and the function will be transferred from Poipet after the Stung Bot is upgraded.

Table 3-20 Current status of facilities on the Cambodian side

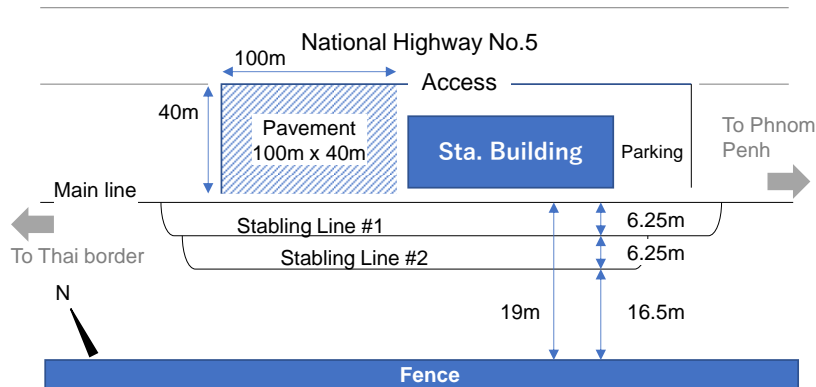
Category	Poipet Station	Stung Bot
Freight train	Prepared (tentative use available)	Railway facilities are not yet in place.
Passenger train	already prepared	-

Source: The JICA Survey Team



Source: The JICA Survey Team

Figure 3-48 Poipet station building (left) and cargo handling space inside Poipet station (right)



Source: The JICA Survey Team

Figure 3-49 The layout of Poipet Station

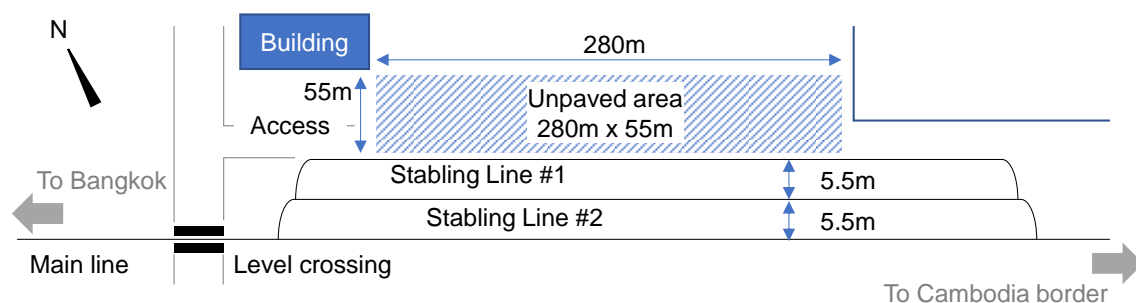
(3) Status of cross-border transport facilities on Thai side

As of May 2023, there is no freight railway transport at the border station, Ban Klong Luk Station, and two round trips per day are available by passenger railway to and from Bangkok. Since Ban Klong Luk station has only facilities for passenger transport, a facility for loading and unloading containers from wagons must be provided at Baan Dong Ngu, about 1 km away, to provide freight railway transport for international train operation. As shown in Figure 3-50 and Figure 3-51, although 2 stabling lines are already installed at Baan Dong Ngu station, it is recommended that the development of access roads and the pavement of handling space.



Source: The JICA Survey Team

Figure 3-50 Ban Klong Luk station (left) and Baan Dong Ngu stabling line (right)



Source: The JICA Survey Team

Figure 3-51 the layout of Baan Dong Ngu station

3.4.4 Issues in International Train Operation between Cambodia and Thailand

(1) Preparation on the Thai side

As mentioned in the previous section, Ban Klong Luk Station, the border station, has only facilities for passenger transport, so cargo inspection facilities and container loading/unloading facilities need to be provided at nearby Baan Dong Ngu in case cargo inspection is required during import/export customs clearance. As of April 2023, no instructions for preparation have been received from the Thai customs authorities to Aranyaprathet Customs, which has jurisdiction over the border, and Aranyaprathet Customs is aware of the issues but has been unable to initiate discussions with SRT regarding specific preparations.

(2) Preparation of railway operators

When operating international trains, the locomotives that tow wagons are switched to locomotives of the respective countries at border stations, so locomotives of both countries will not travel long distances within the other country. As for wagons entering the partner country, confirmation between the railway operators is needed for Cambodian wagons to enter Thailand and Thai wagons to enter Cambodia, but this has not yet been agreed upon as of May 2023.

(3) Preparation on the Cambodian side

As mentioned in the previous section, the Cambodian government intends to establish and operate freight railway facilities in the Stung Bot area in the future, although the Poipet station will be used tentatively when international train begin operation. On the other hand, land acquisition in the Stung Bot area is expected to be difficult and freight railway functions cannot be easily relocated from Poipet station to the Stung Bot area.

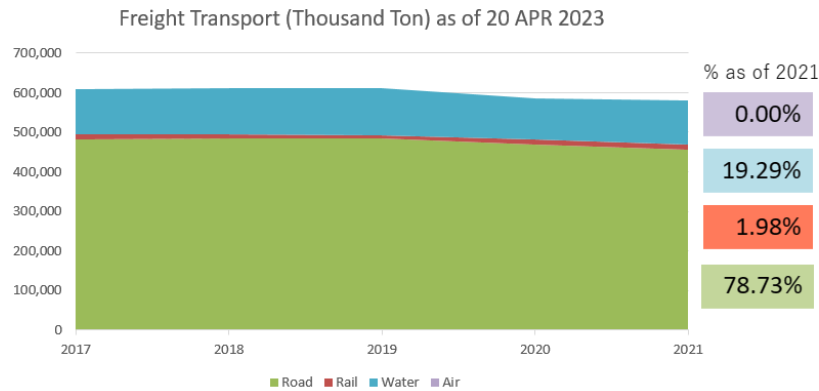
3.5 Case Studies to Promote Railway Transport in Thailand

3.5.1 Overview of Freight Railway Transport in Thailand

Road transport by trucks accounts for about 80% of cargo transport in Thailand, while railway transport accounts for about 2% (Figure 3-52). Although the axle load of the railway network in Thailand is 20 ton, the Thai government is promoting the construction of double tracking on existing lines and the construction of new lines to promote freight railway.

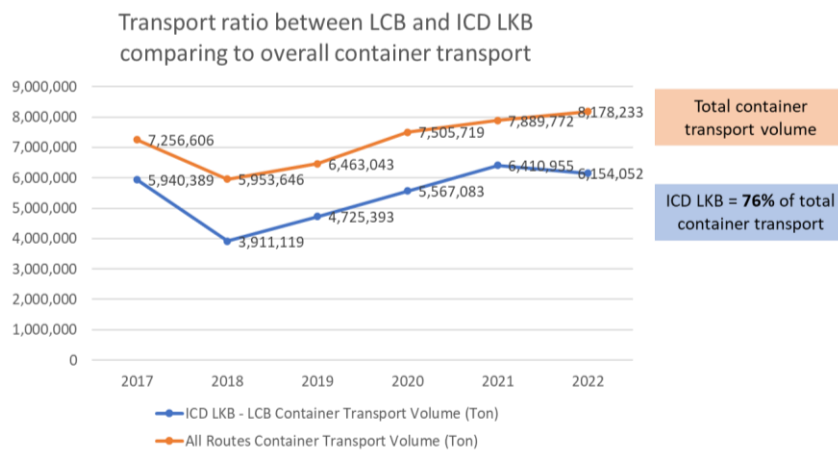
Freight railway transport between Laem Chabang Port, the largest port of Thailand, and the inland hub Lat Krabang Inland Container Depot (ICD) accounts for about 76% of total freight railway transport of Thailand, and about 25% of containers transported on this section are shipped by railway (Figure 3-53). For this reason, this section is an important railway section compared to other sections. On the other hand, since only about 7% of the cargo using the Sihanoukville port is transported by railway (Figure 3-55), the following section discusses the initiatives at Laem Chabang Port and Lat Krabang ICD in Thailand as advanced cases against Cambodia.

Since only about 5% of the total cargo using Laem Chabang Port is transported by railway (Figure 3-54), efforts to promote the use of railway are still underway in Thailand with the aim of further increasing the percentage of cargo using railway.



Source: Thai Ministry of Transport <https://datagov.mot.go.th/>

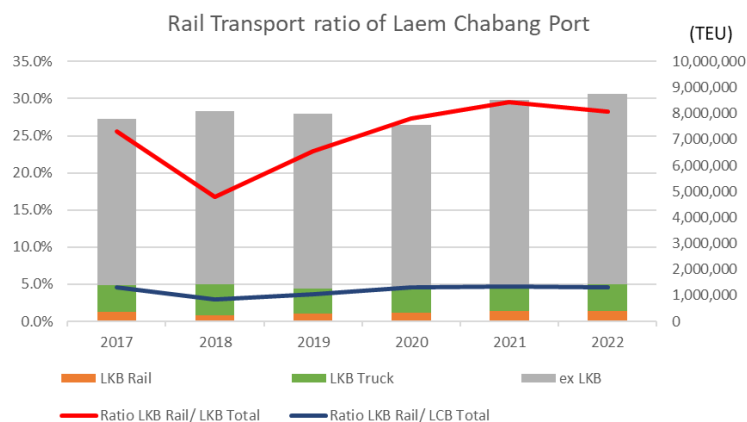
Figure 3-52 Percentage of transport modes in Thailand



Source: Department of Railways, Ministry of Transport, Thailand ข้อมูลสถิติ การขนส่งสินค้าทางราง - ชุดข้อมูล - กรมการขนส่งทางราง (gdcatalog.go.th) https://drt.gdcatalog.go.th/dataset/stat_freight_rail

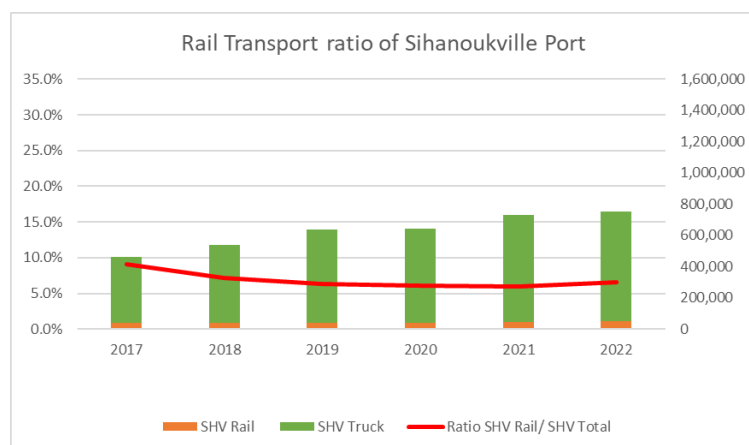
Figure 3-53 Percentage of freight railway transport in Thailand between Laem Chabang Port and Lat Krabang

ICD



Source: Bangkok Shipowners and Agents Association - Statistics (thaibsaa.com) <http://www.thaibsaa.com/index.php/statistics>

Figure 3-54 Mode ratio of cargo using Laem Chabang Port



Source: The Sihanoukville Autonomous Port (PAS)

Figure 3-55 Mode ratio of cargo using Sihanoukville Port

3.5.2 Examples of Measures to Promote Railway Transport

(1) Laem Chabang Port - Single Rail Transfer Operator (SRTO)

The Single Rail Transfer Operator ("SRTO") is located between Laem Chabang Port Terminals B and C, covering an area of approximately 96 ha and capable of holding up to eight train sets on six loading and stable lines. Two Rail Mount Gantry Cranes (RMG) are installed to work on six tracks simultaneously, and one Rubber Tired Gantry Crane (RTG) is installed to load and unload containers detained in the yard to and from trucks.

At SRTO, trucks are collected and delivered between SRTO and the container yard in addition to the freight station function. The Port Authority of Thailand (PAT) is responsible for the operation and management, and TIPS Company Limited is outsourcing the practical operations (for five years from April 2022). PAT sets the price for this service, charging users 690 THB per 20FT container (about 20 USD) and 1,040 THB per 40FT container (about 30 USD) per container. With regard to SRTO operations, officials commented that when preparing cranes, facilities and space commented that the number of each should be properly calculated and prepared to accommodate the exact volume of transport.

Cheaper and more efficient transport between railway stations and port CYs is linked to improved railway and port connectivity, and SRTO initiatives implemented by government agencies (PATs) can be helpful in Cambodia.



Source: SRTO

Figure 3-56 Overall view of SRTO (left) and RMG loading/unloading a train (right)

(2) Lat Krabang ICD

Lat Krabang ICD is located north of Suvarnabhumi International Airport near Bangkok, covering an area of approximately 103 ha and capable of holding up to four trains on four loading and stabling lines. SRT owns the land and six container operators operate their businesses individually on their section as shown in Figure 3-57. The premises include customs facilities (with X-ray inspection facilities), an office building for businesses, and power supply facilities for warehouses and reefer containers.

A tender to consolidate the Lat Krabang ICD operators into a single operator was conducted in 2018, but due to Public Private Partnership (PPP) regulations and approval issues by the relevant agencies, the successful bidder has not started operations as of 2023, and the six existing operators continue to operate. Comments were made by a representative of the Thai Ministry of Transport, as follows; (1) Thailand's PPP model is complex and time-consuming and therefore not recommended for implementation in Cambodia, and (2) the access road to the Lat Krabang ICD is in poor condition, adversely affecting the use of the ICD, and therefore the access road must be prepared well in advance.

Thus, in order to promote freight railway transport in Thailand, railway container terminals have been established on government SRT land in the suburbs of Bangkok operated by private container operators. Railways have also become an alternative to trucks in terms of port connections, providing shippers with a choice. The bonded transport by railway and the development of railway transport hubs by the government in Lat Krabang ICD are also useful initiatives in Cambodia.



Source: SRT

Figure 3-57 Lat Krabang ICD cargo handling lines (left) and six container operators (right)

3.5.3 Suggestions for Cambodia

(1) Bonded transport by railway

Customs facilities are located at Lat Krabang ICD in Thailand, and customs clearance can be conducted at Lat Krabang ICD before and after railway transport. The ability to conduct customs clearance procedures closer to customers will make it easier to respond to urgent inspections and enhance the convenience of railway travel.

In Cambodia, only PP Dryport and Sihanoukville Port have both a railway station and customs facilities. In the

future, customs facilities could be established at Poipet and Battambang railway stations to enable bonded transport by railway, thereby promoting the use of railway.

(2) Government Development of Railway Transport Hubs

SRTO is maintained by PAT and the Lat Krabang ICD by SRT, both of which are government agencies. Although there are some disadvantages as government-organized projects in Thailand, such as complicated procedures, private operators can use the railways with confidence because of the efforts being made by government agencies to promote the use of railways.

In railway operation in Cambodia, although the Sihanoukville port is maintained by PAS, other freight stations are established on a project basis by RR, the railway operation concessionaire, while leasing land from others. For cargo stations other than Sihanoukville Port, the Cambodian government can promote the stable use of railways by developing a railway transport hub.

(3) Connection between Port and Railway

SRTO has started truck pickup and delivery operations between SRTO and the container yard starting in 2022. Conventionally, SRTO only handled loading and unloading between truck and wagons at freight station, and each container yard operator was responsible for truck pickup and delivery operations between SRTO and the container yard in the port. The container yard operator tended to prioritize loading and unloading to the vessel and put off operations for SRTO depending on the schedule of the vessel berthing. SRTO has started truck pickup and delivery operations in order to avoid SRTO's operations being put off by the container yard operator, and to more smoothly connect the containers transport from SRTO to railway.

As in Thailand, the majority of cargo transported by railway in Cambodia is containerized cargo to/from Sihanoukville Port, and therefore, the connection between the railway station and the CY can be facilitated by operating the railway station and the container yard as an integrated unit, or by extending the railway line closer to the container yard to shorten the distance of the railway line to the container yard. The connection between the railway station and the container yard at Sihanoukville Port can be made smoother by operating the railway station and the container yard together, or by extending the railway line closer to the container yard to shorten the lateral distance as much as possible, thereby promoting the use of railways.

