Ministry of Transport

Expressway Authority of Thailand





overview and investment model

Review of the Feasibility Study and Preparation of
the Public Private Partnership (PPP) Report for

Phuket Expressway Project

Phase 1: Kathu – Patong Section and Phase 2: Mueang Mai – Ko Kaeo - Kathu Section

Supporting information for the Opinion Hearing Session regarding
the Public Private Partnership in operation and maintenance (O&M) services,
to be used for the preparation of the PPP report,
in compliance with the Public Private Partnership Act, B.E. 2562 (2019).

AEC PSK PDC

March 2025

Supporting information for Opinion Hearing Session regarding
the Public Private Partnership in operation and maintenance (O&M) service,
to be used for the preparation of the PPP report,
in compliance with the Public Private Partnership Act, B.E. 2562 (2019)
Phuket Expressway Project Phase 1 Kathu - Patong and
Phase 2 Muaeng Mai - Ko Kaeo - Kathu

1. Introduction

Currently, Phuket Province is facing a lot of traffic congestion. In particular, Highway 402, which is the only main route used to connect Phuket International Airport and the northern area of Phuket Island with Phuket Town and other tourist attractions, due to capacity limitations and the nature of the highway without access control. As a result, National Highway No. 402 cannot effectively handle the traffic volume, especially during morning and evening rush hours. In addition, in the connection between the Kathu side and the Patong side, National Highway No. 4029 will be used as the main route for travelling, which