Chapter 4 Current Status and Issues in the Logistics Sector of Agricultural Products for Export

4.1 Current Status of Agricultural Products for Export in the Target Areas

The survey targets rice and corn as the main agricultural products for export. Therefore, the scope of the survey is limited to logistics for export and only an overview of domestic logistics of those crops. Rice logistics is characterized that the most of rice goes through rice mills. The fact that rice is accumulated once at rice mills, it is suitable for mass transport from there by railway. For example, vegetable and fruit is often accumulated in each scattered production areas and transported directly from there by truck to wholesale markets in various regions, as the quality of the produce tends to deteriorate. Therefore, these are basically difficult to be transported by railway.

Based on these findings, this survey focused on rice as an export agricultural product and surveyed not only domestic logistics, but also market trends in export destination countries and export trends from neighboring countries such as Thailand and Vietnam, which compete in the international market. In addition, during the field survey, it was found that corn, as a field crop, is not suitable for mass transport by railway because its production areas are scattered. It is used for various purposes, including food and livestock feed, and in the case of feed, it is mixed with other crops such as soybeans in the logistics process. Therefore, it is difficult to estimate and analyze statistical data on the production and consumption of corn as animal feed.

4.1.1 Agricultural Sector Overview

In 2021, the agriculture sector is a major industry in Cambodia, accounting for about 24.4% of GDP (nominal value) and about 35% of the labor force, although its relative share has declined in recent years due to the growth of the manufacturing and service sectors. The Cambodian government has so far positioned the agriculture and rural development sector as one of its development priorities, which has contributed significantly to promoting economic growth, ensuring food security, developing the rural economy, and improving people's living standards. However, approximately 20% of the rural population as of 2023 is still below the poverty line (1.9 USD/day), agriculture and rural development has issues to improve incomes and living standards in rural areas. In addition, the agricultural labor force has been declining in recent years, creating a shortage of farmers.²⁹

4.1.2 Agricultural Policy

(1) National Development Plan

The Cambodian government has set long-term and medium-term development goals and is working to overcome the issues. The "Cambodia Vision", the most long-term vision, sets a goal for Cambodia to become an Upper-middle-income country by 2030 and a Developed country/High-income country by 2050. "Cambodia

²⁹MAFF Annual Report 2021

"Industrial Development Policy 2015-2025" has been formulated as a medium-term policy document covering the 10-year period from 2015 to 2025. The policy sets the following targets: 1) to increase the share of the secondary industry to 30% of GDP as economic diversification, 2) to increase exports from the manufacturing sector excluding textiles to 15% of total exports, and 3) to promote the formal registration of small and medium-sized enterprises. As policy document covering the five-year period 2019-2023, the "Rectangular Strategy Phase 4" and the "National Strategic Development Plan 2019-2023" were formulated.

The "Fourth Rectangular Strategy" (the rectangular refers to growth, employment, equality, and efficiency), which outlines the direction of the Cambodian government's response to policy issues, identifies "human resource development," "economic diversification," "private sector development and market development," and "sustainable and inclusive development" as the four priority areas by 2023. "National Strategic Development Plan 2019-2023", which outlines key government-wide policies based on the Fourth Rectangular Strategy, identifies key cross-cutting issues as gender, environment, natural resources and green growth, disaster management and public financial management reform. The agricultural policy in the plan states "Strengthen the role of the agricultural sector in job creation, ensuring food security, poverty reduction, and rural community development in the context of inclusive and sustainable development".

(2) Agricultural Sector Development Plan

The Agriculture Sector Strategic Development Plan 2019-2023 (2019-2023) as the mid-term plan of the Ministry of Agriculture Forestry and Fisheries (MAFF), set goals of a shift from traditional agriculture to highly productive and advanced agribusiness and diversification of crops and products to meet market needs. The main contents are: "accelerating the process of preparing, enacting, and enforcing the plant protection and sanitary phytosanitary law and the contract farming law," "increasing investment in high value-added crops, livestock, and aquaculture," "promoting model farm development," "strengthening agricultural extension services," "strengthening farmers' cooperative management," "developing contract farming production mechanism," "reducing the cost and improving the quality of agricultural inputs," "research on establishing agricultural insurance services," "developing financial services to support agricultural production," and "promoting productivity and quality improvement and diversification through the promotion of the use of digital and smart technologies in agriculture." The main priority crops are rice, cassava, mango, cashew nuts, bananas, rubber, and vegetables, which are considered to have high potential, with the aim of promoting private investment and boosting the food processing industry.

The "Agricultural Development Policy 2021-2030", a long-term plan through 2030, has a long-term vision of making Cambodia a high- and middle-income country by 2030 and a high-income country by 2050. To achieve those targets, it has set four strategies: 1) strengthening the competitiveness of the agricultural sector by strengthening agricultural value chains; 2) strengthening support for agricultural infrastructure, credit, and

agricultural trade promotion; 3) strengthening sustainable management of land, forest, and fishery resources; and 4) strengthening governance and human resource development in the agricultural sector. The policy aims to strengthen the competitiveness of the agricultural sector. In doing so, it aims to supply its citizens with high quality, nutritious agricultural products and increase exports, while giving due consideration to the sustainable management of natural resources.

In January 2023, the Cambodia Rice Federation (CRF), a group of private rice millers, announced its goal of exporting 1 million ton of white rice by 2025, a 50% increase over the 2022 level. The CRF, in cooperation with the Ministry of Commerce (MoC), has positioned the Philippines as a new market and is also aiming to expand its market in the Middle East and Europe.³⁰

4.1.3 Rice Production and Post-harvest Processing

(1) Rice Production

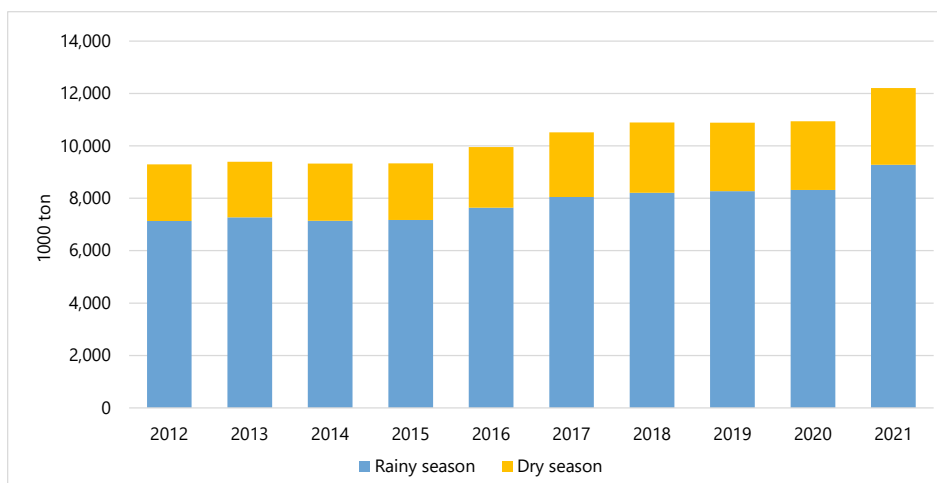
In Cambodia, rice paddy fields account for about 80% of the total agricultural land, and rice is mainly cultivated in one season in rain-fed condition, and in areas where irrigation facilities have been developed it, it is cultivated in two seasons. Cambodia has a tropical monsoon climate with a clear division between wet and dry seasons, and rice cultivation is carried out in wet and dry seasons according to the natural conditions.

The main production areas are concentrated in the Mekong River basin and the plains around Tonle Sap Lake. Since rain-fed rice is the main production system it is easily affected by climatic conditions, and the production volume fluctuates from year to year. However, in the past decade, production has been on a slight upward trend due to government support measures and technological innovations. Although production was stagnant from 2012 to 2015, it has been on a slight upward trend since 2016, with a significant increase in 2021. Figure 4-2 shows the change in rice production over the 10-year period from 2012 to 2021. In 2021, the total harvested area was approximately 3.55 million ha (of which 2.9 million ha were wet season rice and 0.65 million ha were dry season rice), and annual production was approximately 12.21 million ton (of which 9.28 million ton were wet season rice and 2.93 million ton were dry season rice).



Source: The JICA Survey Team
Figure 4-1 Rice production in dry season in Battambang

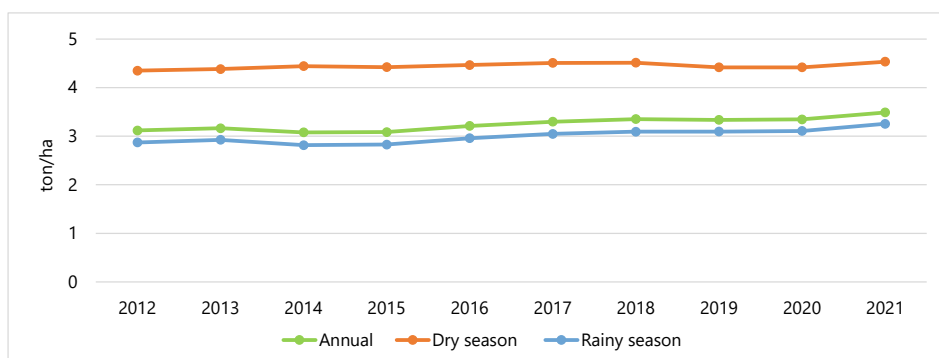
³⁰Khmer Times February 2, 2023 "Cambodia eyes exporting 1 million ton milled rice by 2025" (<https://www.khmertimeskh.com/501230991/cambodia-eyes-exporting-1-million-ton-milled-rice-by-2025/>)



Source: MAFF Annual Report 2021

Figure 4-2 Rice production in Cambodia

Figure 4-3 shows the trend of rice yields over the 10-year period from 2012 to 2021. From 2012 to 2021, both the annual average, wet season rice and dry season rice have stagnated. The average annual yield in 2021 was 3.49 ton/ha, with 3.25 ton/ha for wet season rice and 4.53 ton/ha for dry season rice.



Source: MAFF Annual Report 2021

Figure 4-3 Rice yield in Cambodia

Rice production by provinces in 2021 is shown in Table 4-1. Battambang, Kampong Chhnang, and Pursat, the regions covered by this survey, are important rice-producing provinces, accounting for about 24% of annual production. Rice produced in the beneficiary areas of the West Tonle Sap Irrigation Rehabilitation Project (yen loan project) is also included in the production figures of these three provinces.

Table 4-1 Rice production in Cambodia by province and cropping season in 2021 (ton)

Province	Rainy season (June-Oct.)	Dry season (Nov.-May)	Annual
Battambang*	1,335,703	178,673	1,514,376
Kampong Chhnang*	493,999	199,609	693,608
Pursat*	551,483	150,816	702,299
Banteay Meanchey	796,257	210,428	1,006,685
Kampong Cham	359,157	184,703	543,860
Kampong Speu	409,138	1,841	410,979
Kampong Thom	627,990	341,945	969,935
Kampot.	490,759	46,185	536,944
Kandal.	141,742	240,483	382,225
Kep.	11,369	74	11,443
Koh Kong	27,293	0	27,293
Kratie.	114,629	60,100	174,729
Mondul Kiri	86,327	553	86,880
Oddar Meanchey	270,873	490	271,363
Pailin.	22,368	2,395	24,763
Phnom Penh	16,337	1,781	18,118
Preah Sihanouk	36,896	0	36,896
Preah Vihear	289,837	77	289,914
Prey Veng	1,056,748	541,988	1,598,736
Ratanak Kiri	74,404	0	74,404
Siemreap	488,903	84,908	573,811
Stung Treng	74,724	177	74,901
Svay Rieng	504,930	91,756	596,686
Takeo.	732,667	537,385	1,270,052
Tboung Khmum	263,783	52,305	316,088
Total	9,278,316	2,928,672	12,206,988
Total of target area of this survey*	2,381,184	529,098	2,910,282
Percentage of total amount	(25.7%)	(18.0%)	(23.8%)

Source: MAFF Annual Report 2021

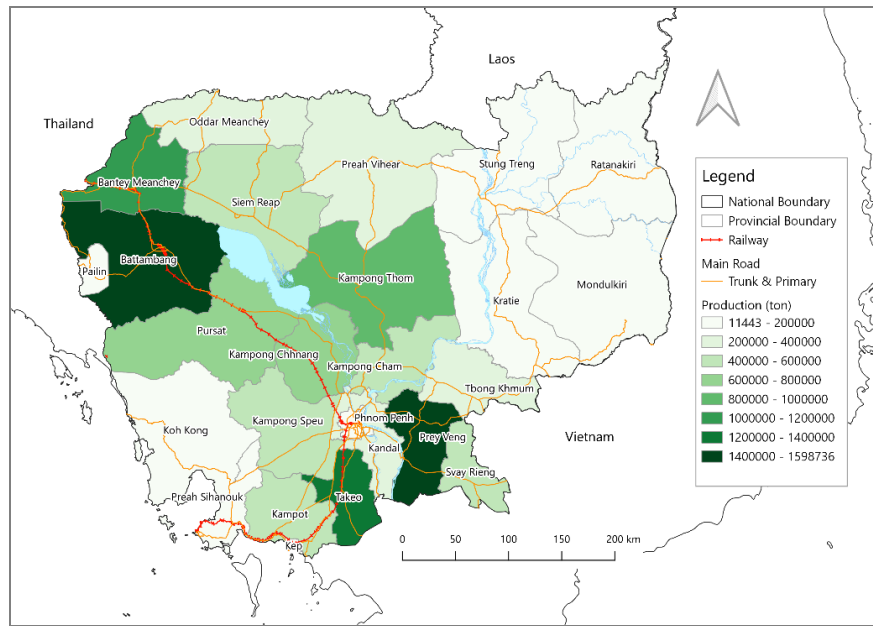
* Areas covered in this survey

Figure 4-4 shows rice production by province and railways and highways in 2021. Battambang, Kampong Chhnang, and Pursat provinces are located along the northern railway line and National Highway 5, indicating that they are important regions for rice supply in the country. In addition, the beneficiary areas of the Tonle Sap Western Basin Irrigation Facility Rehabilitation Project (a yen loan project) are located around Tonle Sap Lake in these three provinces.



Source: The JICA Survey Team

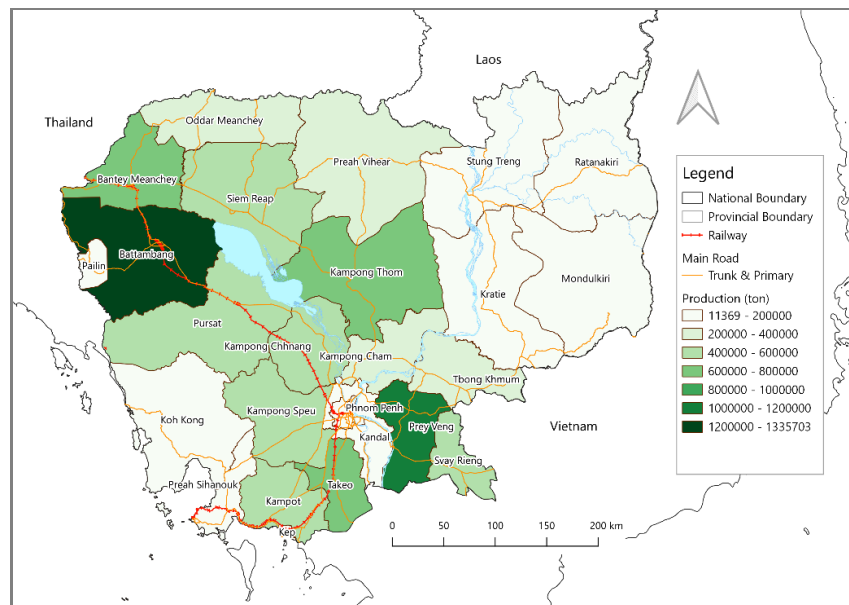
Figure 4-4 Irrigation canals and maintenance roads developed under the yen loan projects (Pursat province).



Source: The JICA Survey Team based on MAFF Annual Report 2021.

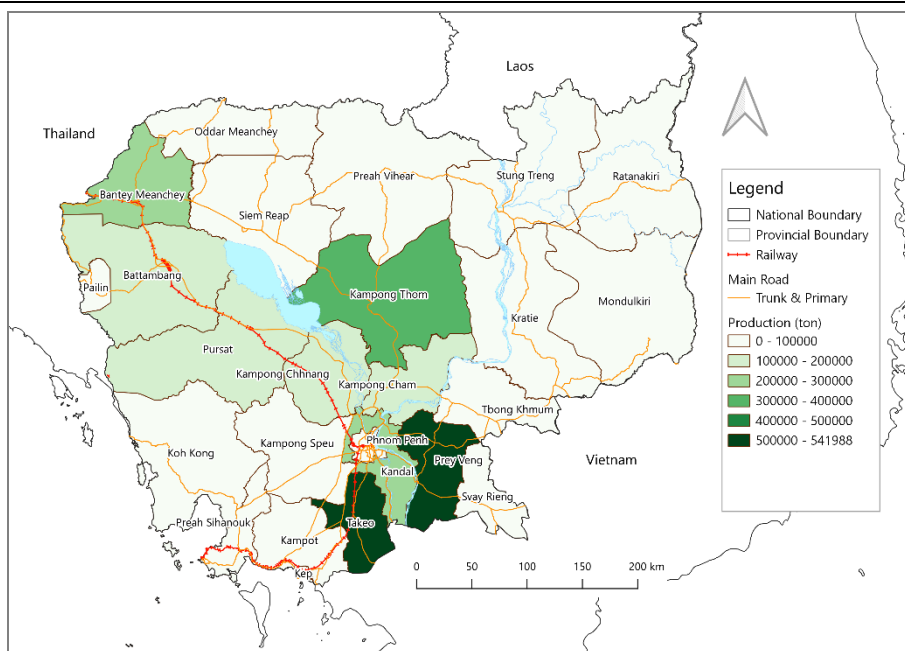
Figure 4-5 Annual rice production by province (2021)

Figure 4-6 and Figure 4-7 show rice production by province and railways and highways by cropping season in 2021. The three provinces covered in this survey produced more wet-season rice than dry-season rice, indicating that wet-season rice production is particularly prevalent in these provinces. On the other hand, for dry season rice, Kandal and Kampong Speu provinces around Phnom Penh produce a large amount. This is presumably due to the fact that irrigation facilities are better developed in the provinces surrounding Phnom Penh than other provinces.



Source: The JICA Survey Team based on MAFF Annual Report 2021.

Figure 4-6 Rice production by province, rainy season (2021)



Source: The JICA Survey Team based on MAFF Annual Report 2021.

Figure 4-7 Rice production by state, dry season (2021)

(2) Post-harvest of rice

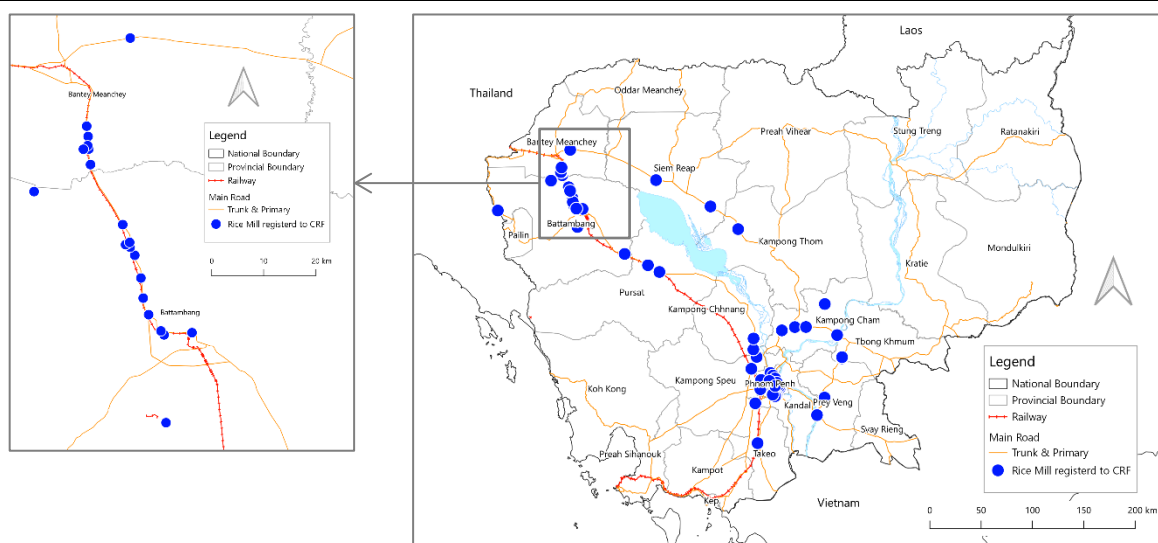
Battambang, Pursat and Kampong Chhnang provinces, the target areas of this survey, are located on the southern shore of Tonle Sap Lake and are served by the Northern line of Railway Line and NH5. Battambang Province, in particular, has a large area of arable land and is known as one of the country's leading rice growing areas due to the rich soil on the shores of Tonle Sap Lake, where many rice mills are concentrated. In general, rice produced in Cambodia tends to be consumed within each province, but according to interviews with rice millers, rice



Source: The JICA Survey Team

Figure 4-8 Large rice mill in northern part of Battambang

produced in Battambang Province is recognized in the market as having the highest production volume and quality, and is widely distributed in urban markets outside the province, with some also being exported. The location of major rice mills that are members of the Cambodian Rice Federation (CRF) as of Figure 4-9. According to the figure, major rice mills are particularly concentrated in the approximately 60 km range along NH5 and the Northern line of Railway between Battambang and Mongkol Boray in Banteay Meanchey Province. Many rice mills are also located near Phnom Penh. Among the rice produced in the beneficiary areas of the Tonle Sap Western Basin Irrigation Facility Rehabilitation Project (yen loan project) (Figure 4-10), some of them produced in the beneficiary areas near Battambang is delivered to the rice mills in northern Battambang. (Figure 4-8)



Source: The JICA Survey Team based on CRF data.

Figure 4-9 Location map of major rice mills affiliated with Cambodian Rice Federation (CRF) as of March 2023

There are several large wholesalers in Phnom Penh, the largest consumption area in Cambodia. White rice produced in each province is collected in Phnom Penh by wholesalers and supplied to consumers in each city through retailers. On the other hand, some of the paddy produced mainly in Battambang and Banteay Meanchey provinces is milled and packaged for export and transported to Phnom Penh or Sihanoukville ports for export as white rice. In addition, rice is exported to Vietnam or Thailand as paddy rice without milling.

According to interviews with rice mills in the survey area, the main varieties planted in 2022 were Pka Malis, Sen Kro Ob (SKO), and OM5451. Pka Malis, also known as jasmine rice, is a late maturing variety of long grain rice grown primarily in the rainy season and harvested from October to December. Sen Kro Ob is an early maturing long grain rice variety grown primarily in the dry season. OM5451 is an early maturing long grain rice variety developed by crossing Jasmine rice with an early maturing variety. Each variety has its own milled rice revenue and shipping price. Based on interviews with rice mills in the survey area, the average purchase price of paddy rice and the average shipping price of white rice at the mills, as well as their ratios, are shown in Table 4-2. Pka Malis accounted for the highest percentage, indicating that it is a highly profitable variety. In addition, even for the same variety of rice, milling and inspection methods differ between rice for the domestic market and rice for export.



Source: The JICA Survey Team

Figure 4-10 Sen Kro Ob grown in yen loan project site

Table 4-2 Paddy buying price, white rice shipping price by variety at rice mills (March 2023)

Rice variety	Paddy buying price (USD/ton) (A)	White rice shipping price (USD/ton) (B)	Ratio (B)/(A)
Pka Malis	290.0	670.0	2.31
Sen Kro Ob (SKO)	275.5	620.0	2.25
OM5451	217.5	460.0	2.11

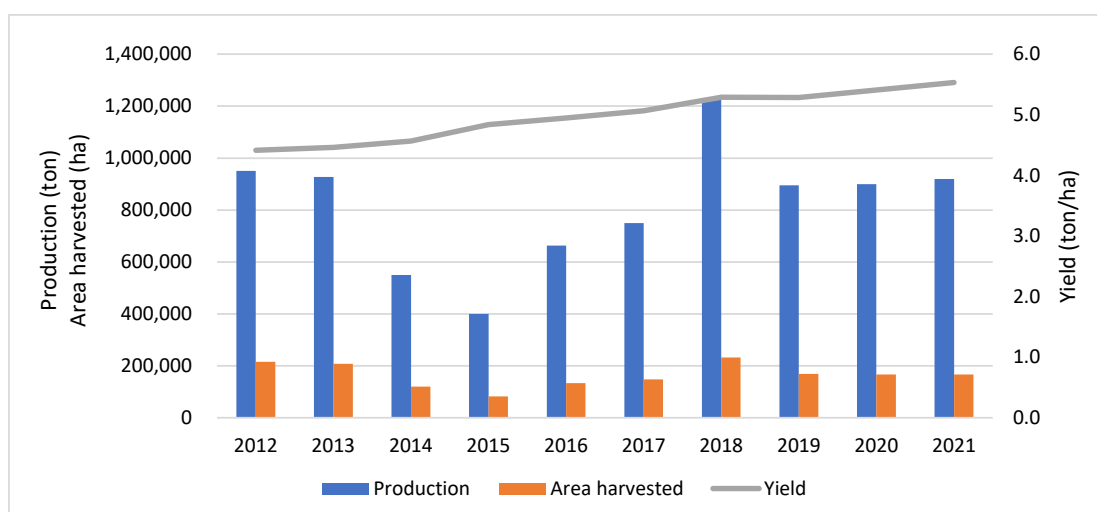
Source: Average of the results of interviews with rice mills in the surveyed areas.

According to interviews with rice mills in Battambang Province, rice mills buy paddy from collectors or farmers, and payment is made in cash on delivery or in advance. On the other hand, transactions are often made on credit to wholesalers or retailers. In addition, the white rice market often fluctuates depending on the year's crop conditions, which may result in a shortage of funds for the following year's operation. In addition, as mentioned earlier, rice mills in Battambang and Banteay Meanchey provinces have not operated at times due to low dry-season rice production, which has also led to lower mill utilization rates.

4.1.4 Corn Production, Logistics and Consumption

(1) Corn production

In Cambodia, corn is grown primarily for livestock feed. Annual production in 2021 was 920,000 ton with a yield of 5.5 ton/ha. It is also characterized by large yearly increases and decreases in harvest area and production. Figure 4-11 shows the trends of corn production and yield in Cambodia.



Source: FAOStat

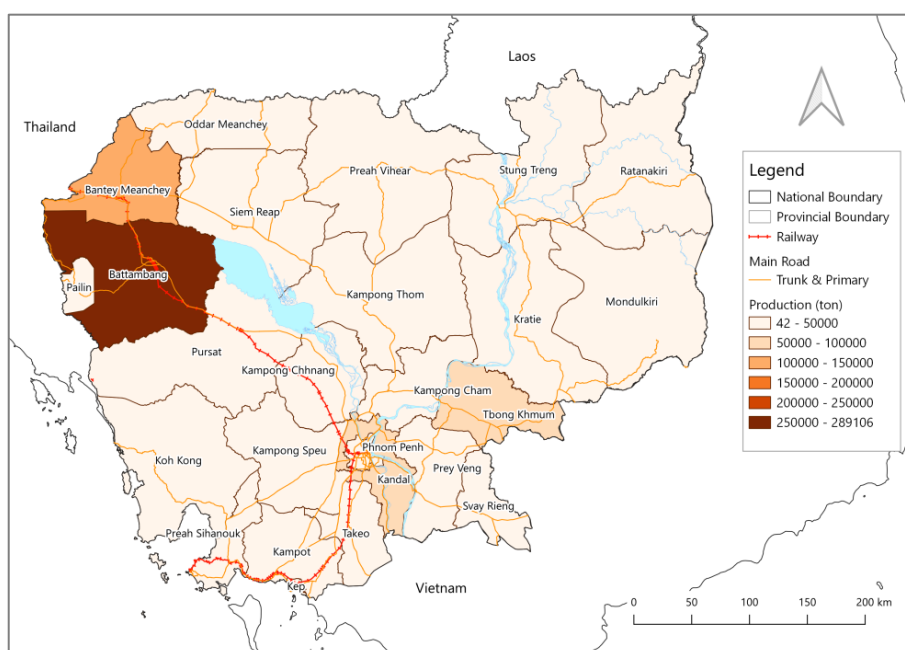
Figure 4-11 Corn harvest area, production and yield in Cambodia

Figure 4-13 shows corn production by province and railways and highways in 2021. Battambang province has the highest production, followed by Banteay Meanchey province. Production is also high in the areas along the Mekong River in Tbong Khmum and Kandal provinces. In Battambang and Banteay Meanchey provinces, it is grown sparsely as a field crop in areas where irrigation is not fully available and production areas are scattered.



Source: The JICA Survey Team

Figure 4-12 Fodder corn grown on the banks of the Mekong River, Kampong Cham province.



Source: The JICA Survey Team based on MAFF Annual Report 2021.

Figure 4-13 Annual corn production by province in 2021

(2) Corn logistics

The transport route of corn is shown in Figure 4-15. Most of the corn produced in each province is consumed for food or livestock feed in the producing area. Some of the feed is transported to feed mills in various provinces, processed as mixed feed with other crops such as soybeans, and shipped to various regions. Transport of feed is primarily done via NH5 and NH6. Corn produced in Battambang and Banteay Meanchey provinces is transported to mills in the provinces, cored and reduced in weight, and then exported by truck to Thailand as livestock feed.



Source: The JICA Survey Team

Figure 4-14 Collected and dehulled fodder corn, Kampong Cham province.



Source: The JICA Survey Team based on MAFF Annual Report 2021 and results of interviews with local governments, feed mills, and agricultural associations.

Figure 4-15 Main transport routes for corn in Cambodia

(3) Corn consumption

The domestic balance of corn in Cambodia is shown in Table 4-3. Of the 950,000 ton produced in 2020, 147,000 ton (15.5%) are exported, and 1,019,000 ton are supplied domestically. Of the domestic consumption, 603,000 ton (58.8%) was for food, followed by 152,000 ton (14.8%) for losses, 57,000 ton (5.2%) for processing, and 10,000 ton (0.9%) for feed. Since corn is often processed as livestock feed, the purpose of the processing use is considered to be for livestock feed.

Table 4-3 Balance of corn (breakdown of domestic supply and domestic consumption) (in 1000 ton)

Category	Item	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Domestic Supply	Production (A)	717	951	927	550	400	663	750	1,232	895	950
	Import volume (B)	11	17	21	21	21	19	28	38	30	72
	Stock (C)	-31	-7	-2	0	-114	-27	-42	123	-91	-144
	Export volume (D)	30	46	15	2	2	2	70	98	2	147
	Domestic supply (A)+(B)-(C)-(D)	729	929	935	569	533	707	750	1,049	1,014	1,019
Domestic consumption	For food	454	564	569	299	340	445	470	643	609	603
	For processing	0	0	0	0	0	0	0	0	57	57
	For tourist consumption	0	1	1	1	1	1	1	1	1	6
	For seeds	6	7	7	4	4	5	5	4	6	6
	For animal feed	9	15	19	20	20	16	9	9	11	10
	Loss	108	143	139	83	60	100	115	189	137	152
	Other non-food uses	152	200	201	162	108	141	149	203	193	191
Domestic consumption	729	930	936	569	533	708	749	1,049	1,014	1,026	

Source: FAOSTat

4.2 Current Status and Issues of Logistics Routes and Costs for Exported Agricultural Products

4.2.1 Logistics of Rice

(1) Rice Logistics Flow

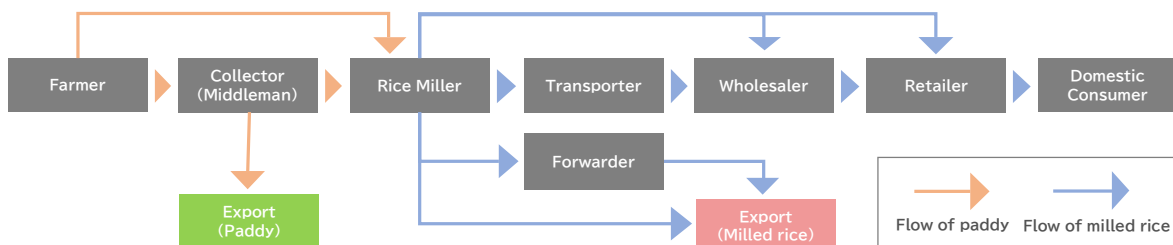
Rice is distributed based on supply and demand from the production area to the consumption area. Paddy rice produced by farmers is collected by local collectors (middleman) using small- and medium-sized trucks that collect at farmers' yards and deliver the rice to the rice mills. They are collected in approximately 100 kg bags, at which stage they are weighed, and the shipping volume is recorded for each farmer. Some farmers near the rice mills and farmers with vehicles such as trucks bring their paddy rice directly to the rice mills without going through a collector (middleman).



Source: The JICA Survey Team
Figure 4-16 Paddy rice (rice with husks before milling) collected from farmers and weighted

Some of the rice is sold as paddy rice by collectors (middleman) to traders from Vietnam and Thailand. Paddy rice is mostly exported to Thailand from Battambang and Banteay Meanchey provinces adjacent to the Thai border, and to Vietnam from provinces along the Mekong River near the Vietnamese border. For paddy exports, Cambodian collectors (middleman) transport the paddy to the border with Vietnam and Thailand, where it is handed over to transporters from the Vietnamese and Thai side. Transport to Thailand is mainly by truck, and to Vietnam by truck or river water transport on the Mekong River. In some areas near the Vietnamese border, collectors from Vietnam purchase paddy directly from farmers.

As for domestic logistics, after the rice is milled by rice mills into white rice, it is packaged and sold to transporters, wholesalers, and retailers, who then supply it to domestic consumers. It may be sold directly from the millers to wholesalers or retailers. White rice for export, on the other hand, is milled and then transported to Phnom Penh or Sihanoukville port for export. Figure 4-17 shows the logistics flow of rice based on the results of interviews with rice mills in the northern Battambang and Phnom Penh area.

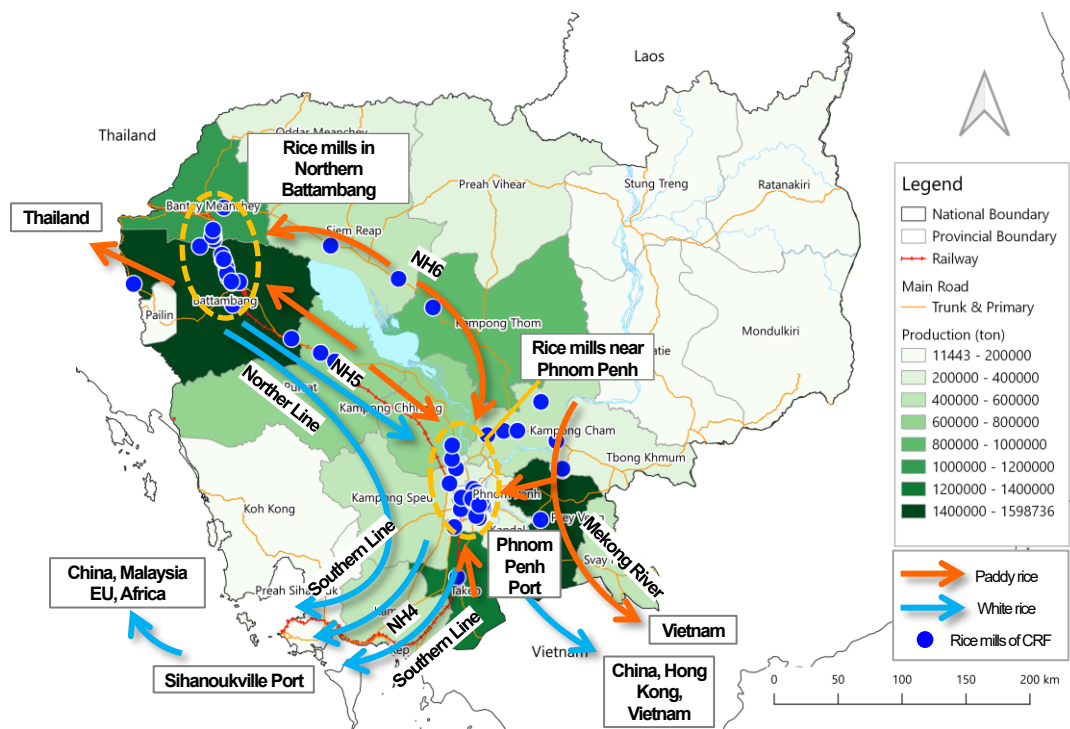


Source: The JICA Survey Team based on interviews with rice mills in northern Battambang and around Phnom Penh.

Figure 4-17 Logistics flow of rice in Cambodia

(2) Rice Transport Routes

Figure 4-18 shows the logistics flow of rice in Cambodia based on interviews with rice mills in the Phnom Penh area and Battambang Province. The paddy produced is collected in rice mill clusters in the north of Battambang and around Phnom Penh. According to interviews with rice mills in northern Battambang, paddy comes not only from within Battambang province, but also from Banteay Meanchey, Pursat, and Siem Reap provinces, and is collected from a wide area. Paddy is often transported by large trucks (40 ton) for long distances and by small trucks or tractors for medium and short distances. There are also small rice mills scattered throughout the countries, but the white rice milled there is often consumed locally. After milling, white rice is mainly transported using the main roads, NH5 and NH6, and the main roads around each rice mill.



Source: The JICA Survey Team based on MAFF Annual Report 2021 and results of interviews with rice mills in Battambang and Phnom Penh.

Figure 4-18 Main transport routes of paddy and white rice in Cambodia



Source: The JICA Survey Team

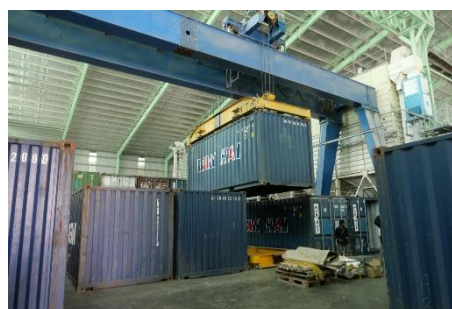
Figure 4-19 Trucks to transport white rice long distance from Battambang to Phnom Penh or Sihanoukville



Source: The JICA Survey Team

Figure 4-20 A truck driver sleeping under the vehicle

After being milled at rice mills in northern Battambang and around Phnom Penh, the rice is transported to Phnom Penh, mainly via NH5, where it is sold through wholesalers and retailers. Rice for export is transported to and exported from the Sihanoukville port via NH5 and NH4 and the Northern and Southern lines. In addition, some white rice is transported to Phnom Penh Port via NH5 for export. In many cases, the rice is transported under the responsibility of the rice millers or the rice millers contract with forwarders to transport the rice, whichever



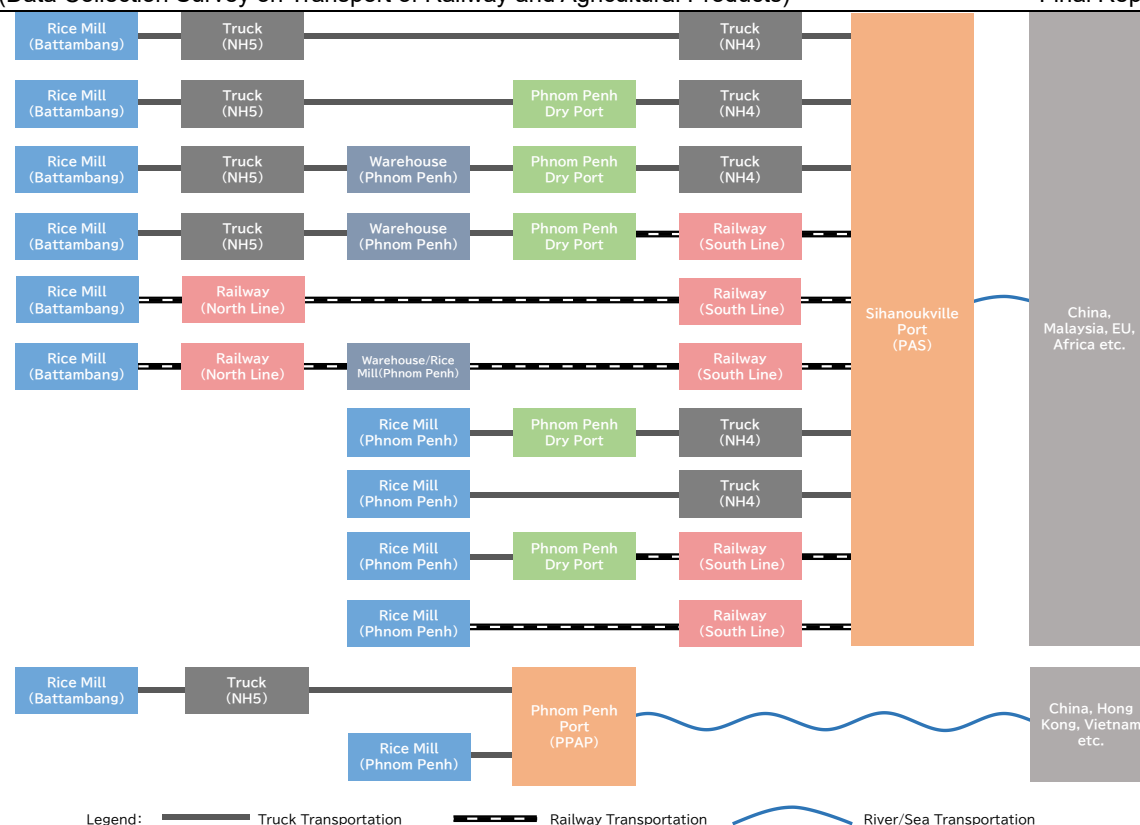
The JICA Survey Team

Figure 4-21 A container loaded with white rice to be transported by railway from Phnom Penh to Sihanoukville

is available and economical at the time of transport. It may be transported and consolidated from northern Battambang to warehouses around Phnom Penh, from where it is transported via the Southern line to the port of Sihanoukville. Customs clearance may take place at the Phnom Penh Dryport, which is located in the middle of the transport route, or at the Sihanoukville port. In some cases, direct transport by Northern line and Southern line was used from Battambang to Sihanoukville port. Based on the results of interviews with rice mills in the northern Battambang and Phnom Penh area, Figure 4-22 shows an example of transport routes of rice for export from rice mills in the northern Battambang and Phnom Penh area.

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Source: The JICA Survey Team based on interviews with rice mills in northern Battambang and around Phnom Penh.

Figure 4-22 Example of transport routes of rice for export from rice mills in northern Battambang and around Phnom Penh

(3) Current status of rice transport by mode (transport share)

Freight stations with spur lines dedicated to rice transport are shown in Figure 4-23. The breakdown of rice transport by railway is not clear but based on estimates from rice millers (who own freight stations) with experience in rice transport, at least 3,500 ton per station are expected to be exported per year. This is estimated to be about 14,000 ton as basic unit at the four stations, which is about 2% of the volume exported from the ports of Sihanoukville and Phnom Penh. Figure 4-23 and Table 4-4 show the results of the estimation. Note that these figures do not include containerized shipments brought in stations except for stations dedicated to rice, so the actual volume may be higher.³¹

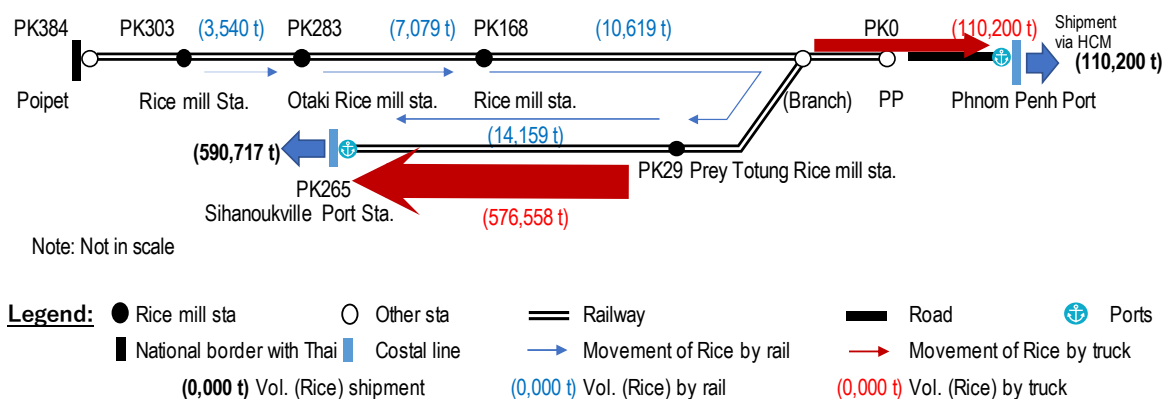
Table 4-4 Summary of rice transported by mode of transport

Item	Sihanoukville port	Phnom Penh port
Annual export volume of rice (2022)	590,717 ton	110,200 ton
Of which, railway transport (estimated)	14,159 ton	-
Of which, truck transport (estimated)	576,558 ton	110,000 ton
Railway transport share	2.4%	(0%)
	2.0%	

Note: Estimated by the JICA Survey Team based on model case of stations dedicated to rice

Source: RR, PPAP, PAS materials, The JICA Survey Team

³¹ Estimated rice transport per station at 14,000 ton. Assumes 10 cars (20 TEU), 2 round trips/week during harvest season (December - April), 3 months during growing season (no transport), 4 months during other rainy seasons (0.5 round trips/week), 25 ton/TEU loaded, 70% of consumption for export (based on interviews with major rice milling companies). The ratio of use of the Sihanoukville and Phnom Penh ports is assumed to be 84:16 (see 4.2.2(2) Rice Export Ports).



Note: Estimated by the JICA survey team based on a model case of stations dedicated to rice. Trucking volumes west of Phnom Penh and toward Pursat/Battambang are not indicated due to the unknown rice production volume and delivery routes. PK and HCM denote kilometer posts originating from Phnom Penh and Ho Chi Minh, respectively.

Source: RR/PPAP/PAS materials, the JICA Survey Team

Figure 4-23 Rice transport routes for export by mode of transport (Estimate: 2022)

4.2.2 Rice Exports

(1) Rice Exports and Balance

Figure 4-24 shows the volume and value of white rice exports from Cambodia. Since 2012, both export volume and export value have continued to increase. In 2021, the export volume was about 620,000 ton, with an export value of 415 million USD and an export unit price per ton of 665 USD/ton.



Source: FAOStat

Figure 4-24 Total exports of white rice from Cambodia and total export value

The domestic balance of supply and consumption of rice in Cambodia is shown in Table 4-5. Of the 10,960,000 ton produced in 2020, 1,013,000 ton (9.5%) is exported, and 10,232,000 ton (93.4%) is supplied domestically. Of

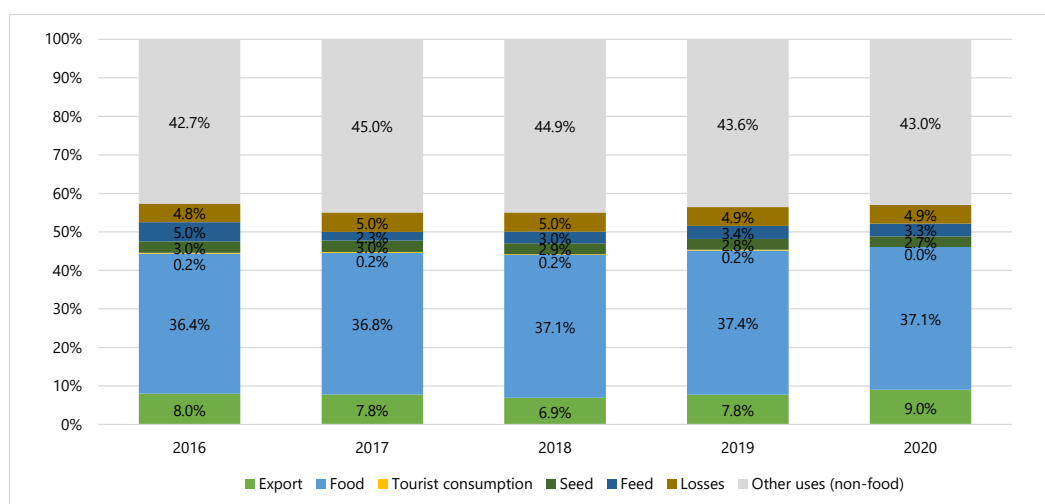
the domestic supply, food accounted for 4,168,000 (40.7%), followed by losses of 548,000 (5.3%), feed 375,000 ton (3.7%), and seed 306,000 ton (3.0%).

Table 4-5 Rice balance in Cambodia (breakdown of domestic supply and consumption) (in 1000 ton)

Category	Item	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Domestic Supply	Production (A)	8,779	9,291	9,390	9,324	9,335	9,952	10,518	10,892	10,886	10,960
	Import Volume (B)	19	171	64	36	106	35	15	55	35	21
	Stock (C)	227	567	198	-124	-140	-328	84	48	-163	-264
	Export Volume (D)	263	304	558	532	721	824	815	755	860	1,013
	Domestic supply (A)+(B)-(C)-(D)	8,308	8,591	8,698	8,952	8,860	9,491	9,634	10,144	10,224	10,232
Domestic consumption	For food	3,431	3,527	3,575	3,684	3,719	3,754	3,847	4,047	4,149	4,168
	For tourist consumption	10	12	16	16	20	19	19	19	21	0
	For seeds	304	308	321	307	310	307	311	312	310	306
	For animal feed	328	260	255	280	280	513	237	327	373	375
	Loss	356	377	381	466	467	498	526	545	544	548
	Other non-food uses	3,880	4,107	4,151	4,200	4,064	4,400	4,700	4,900	4,829	4,828
	Domestic consumption	8,308	8,591	8,698	8,952	8,860	9,491	9,634	10,144	10,224	10,232

Source: FAOStat

Figure 4-25 shows the percentage of rice (paddy and white rice) consumption by use, including exports. Exports accounted for 9.0% of total consumption in 2020, with rice for food accounting for 37.1%. It should be noted that other uses other than food accounted for 4,828,000 (43.0%). Since rice for food includes consumption as a processed product, a large portion of the domestic supply is consumed for other non-food uses. Since it is unlikely that rice is consumed in large quantities other than for food, it is inferred that this includes quantities that are not captured in statistical data.



Source: FAOStat

Figure 4-25 Percentage of rice consumption by use in Cambodia

As mentioned earlier, the majority of rice produced in Cambodia is exported to neighboring Thailand and Cambodia as paddy rice. Other non-food uses presumably include the amount exported as paddy rice without being officially recorded. According to FAOStat statistical data, the export volume of paddy rice from Cambodia to Vietnam in 2021 is only 40 ton and to Thailand is 0 ton. In interviews with Customs and logistics companies, Cambodian logistics companies pointed out that exports to Thailand, even in transit, are not officially approved by the Thai authorities.



The JICA Survey Team

Figure 4-26 Cambodian paddy rice to be exported to Vietnam by ship without official record

Interviews conducted in this survey on the logistics routes of paddy along the Mekong River in Kandal and Kampong Cham provinces confirmed that much paddy is transported to Vietnam from loading ports along the Mekong River without being recorded. As mentioned above, milling rice increases the unit price per weight of rice by 2.1 to 2.3 times and adds value within Cambodia. Therefore, it appears that exporting rice as unpolished paddy is a big opportunity loss for Cambodia.

According to interviews with rice millers in Kampong Cham province along the Mekong River, the paddy loading ports are often operated by Vietnamese. Some of them said that rice produced along the Mekong River is of poorer quality than rice produced around Battambang, and that because of the lower trading price, the rice flows out to Vietnam, which demands inexpensive paddy rice, and the rice mills in Cambodia could not buy high quality rice.

It is inferred that a sufficient supply of certified rice seeds and improved rice cultivation techniques for farmers are needed to improve quality of rice. Milling rice in Cambodia to export quality, adding value, and shipping to the world market from official export ports could reduce the outflow of paddy rice to Vietnam and Thailand, and benefit domestic economy in Cambodia. To this end, it is necessary to strengthen price competitiveness by reducing the cost of milling and transporting white rice.

(2) Rice Export Ports

International export ports in Cambodia are Phnom Penh Autonomous Port (PPAP) and Sihanoukville Autonomous Port (PAS), from which the majority of white rice is exported. Container and white rice exports from PPAP and PAS and the ratios of both ports are shown in Table 4-6. In 2022, 15.7% of PPAP and 84.3% of PAS, with the majority of exports from PAS. On the other hand, in terms of total container volume, the utilization ratio of PAS is not as high as that of rice, with PPAP accounting for 38.8% and PAS for 61.2% in 2022. In this respect, the simplification in document procedures of Vietnam may help to raise the utilization ratio of PPAP.

Table 4-6 Container and white rice exports from Phnom Penh Port (PPAP) and Sihanoukville Port (PAS)

Year	2020		2021		2022	
Port	PPAP	PAS	PPAP	PAS	PPAP	PAS
Export container throughput (TEUs)	152,360	321,200	185,685	352,242	224,919	355,034
Share	32.2%	67.8%	34.5%	65.5%	38.8%	61.2%
Export rice throughput (ton)	84,700	572,639	73,800	563,480	110,150	590,717
Share	12.9%	87.1%	11.6%	88.4%	15.7%	84.3%

Note: Estimated at 1 TEU = 25 ton equivalent (PPAP)

Source: PPAP and PAS

White rice from PPAP is exported to China (mainland), Netherland, Hong Kong, Vietnam, Japan, and the rest of the world from PAS. The country with the highest export volume from PPAP in 2021 was China (mainland). As per the ratio of PPAP to PAS, PAS still accounted for the majority at 67.6%.

Table 4-7 White rice exports from Phnom Penh Port (PPAP) and Sihanoukville Port (PAS) by destination country and percentage

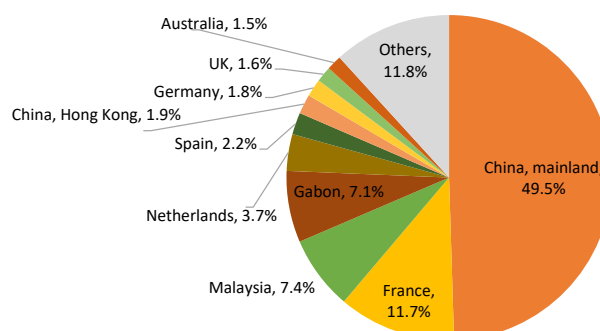
Export volume (ton)						
Year	2020		2021		2022	
Port	PPAP	PAS	PPAP	PAS	PPAP	PAS
China (Mainland)	73,125	177,651	64,400	235,446	98,725	205,987
Netherland	2,550	24,810	425	25,445	2,000	36,492
China (Hong Kong)	4,025	20,614	4,675	11,121	700	9,656
Vietnam	500	499	1,300	489	1,875	613
Japan	525	515	0	11	250	32
Ratio of PPAP and PAS						
Year	2020		2021		2022	
Port	PPAP	PAS	PPAP	PAS	PPAP	PAS
China (Mainland)	29.2%	70.8%	21.5%	78.5%	32.4%	67.6%
Netherland	9.3%	90.7%	1.6%	98.4%	5.2%	94.8%
China (Hong Kong)	16.3%	83.7%	29.6%	70.4%	6.8%	93.2%
Vietnam	50.0%	50.0%	72.7%	27.3%	75.4%	24.6%
Japan	50.5	49.5%	0.0%	100.0%	88.5%	11.5%

Source: PPAP

Note: Only destination countries exported from PPAP

(3) Rice Export Destinations

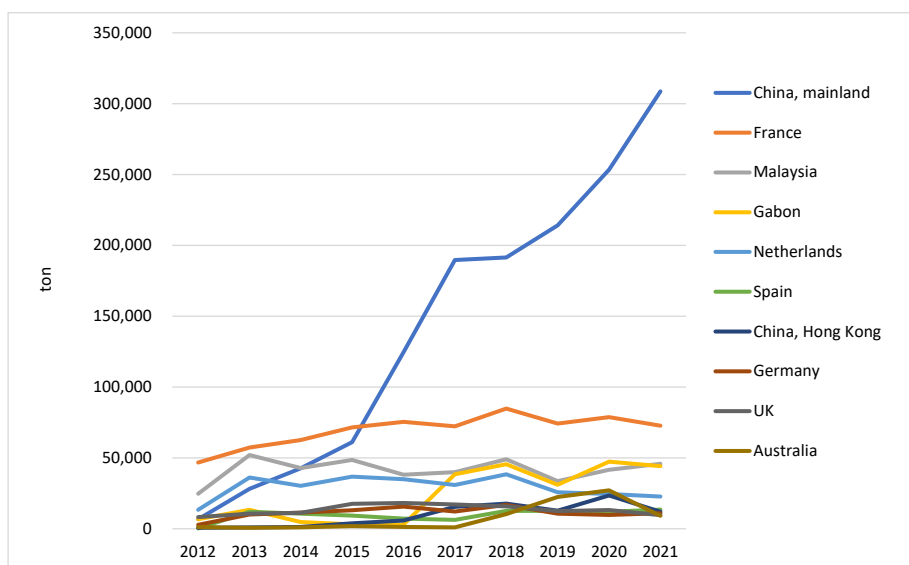
Figure 4-27 shows the percentage of white rice exports from Cambodia by destination country in 2021. China (mainland) had the highest percentage at 49.5%, followed by France at 11.7%, Malaysia at 7.4%, Gabon at 7.1%, and Netherland at 3.7%.



Source: FAOStat

Figure 4-27 White rice exports from Cambodia by destination country, 2021

Figure 4-28 shows the export volume of white rice from Cambodia by destination country. Since 2012, the volume of exports to China (mainland) has increased drastically, exceeding France, which had previously had the most exports in 2016. In 2012, it was 6,819 ton, but it has been increasing every year, and by 2021 it will be 308,683 ton, a sharp increase of about 45 times. Gabon in West Africa is on the rise. Export volumes to the other countries are stable and have not changed significantly.



Source: FAOStat

Figure 4-28 White rice exports from Cambodia by destination country

Table 4-8 compares the export destination countries with Thailand and Vietnam, which are competitors in the international market for white rice. China (mainland), Malaysia, and China (Hong Kong) all rank high in the rankings, but other countries tend to be scattered widely. Looking at Cambodia, Gabon is particularly large, with a large volume of exports to European Union (EU) countries. For Thailand, South Africa and the U.S. are the most common, and Japan is also at the top of the list. Vietnam is characterized by its remarkably high export volume to the Philippines. As mentioned above, the Cambodia Rice Federation (CRF) has announced that it has identified the Philippines as a new market and is also aiming to expand its market in the Middle East and Europe. In order to enter the Philippine market, competition with Vietnam must be considered, and in the Middle East market, competition with Thailand and Vietnam must be considered. On the other hand, maintaining and strengthening exports to EU countries, where there is less competition, is considered a rational policy for Cambodia.

Table 4-8 Top 20 importers of white rice from Cambodia, Thailand, and Vietnam (2021)

No.	Cambodia		Thailand		Vietnam	
1	China (Mainland)	308,683	South Africa	763,690	Philippines	2,440,123
2	France	72,841	United States of America	590,365	China (Mainland)	617,730
3	Malaysia	45,871	China (Mainland)	454,479	Malaysia	237,730
4	Gabon	44,304	Benin	369,889	Mozambique	158,970
5	Netherland	22,798	Japan	290,246	Singapore	107,675
6	Spain	13,605	Angola	239,294	China (Hong Kong)	75,518
7	China (Hong Kong)	12,066	Iraq	225,079	Indonesia	60,493
8	Germany	10,976	Mozambique	201,586	United Arab Emirates	42,493
9	United Kingdom	9,689	Cameroon	201,522	Australia	34,878
10	Australia	9,260	Yemen	191,582	Saudi Arabia	22,973
11	Belgium	7,491	China (Hong Kong)	171,918	Mongolia	17,049
12	Brunei	7,182	Malaysia	149,513	France	17,032
13	Saudi Arabia	6,234	Philippines	141,299	Taiwan	14,825
14	Czech Republic	5,944	Niger	115,658	Laos	13,538
15	Singapore	5,888	Singapore	99,014	Fiji	13,075
16	Italy	4,667	Canada	92,282	United States of America	11,433
17	Portugal	4,241	Democratic Republic of the Congo	91,075	New Zealand	9,778
18	Poland	4,020	Australia	62,256	Qatar	9,448
19	Sweden	3,670	Ghana	60,920	Canada	8,509
20	New Zealand	3,555	France	55,425	Togo	7,962

Source: FAOStat

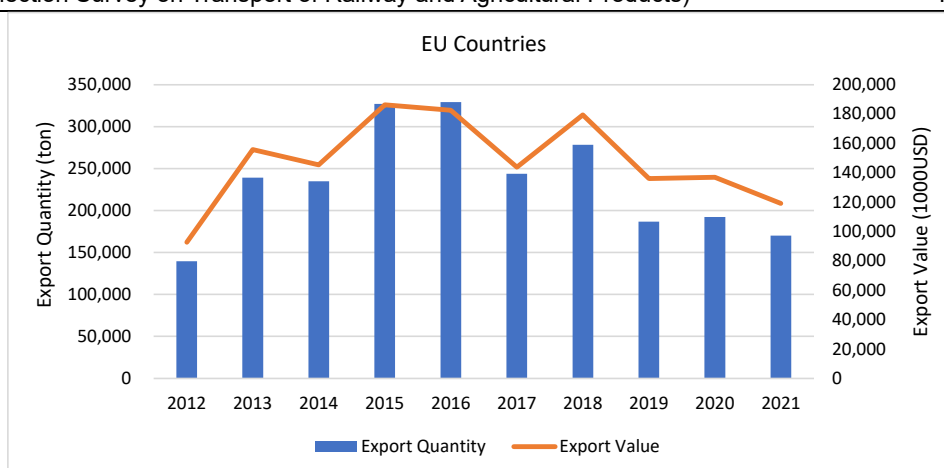
(4) Exports to EU countries and Everything But Arms (EBA)

The European Union (EU) has established the Everything But Arms (EBA) initiative to make all imports from Least Developed Countries (LDC) to the EU duty-free, except for arms, and to remove quota caps. The initiative has been established as a part of the EU's Generalized System of Preferences (GSP), whose main purpose is to promote development in the poorest countries. EBA entered into force in March 2001, and the countries covered by EBA are updated on a timely basis.³² Rice has been one of those commodities since September 2009. Cambodia was previously included in the list of the countries covered, but since August 2020, Cambodia has been excluded from EBA due to human rights concerns^{33,34}. It is thought that the reason why Cambodia exports to many EU countries is because of EBA in the past. As a result, even in 2021, EU countries still are among the top export destination countries from Cambodia. However, since rice exports to EU countries do not benefit from the duty-free treatment, Cambodia will surely be forced to compete with other countries in the future, and for this reason it is necessary to strengthen international price competitiveness by reducing export prices. Figure 4-29 shows the volume and value of white rice exports from Cambodia to EU countries. According to the report, there has been a downward trend since 2019, which may have been affected by suspension of EBA for Cambodia.

³²<https://trade.ec.europa.eu/access-to-markets/en/content/everything-arms-eba>

³³<https://gsphub.eu/about-gsp/eba>

³⁴https://ec.europa.eu/commission/presscorner/detail/en/IP_20_1469



Source: FAOSTat

Figure 4-29 White rice exports from Cambodia to EU countries in volume and value

(5) Market Trends in Export Destination Countries

Table 4-9 shows imported volume of white rice from Cambodia by country and their percentages in its major export destination countries. In all the countries, there is competition with neighboring Thailand and Vietnam. In EU countries, now that Cambodia is excluded from EBA, it is expected to compete with neighboring countries, Thailand and Vietnam, under almost the same conditions. Therefore, in order to maintain market share in the EU countries, it is necessary to strengthen price competitiveness by reducing export prices and to strengthen marketing method.

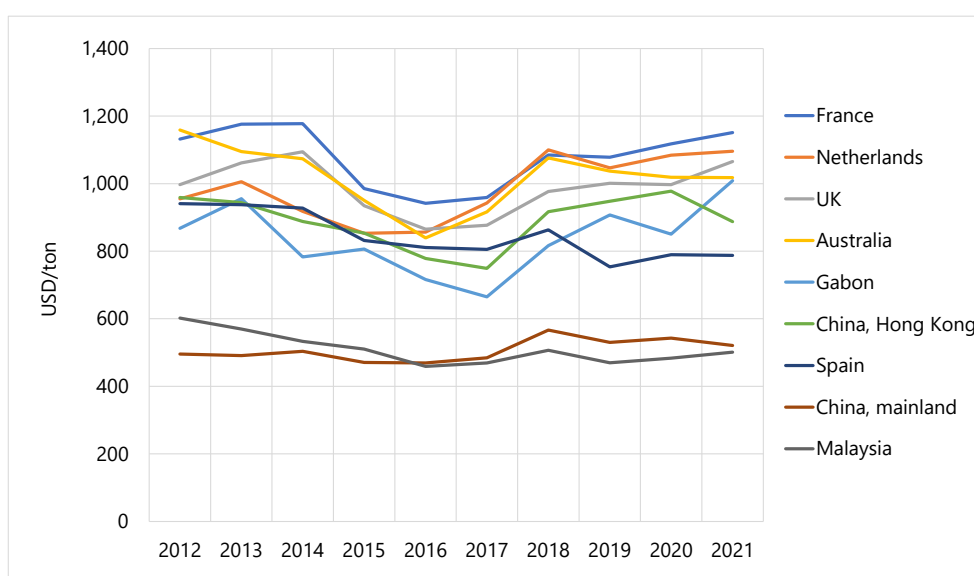
Table 4-9 Imports of rice by country and share in major export destination countries from Cambodia in 2021

Order	China (Mainland)			France			Malaysia		
	Exporter	Import volume	Ratio	Exporter	Import volume	Ratio	Exporter	Import volume	Ratio
1	Vietnam	617,730	25.8	Italy	121,777	34.8%	India	438,164	38.8
2	Pakistan	540,452	22.6%	Cambodia	51,899	14.8%	Pakistan	251,010	22.2%
3	Thailand	424,658	17.7	Thailand	49,774	14.2%	Vietnam	237,730	21.0
4	Myanmar	389,202	16.2%	Belgium	47,505	13.6%	Thailand	140,260	12.4%
5	Cambodia	297,637	12.4%	Vietnam	17,032	4.9%	Cambodia	42,430	3.8%
6	Taiwan	69,756	2.9%	Netherland	15,772	4.5%	Myanmar	18,007	1.6%
7	India	28,050	1.2%	India	14,910	4.3%	Others	1,841	0.2%
8	Laos	27,872	1.2%	Spain	11,383	3.3%			
9	Others	704	0.0	Pakistan	11,170	3.2%			
10				Others	8,400	2.4%			
order	Gabon			Netherland			Spain		
	importer	import volume	rate	importer	import volume	rate	importer	import volume	rate
1	Cambodia	44,304	76.6%	India	24,683	17.0%	Myanmar	27,850	29.7
2	Thailand	12,673	21.9%	Thailand	23,306	16.1%	Italy	12,926	13.8
3	Others	826	1.4%	Cambodia	18,777	12.9%	Cambodia	9,097	9.7%
4				Italy	18,151	12.5%	Portugal	7,478	8.0%
5				Pakistan	17,052	11.8%	Bulgaria	7,000	7.5%
6				Vietnam	7,592	5.2%	Thailand	6,574	7.0%
7				Belgium	7,068	4.9%	Others	22,890	24.4%
8				America	6,034	4.2%			
9				Others	22,355	15.4%			
10									

order	China (Hong Kong)			United Kingdom			Australia		
	importer	import volume	rate	importer	import volume	rate	importer	import volume	rate
1	Thailand	155,639	55.8%	Italy	59,573	24.6%	Thailand	58,163	31.4%
2	Vietnam	75,518	27.1%	India	41,570	17.2%	India	44,954	24.3%
3	China (Mainland)	21,117	7.6%	Spain	34,373	14.2%	Vietnam	34,878	18.8%
4	Cambodia	10,314	3.7%	Thailand	26,006	10.7%	Pakistan	12,661	6.8%
5	Japan	6,192	2.2%	Pakistan	17,243	7.1%	America	9,661	5.2%
6	America	5,098	1.8%	Belgium	16,921	7.0%	Cambodia	9,175	5.0%
7	Others	4,871	1.7%	Netherlands	12,738	5.3%	Others	15,576	8.4%
8				Cambodia	7,589	3.1%			
9				America	5,452	2.3%			
10				Others	20,786	8.6%			

Source: FAOStat

The unit buying price of imported white rice by country (average unit price of imported rice from all exporting countries) in Cambodia's major export destination countries is shown in Figure 4-30. There is a tendency to divide the group of countries importing at relatively high unit prices and countries importing at relatively low unit prices. EU and African countries tend to import white rice at relatively high unit prices, while China (mainland) and Malaysia tend to import low-priced rice.



Source: FAOStat

Figure 4-30 Average unit import price of white rice by country in Cambodia's major export destination countries

4.2.3 Logistics Costs: Competition with Thailand and Vietnam and the Need to Reduce Costs

Table 4-10 compares FOB prices and price breakdowns of white rice for export between Cambodia and Vietnam. According to an existing report, the unit cost (per ton) of production cost including hulling and milling process was +137USD or 133% of that of Vietnamese rice. As per the breakdown, both the cost of purchasing paddy rice and the unit cost of drying and milling rice were higher than in Vietnam, with a high ratio of +26USD, or 224%. Other white rice production costs were also +38USD, or 371%, although the details are unknown. In

terms of transport and export-related costs, transport costs were +36USD, or 200%. Other transport and export-related costs were also +20USD, or 386%, although the details are unknown.

Table 4-10 Comparison of FOB prices and price breakdown of white rice for export from Cambodia and Vietnam (USD/ton)

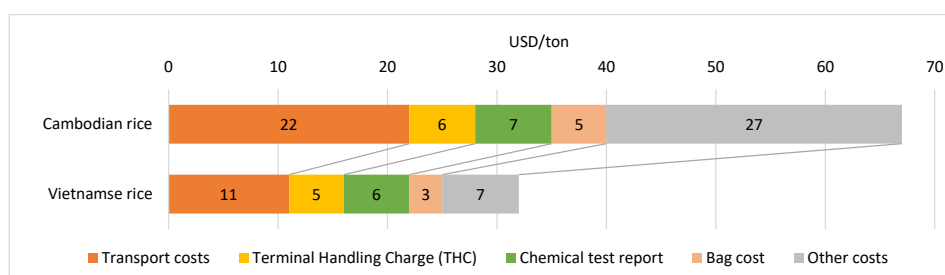
Item	Cambodian rice (Variety: Sen Kro Ob)	Vietnamese rice (Variety: Jasmine rice variety)	Cost difference of Cambodian rice to Vietnamese rice	Cost ratio of Cambodian rice to Vietnamese rice
white rice production costs	561	423	+137	133%
Buying wet paddy	754	689	+65	109%
Drying and milling	99	35	+64	283%
- Electricity (of which, electricity)	47	21	+26	224%
- Other white rice production costs (of which, other costs)	52	14	+38	371%
Sales of by-products	-293	-301	+9	97%
Transport and export-related expenses	68	32	+36	213%
Transport costs	22	11	+11	200%
Container Handling Charge (THC: Terminal Handling Charge)	6	5	+1	120%
Pesticide residue report cost (Chemical test report)	7	6	+1	117%
Bag cost	5	3	+2	167%
Other costs	27	7	+20	386%
Free on Board (FOB) price (FOB price)	628	456	+173	138%

Source: Cambodian Rice Export Costs prepared by CAVAC, 2020

Figure 4-31 illustrates the transport and export-related costs in the previous table. Transport costs and other transport/export-related costs need to be reduced. In order to increase price competitiveness in competition with Vietnamese rice in the international market, it is necessary to reduce overall costs. Furthermore, according to local interviews, the unit transport cost by truck in Cambodia is on the rise. Therefore, it is necessary to reduce the unit transport cost by shifting to railway transport in order to strengthen the price competitiveness of white rice in the international market. The cost of transport by truck includes the cost of fuel, and the retail unit price of gasoline in Cambodia in April 2023 was 1.14USD/liter, while that in Vietnam was relatively lower at 0.97USD/liter. Other transport and export-related costs consist mainly of 1) Unofficial fees to MoC officials (unofficial), 2) phytosanitary application fees (unofficial), 3) phytosanitary inspection fees (official), and 4) phytosanitary-related processing (official). Although a breakdown of the respective value of Cambodian and Vietnamese rice in the existing data was not confirmed, it is inferred that these rice products are more expensive than Vietnamese rice. Therefore, it is also necessary to examine the breakdown of other transport and export-related costs and their respective unit costs, identify costs that are highly effective in reducing costs in comparison with Vietnam, and consider and implement countermeasures. These improvements are also needed, especially since it includes informal costs that should not have to be paid.^{35,36}

³⁵<https://jp.tradingeconomics.com/cambodia/gasoline-prices> (viewed May 15, 2023)

³⁶<https://jp.tradingeconomics.com/vietnam/gasoline-prices> (viewed May 15, 2023)



Source: Cambodian Rice Export Costs prepared by CAVAC, 2020

Figure 4-31 Comparison of transport and export-related costs of white rice produced in Cambodia and Vietnam for export

4.3 Analysis of the Potential and Effects of Modal Shift

4.3.1 Setting of Scenario

(1) Condition

Based on the results of the survey in Chapter 4.2, a scenario and assumptions were set for the potential cost reduction and modal shift from truck to freight railway. There are four common conditions:

- 1) Assumed cargo is a 20FT container loaded with 25 ton for transport of bagged rice.

A logistics firm handling rice in Cambodia confirmed that they use 20FT containers to transport rice, loaded with 25 ton. It is believed that 20FT containers are selected because of their better loading efficiency compared to 40FT containers. The railway track in Cambodia have been designed with a mix of 15 ton and 20 ton axle load, giving total wagon weights of 60 ton and 80 ton, respectively, that can carry. A comparison of rice loaded in containers (20FT/40FT) on freight cars is shown in Table 4-11. If 25 ton are loaded per container, two 20FT containers on one wagon will weigh about 54 ton, and the operation of loading 25 ton on a 20FT container can be judged to be reasonable because the wagon can run even considering the dead weight of the wagon. In the case of the maximum loading weight limit, if two 20FT containers are loaded, they will exceed the axle load limit (60 ton) and will not be allowed to travel.³⁷

Table 4-11 Traveling availability of rice loaded in containers (20FT/40FT) on wagons

Item	20FT container (2 pcs)	40FT Container
Dead Weight (A)	4.4 ton (2.2 ton 2 pcs)	3.7 ton
Maximum loading weight (B)	56.6 ton (28.3 ton 2 pcs)	26.7 ton
[Reference] General rice transport loading capacity (C)	50 ton (2 x 25 ton)	(No 40FT containers used)
Maximum gross weight (A+B)	61 ton	30.4 ton
(15-ton axle load section)	not allowed	acceptable
[Reference] General rice transport gross weight (A+C)	54.4 ton (27.2 ton 2 pcs)	(No 40FT containers used)
(15-ton axle load section)	acceptable	-

Source: The JICA Survey Team based on <https://www.mol-logistics-group.com/support/handbook/seacontainer/>
<https://www.mol-logistics-group.com/support/handbook/seacontainer/>

³⁷RR operates with either one 40FT container or two 20FT containers loaded in one wagon, and these are used as a single unit (wagon).

- 2) The origin of transport shall be the rice mill accumulation point in Battambang and the station origin shall be Chondeur Svar station.

Rice millers in the target area are accumulated near Battambang (see 4.2.1). Therefore, the center of gravity of these points was used as the origin point of transportation, and the loading station was the nearest station, Chondeur Svar station, 2 km away from the center of gravity. Chondeur Svar station is already used for transporting rice in containers by a local logistics company.

- 3) The destination shall be France and via the port of Rotterdam, the largest port in the EU.

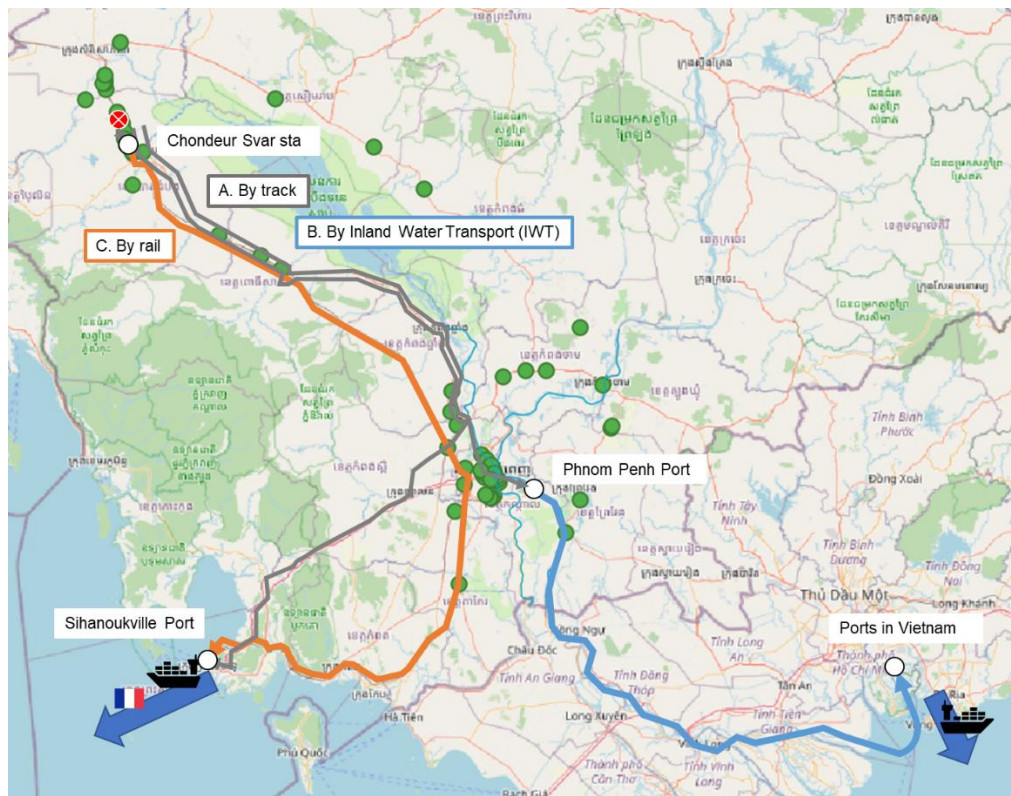
China is the number one destination for rice exports, and France is the number two. While China imports low-price rice, France tends to prefer high price rice (see 4.2.1). The quality of Battambang rice is high, and developed countries such as France, Netherland, and Spain import more than 10% of their total rice imports from Cambodia (see 4.2.1). Therefore, this survey assumed a scenario of handling high-end rice rather than competing on price.

- 4) The costs to be compared are to the port of arrival (CIF: Cost, Insurance and Freight).

Since it is difficult to identify specific final destinations, costs up to the port of arrival are accounted for and compared.

(2) Comparative Scenarios

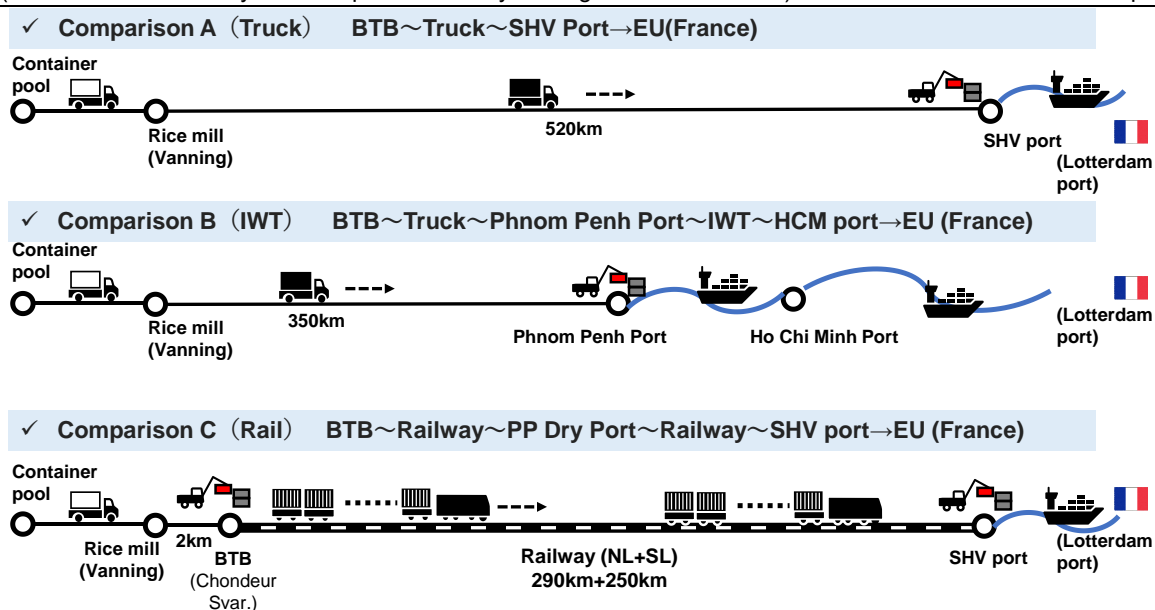
The three modes of transport being compared are truck transport (A), inland water transport (B), and railway transport (C). Figure 4-31 shows the paths of each of them.



Source: The JICA Survey Team, ©OpentStreetMap Contributors

Figure 4-32 Railway, road and water transport routes in comparison scenarios

In truck transport (A), inland water transport (B), and railway transport (C), trucks deliver loaded containers from pickup/delivery points to Sihanoukville Port, Chondeur Suvar Station, and Phnom Penh Port, respectively. Railway transport (C) is assumed to depart from Chondeur Svar station and arrive at Sihanoukville Port station. The port of transit is assumed to be through Sihanoukville Port for truck transport (A) and railway transport (C), and through Phnom Penh Port for inland water transport (B), respectively. In order to be more in line with actual conditions, the cost of arranging empty containers from the port was also included. These are shown in Figure 4-33.



Source: The JICA Survey Team

Figure 4-33 Comparative scenarios (truck transport(A), inland water transport (B) and railway transport (C))

4.3.2 Comparison Results

A comparison of costs, lead times and delivery conditions for truck transport (A), inland water transport (B) and railway transport (C) is shown in Table 4-12.

Table 4-12 Comparison results by mode (truck, inland water transport, and railway transport)

Mode	A: Truck	B: IWT	C: Railway
Commodity, section	White rice, bag package; Rice mill at BTB-SHV/ PP port-French		
Cost (USD/container)*			
Land transport cost (i)	1,437 (1.00)**	1,419 (0.99)**	1,040 (0.72)**
-Transport	860	820	463
-Transport (last one mile)	-	-	40
-Handling fee (LoLo) at sta.	-	-	80
-Handling fee (LoLo) at Port	57 (empty)+15 (loaded)	23 (empty)+45 (loaded)	57 (empty)+15 (loaded)
-Transport inside Port	-	-	20 (empty)+20 (loaded)
-Customs	145	145	145
-Phytosanitary	150	150+20 (certificate)	150
-Cargo over weight	150 (3ton)	150 (3ton)	-
-Insurance, gate fee, export handling commission	60	66	50
Vessel cost (ii)	1,205 (1.00)**	1,345 (1.12)**	1,205 (1.00)**
-Vessel shipment	900	1,100	900
-Docs, seals, others	305	245	305
Total (i+ii)	2,642 (1.00)**	2,764 (1.06)**	2,245 (0.85)**
Leadtime*			
-Rice mill~port for export	14 hours (SHV)	8 hours (PP Port)	22 hours (SHV by railway)
-Port for export~arrival port	25-30 days	32-38 days	25-30 days
Others*			
Cut for delivery of container	SHV Port: 12:00 Sat	PP Port: 12:00 Sat	PP Dryport: 1 day advance before train

Note: *Costs and transport times were organized by the survey team with reference to interviews with several logistics companies, PAS/PPAP and other companies, as well as pilot transport results. **Rate in the case that the truck transport (A) sets 1.0

Source: The JICA Survey Team

(1) Transport costs

Transport costs can be divided into land transport costs ((i) in Table 4-12) and maritime transport costs (ii) in Table 4-12). In terms of total cost, truck transport is the cheapest at USD 2,642, inland water transport at USD 2,764, and railway transport at USD 2,245, with railway transport being the least expensive (25% cheaper than truck).

1) Land transport costs

In terms of total transport cost, trucks cost 1,437 USD, inland water transport 1,419 USD, and railway 1,040 USD, with inland water transport about 1% cheaper and railway transport about 30% cheaper.

Looking at the breakdown of railway cost, transport costs (transportation) are about 50% less expensive than trucks and inland water transport, and even after taking into account transport (Transportation (last mile)) and handling fee (LOLO) as sta.) as well as transport inside Sihanoukville Port (Transportation inside Port), which are only incurred for railway transport, are 623 USD compared to 860 USD for truck transport and 820 USD for inland water transport, which are about 20~30% cheaper, thus railway maintaining price competitiveness. In addition, for truck transport, 50 USD/ton is charged by the logistics provider as a trailer arrangement fee for transport of 22 ton or more, but this fee is not required for railway transport. Mainly reflecting these cost-reduction effects, railway is 28% less expensive than truck.

For inland water transport, the transport distance is to the port of Phnom Penh (about 350 km), which is less expensive than to the port of Sihanoukville (520 km), but the difference is small. Although quarantine (Phytosanitary) is required for all transport distances, an additional certificate is required for inland water transport (via Vietnam) (20 USD/container), contributing to raising cost, which reduces costs by about 1% compared to truck transport, and the difference between the two is minimal.³⁸

2) Maritime transport costs

Assuming transport from the ports of Sihanoukville or Phnom Penh to Rotterdam, the maritime transport cost was 1,345 USD from the port of Phnom Penh, which has a long transport distance, and 1,205 USD from the port of Sihanoukville. The cost of railway and truck transport was about 10% less expensive than inland water transport.³⁹

(2) Lead time

Comparing transport times to ports within Cambodia, transport to the port of Phnom Penh (inland water transport) is the fastest (8 hours), followed by truck (14 hours to Sihanoukville port) and railway (22 hours to Sihanoukville port). According to interviews with rice millers, some commented that transport time of 48 hours

³⁸For railway, the route is the same as it goes through Sihanoukville port.

³⁹Documentation costs and other costs are difficult to compare on a one-to-one basis because cost items are not uniform among shipping companies (Japanese logistics provider).

or less is acceptable, and they attempt to avoid high temperatures by such measures as transporting by railway at night.

In terms of lead time for maritime transport, the short distance via Sihanoukville Port is about 25~30 days, and via Phnom Penh Port is about 32~38 days. In the case of the Phnom Penh port, it was noted that it may take more time due to the detention for inspection at Ho Chi Minh.

(3) Other

Container delivery at both Sihanoukville and Phnom Penh ports is on Saturdays at noon, and the acceptance date is the same. In the case of railways, the general rule is to bring in the day before the departure date of the railway. Freight train schedules have not been set as of May 2023, making it difficult to set schedules for delivery dates.

4.3.3 Willingness of Rice Millers on Modal Shift

Railway transport is characterized by its potential to transport large volumes of goods from one specific location to another at low cost. Therefore, within Cambodia, it was thought that the particularly long-distance transport of large volumes of rice would be the transport of white rice for export from the rice mill accumulation area north of Battambang to Sihanoukville port. The route was a route with cost savings and particularly high potential for shifting from truck to railway transport. Interviews with rice mills in northern Battambang that are using truck transportation, although some rice millers were already using railway.

The results of interviews with rice millers regarding their willingness in shifting from truck to railway transport based on the assumed transport costs calculated in this survey are as follows.

Table 4-13 Results of interviews with rice millers regarding willingness in shifting from truck to railway transport

Item	Contents/Results
Criteria of interviewee	Located in the rice mill accumulated area in the northern part of Battambang Transporting white rice to Sihanoukville Port (PAS) Using only trucks and not using railways
Rice millers to be interviewed	Capital Food Investment Import Export Ser Khun Rice Mill Golden Daun Keo Rice Mill Fed Rice Battambang Palm Rice (5 companies above)
Main export Destinations	China, Malaysia, EU, Canada
Question	Q: If the cost of railway transport (per 20-foot container) is about 70% of that of truck transport, would you switch to railway transport?
Results of answers to the question	5 out of 5 companies said they would switch if transport costs were reduced to about 70%.
Reasons for not using railway transport	At this time, the company does not have a policy to use the railway. Due to its distance from the railway tracks Because there are no container yards for railways near the plant
Other responses	Some of them are concerned about the amount of initial investment required for the construction of spur line and the purchase of equipment in the event of a switch to railway transport. Some of them are concerned about the proper functioning of the railway operations. Since the plant is adjacent to the railway tracks, a company has commissioned an outside contractor to conduct a survey on the possibility of switching to railway transport and will make the switch depending on the results of the survey.

Source: The JICA Survey Team

According to interviews with rice millers in the northern part of Battambang, several of them have already

purchased a portion of the land on which the railway line could be built, have purchased land for warehouses near the railway line, or have had RR or a professional survey company conduct a survey for the future shifting to railway transport. In addition, an interview with a logistics company specializing in agricultural products revealed that a container yard for transporting white rice from northern Battambang is planned to be constructed near the Chondeur Svar station. Some rice millers expressed the opinion that the dryport there in the future would facilitate transport of rice to Sihanoukville port.⁴⁰

4.3.4 Issues

Table 4-14 shows the current status of and issues related to railway transport, inland water transport, and truck transport, based on interviews with rice millers.

Table 4-14 Current status and issues of railway transport, inland water transport, and truck transport

Transport mode	Current Status	Issue
Railway	<ul style="list-style-type: none"> • Frequent delays • Inappropriate locking btw. Container/wagon 	<ul style="list-style-type: none"> • Impact on manufacturing/ staffing schedule • Collapsing risk
Inland water transport	<ul style="list-style-type: none"> • River port. <ul style="list-style-type: none"> ➢ Transport via Viet Nam is necessary ➢ Limited vessel entry • Off-record shipping to Vietnam (Mekong river) 	<ul style="list-style-type: none"> • Complicated formality in Viet Nam • Extra cost and time for transit • (1,000USD/ license, Quarantine certificate 20-25USD/ con, 10-14days for the inspection) • Shallow draft, seasonal variation (Rainy/ Dry) • Transparency assurance, Property declaration
Truck	<ul style="list-style-type: none"> • Arrangement difficulty of empty container (in particular, 20FT) • Seasonal volume variation 	<ul style="list-style-type: none"> • Containers procurement • Increased fares in peak season

Source: The JICA Survey Team

(1) Issues on railway transport

Frequent transport delays were reported, which disrupted the logistics process. It is desirable to improve punctuality by taking advantage of the strengths of railways, which are less impacted by road traffic. In addition, as shown in Figure 4-34, the locking system of the wagon did not function properly, and the container and wagons were not locked appropriately, leading to concerns that the wagon might tip over while running. The railway operator, RR is required to repair the wagons and ensure the locks to be securely fastened.



Source: The JICA Survey Team

Figure 4-34 Container and wagon anchorage

⁴⁰ According to CRF, an MOU will be signed between CRF and RR during 2023 (contents unknown) and railway transport will commence on the basis of the MOU.

(2) Issues on inland water transport

Since Phnom Penh port is a river port, it is necessary to go through as Transit in Ho Chi Minh City in order to connect to maritime transport. The risk of being detained for 10-14 days for inspection by the authority of Vietnam was confirmed, as well as the additional costs of obtaining a license for transit (1,000 USD/ license), quarantine certification 20-25 USD/ container, etc. In terms of infrastructure, the difference in draft between the wet and dry seasons is large (1 m), and based on the assumption of container transport, only barges can call at the port. There are also reports of off-record exports to Vietnam across the Mekong River, and ensuring transparency and traceability is also an issue.

(3) Issues on truck transport

While 20FT containers are commonly used for bulk transport such as rice, the container size commonly used in Cambodia is 40FT, and some respondents commented that 20FT containers are more difficult to procure than 40FT containers. Railway transport has a capacity large volume of empty containers to be transported directly from ports, also cheaper and more economical than trucks for long-distance shipments. It is desirable to establish container pools in inland regions and provide such services to truck operators. In addition, some respondents reported difficulty in arranging trucks during the harvest season, when demand for rice transport increases due to the variation of the volume. During periods of rapidly increasing demand, measures to reduce transport costs can be considered by sharing transport with railways.

4.3.5 Conditions of Modal Shift

(1) Conditions for Modal Shift from Truck to Railway

Firstly, in the case of rice exports from Battambang, using the Sihanoukville port by railway has a 28% cost reduction in the land transport portion, and according to interviews, local rice millers have confirmed their willingness to shift to railway under the same conditions. On the other hand, since this fact is not generally known to the public, aggressive advertising of the cost-saving benefits of switching to rail may promote its use.

Secondly, the shifting to railway requires the development of a railway station for dedicated use, which requires investment. Since the development is performed by RR, the cost for the development is not disclosed. It is expected that RR will actively engage in sales activities to rice millers who wish to transport rice, and discuss the benefits of reduced transport costs and the prospect of recovering investment costs, thereby promoting the use of railways.

Thirdly, a service to transport containerized rice at stations that handle general containers is already in place by some logistics companies that handle rice transport. As of May 2023, there are no freight stations on the Northern line that are equipped with loading and unloading equipment and are capable of fully utilizing container transport. The development of the CY is expected to make it easier for logistics companies that handle rice to use the railway and accelerate their efforts to arrange transport.

(2) Conditions for Modal shift from Truck to Inland Water Transport

It was shown that land transport costs are slightly lower when transported via the Phnom Penh port than when trucked to Sihanoukville. On the other hand, it was confirmed that when using the Phnom Penh port, the Transit must go through Ho Chi Minh, and even for Transit, additional costs such as detention, quarantine certificates, and licenses for inspection will be incurred. Several vendors identified these as the main reasons for not using the Phnom Penh port. There is potential transport demand for exports to countries such as China, Hong Kong, and the Philippines, as the shipping distances are shorter than at Sihanoukville Port. If procedures on the Vietnamese side at the time of export are improved, it is expected to be shifted to inland water transport.

Chapter 5 Issues and Recommendations

Based on the findings described up to Chapter 4, the followings are the issues that have been identified and the proposed projects that the Cambodian Government shall undertake to address these issues. The symbols described in this chapter (e.g. R1) correspond to the project proposal number, and the classification of the prefixes is shown in Table 5-1.

Table 5-1 Project number and prefix

Prefix	Project Category
R	Railway-related Project
T	Truck transport-related Project
W	Inland water transport-related Project

Source: JICA Survey Team

5.1 Issues

5.1.1 Issues in the Railway Sector

(1) R1_Improvements to axle loads and Station Facilities

In Cambodia, there is a mix of 15 ton and 20 ton axle load sections, which does not allow for the advantages of railway in transporting large quantities of heavy goods compared to truck transport. Railway facilities at the container yards are also inadequate, thereby causing a lot of delays to wait for work.

(2) R2_Railway hub for rice transport

In order to operate trains for commercial purposes, it is necessary to collect a certain amount of cargo for logistics companies, but rice, which is widely produced in Cambodia, is transported in small units, and most rice mills are unable to secure sufficient cargo volume to transport by railway.

(3) R3_Capacity Building for Government Agencies

There are discrepancies in the interpretation of the concession agreement between MPWT(DoR), the owner of the infrastructure, and RR, the operator of the railway, and the government and RR are unclear as to when the contract should start, whether the concession fee should be paid, and who is responsible for the maintenance of the infrastructure. The government and RR are unclear as to where the responsibility lies. Preparations for the operation of international railway with Thailand are underway, but the status of preparations by Cambodian domestic officials for the realization of an international train operation is also unclear. Furthermore, plans for the development of an international station (international freight station) on the Cambodian side has not progressed and a study for its development should be carried out by MPWT (DoR). In addition, the track infrastructure mentioned in “R1” will require improvement of railway facilities, but RR is responsible for all operations and maintenance of the railway, and there are plans to implement track improvements by RR. Therefore, the MPWT(DoR) itself is not aware of the status of the infrastructure. The Cambodian government lacks the know-how to implement railway projects, making it difficult to properly manage construction.

(4) R4_Establishment of Safety Management System

When people or animals enter the tracks, they often are hit by trains or cause trains to stop abruptly. When a train passes through a railway crossing, the driver always uses the horn to warn others of the train approaching. In addition, in the event of a railway accident, accident information is not reported to the government, making it impossible to take measures for prevention of accidents and mitigation of accident impact.

5.1.2 Issues in the Agricultural Products Sector

(1) T1_(Road Transport) Truck Procurement and Weight Limits

As mentioned in 2.1, in Cambodia, vehicle length is limited to 16.0 m, and vehicles (trailers, etc.) exceeding this limit are not allowed to operate. According to CAMTA, trucks that can be procured within this limit are extremely limited (e.g., Russian-made), and Japanese-made trucks are not sold in Cambodia because their vehicle length exceeds 16.0 meters. There are also vendors who make illegal modifications to their vehicles, such as cutting them down to comply with this standard. In addition, the weight limit within Cambodia is 40 ton, while in Thailand the limit is 50 ton. Under the framework of the Cross Border Transport Agreement (CBTA), the GMS countries are promoting the application of standard truck access policies between GMS countries under a licensing system, but it is practically impossible for vehicles weighing 50 ton to enter Cambodia.

(2) W1_(Inland Water Transport) Container Shipping Route Restrictions

As of 2023, the only river port in operation that can handle containers is Phnom Penh Port (LM17), which is far from the Battambang area, the subject of this survey, and is one of the reasons why inland water transport is not being used. In addition, rice millers and logistics companies that handle rice requested the construction of warehouses to store rice at the port and facilities to transport rice in bulk.

(3) W2_(Inland Water Transport) Transit Procedures on the Vietnamese side

As mentioned in 4.3.4, Phnom Penh Port is a river port, so it is necessary to go through (Transit) Ho Chi Minh City in order to connect to maritime transport. According to the Transit agreement between Cambodia and Vietnam, while Transit items are not inspected except for high-risk items almost items are inspected and are held for 10-14 days for inspection. It has been reported that for the export (Transit) of rice, bananas, and mangoes, a license fee of 900-1,000 USD per year and a quarantine certificate of 20-35 USD per container are required, and for the import, an inspection is required when used equipment is imported (Transit), resulting in additional costs and this has resulted in additional costs and waiting time for the inspection. In addition, Transit procedures are limited to business hours (the agreement specifies that procedures are to be performed 24 hours a day).⁴¹

⁴¹Based on PPAP and interviews with logistics companies.

5.2 Short- and Mid-term Improvement Policies and Project Proposals

Table 5-1 summarizes the names, issues, scope and benefits, and timing of maintenance for the projects proposed in this survey. An overview of these projects is also described from the next section.

Table 5-2 List of proposed projects

Type	Name of proj. [Implementing Agency]	Issues	Scope	Benefit	Timeline
Railway	R1_Track improvement project [DoR].	Limited axle load (15ton) and speed (30-50kph) Obstruction of traffic on main line during handling and oil filling works	-Improvement of tracks, bridges and culverts -Introduction of facilities in CY (oil filling line, handling line, etc.)	To improve loading capacity 60 ton to 80 ton (+33%)	Short-Mid
Railway (Agri.)	R2_Station development for Rice distribution [DoR/ Provincial Government].	Large lot is necessary to use railway	Development of hub (CY) for rice distribution	To increase demand of rice distribution by railway	Mid
Railway	R3_Capacity building on MPWT [DoR].	Supervising capacity of RR	R3-1_Assistance on modification of the Concession agr. R3-2_Assistance to realize international freight train operation R3-3_Support for supervision of track improvement (15t→20t) R3-4_Asset management	To realize international freight train operation To improve capacity of DoR to supervise railway projects and operators	Short
Railway	R4_Safety improvement [DoR].	Accidents at level crossings	R4-1_Installation of safety devices (e.g., warning device, fence) R4-2_Education and campaign for safety R4-3_Establishment of accident investigation committee	To reduce train accidents	Short
truck (Agri.)	T1_Relaxing of Load Weight and Truck Length regulation Designated road for heavy trucks [GDLT].	Limited type of truck for procurement Limited load weight capacity	To ease regulation for specified road for tuck (Truck length: 16m→16.7m, Load weight: 40 ton→50ton)	To expand opportunities of truck procurement by logistics companies To increase efficiency of logistics on truck transport (+25%)	Short
IWT (Agri.)	W1_River port development [MPWT/ PPAP]	Limited ports for containers vessel	River port development (Chong Khneas , Kompong Chhnang, Prek Kdam, Kompong Leaeng, Boeungket, Chhlong, Sovannaphum) -Warehouse -Bulk Cargo terminal	To increase demand of agricultural products via PPAP	Long
IWT (Agri.)	W2_Formality enhancement on international trade via PPAP [MPWT]	Formality of int'l trade at HCM (Extra cost for License, lead time)	Request for Vietnam Customs		Short

Note: Short: less than 3 years, Mid: less than 5 years, Long: More than 5 years

Source: The JICA Survey Team

5.2.1 Railway-related Projects

(1) R1_Track improvement project [DoR].

The section limited to a 15 ton axle load will be improved to 20 ton, and the running weight will be increased by about 33% from 60 ton to 80 ton. This makes it possible to run two 20FT. containers in one wagon at the maximum capacity. In addition, cargo handling lines and fuel supply lines at CY will be developed, aiming for operations that does not obstruct traffic of the main line. The implementation period shall be short to medium term (3 to 5 years) and the implementing agency shall be DoR.

(2) R2_Station development for rice distribution [DoR/ Provisional Government].

The project aims to improve demand for railway transport of rice by making CY available to rice millers and logistics providers targeting Battambang. In developing the site, it is assumed that private companies (including RR) will invest and operate the site, and sites near arterial roads and rice millers, etc. will be selected, along with the development and demarcation of access roads. The implementing agency shall be DoR for a medium term (5 years) and the implementing agency shall be DoR and/or Provincial Government.

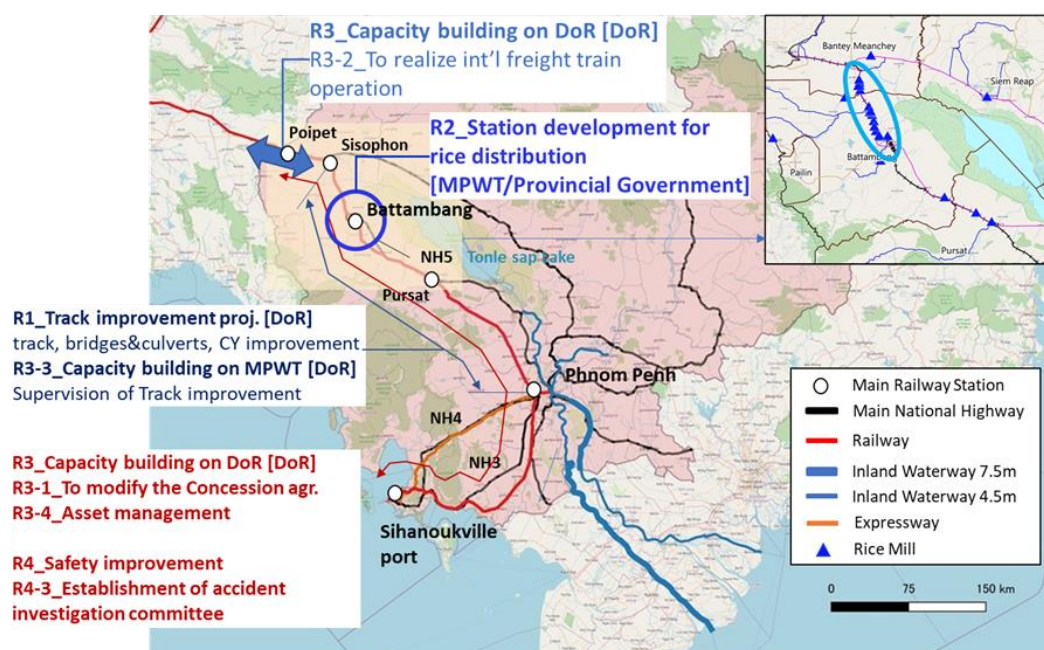
(3) R3_Capacity building on DoR [DoR].

With a view to railway act legislation in the future, provide assistance to DoR in reviewing and discussing changes to the concession agreement with the RR so that DoR can manage the operator as a supervisory authority to strengthening construction management capacity, DoR will not only properly manage its assets, but also transfer its know-how in performing improvement works for railway projects as the Cambodian government. In light of the current situation where discussions between the Cambodian and Thai governments are already taking place intermittently to realize international train operation, it is proposed to encourage the realization of international train operation by both parties further coordinate their efforts. MPWT(DoR) will also initiate a study for the development of an international station (international freight station) on the Cambodian side. The period of implementation shall be short term (up to 3 years) and the implementing agency shall be DoR.

(4) R4_Safety improvement [DoR].

The aim is to reduce the number of railway accidents by improving level crossing warning devices and fencing, and educating local residents. In addition, since accidents are not reported to the supervising authority, an accident investigation committee shall be set up, which will require to report accidents as they occur. The period of implementation shall be short term (up to 3 years) and the implementing agency shall be DoR.

The location of these proposed projects is shown in Figure 5-1.



Source: The JICA Survey Team, © Openstreetmap contributors

Figure 5-1 Location map of railway-related projects

5.2.2 Agriculture-related Projects (Excluding Railway)

- (1) T1_Relaxing of Load Weight and Truck Length regulation and Designated road for heavy trucks [GDLT].

Provide assistance in the development of relaxation of the effective length of vehicles in Cambodia. Since the arterial road is designed with a vehicle length of 16.7 m (for trucks), the change to 16.7 m is reasonable. In addition, Japanese used trucks would also be able to be procured if regulations are eased to this length. About weight restrictions, in terms of cross-border transport with Thailand, it is desirable to raise weight restrictions to the same level as in Thailand (from 40 ton to 50 ton: 25% improvement) and to improve transport efficiency. However, verification is needed as there is no clear provision for vehicle weight limits in road design standards. It is desirable to designate important roads as logistics roads and regulate the targets for weight restrictions, rather than deregulate them uniformly. The implementing agency shall be GDLT, and the implementation period shall be short term (up to 3 years).⁴²

- (2) W1_River port development [MPWT/ PPAP].

The project promotes the development of seven river ports planned by MPWT Department of Waterway Transport. The Sub-feeder Multipurpose Terminal (TS11) planned near the downstream of Tonle Sap will handle containers, but to stimulate the transport of agricultural products from the survey area, it is desirable to build a port

⁴²Road Design Standard, Part 1, Geometry (MPWT CAM PW.03.101.99)

upstream of Tonle Sap that can also handle containers. In addition, to promote the transport of agricultural products, warehouses where agricultural products can be stored and facilities (silos, etc.) for handling bulk products shall also be constructed. The implementing agency shall be MPWT or PPAP and the implementation period shall be long-term (5 years or more).

(3) W2_Formality enhancement on international trade via PPAP [MPWT].

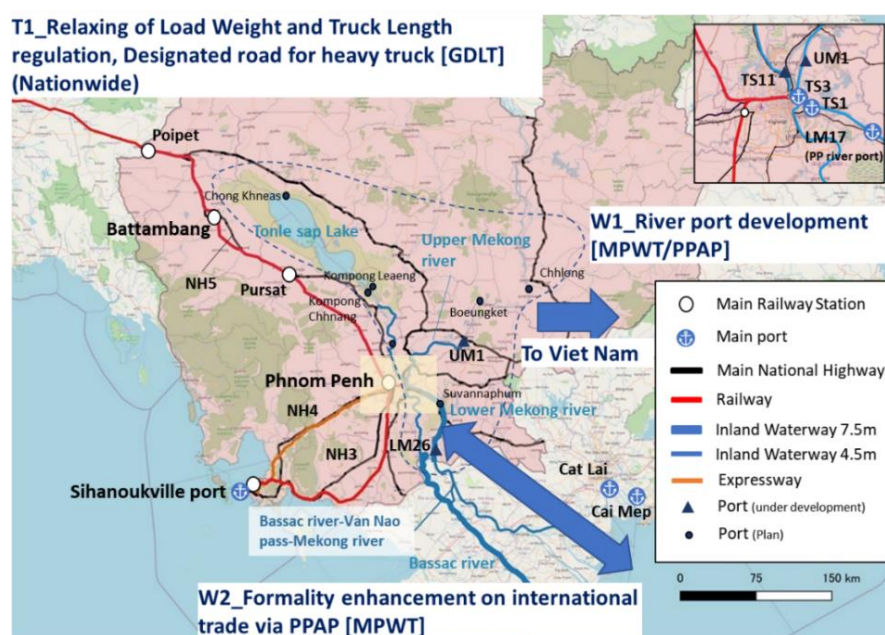
According to PPAP, the Cambodia-Vietnam bilateral agreement on Transit transport is not implemented, and the main requests of PPAP to the Vietnamese side are shown in Table 5-2. Cambodian government further coordinate with Vietnamese side to promote exports using inland water transport. The implementing agency shall be MPWT, as a coordinator between Viet Nam on behalf of Cambodian government, and the implementation period shall be short term (up to 3 years).

Table 5-3 Requests from PPAP to Vietnam

No.	classification	Title.	Details of request
1	Implementation of bilateral transit agreements	Inspection of transit cargo	Inspections take 10-14 days and should be limited to very high-risk shipments.
2		Export of agricultural products (rice, bananas, mangoes) (transit)	Withdrawal of the requirement to issue a license fee of USD 900-1,000 per year and a quarantine certificate of USD 20-35 per container
3		Importing used goods into Cambodia	Improved transit procedures in Vietnam when importing used equipment to Cambodia
4		procedural improvement	24-hour service for procedures
5	Infrastructure Improvement	improvement of water draft	Bassac River-Van Nao Pass- Mekong River draft improvement (4.5~5.5m to 7.5m)
6		Congestion at Cat Lai Port	Improved capacity at Cao Lai port

Source: PPAP

The location of these proposed projects is shown in Figure 5-2.



Source: The JICA Survey Team, © Openstreetmap contributors

Figure 5-2 Location map of agriculture-related projects (excluding railway)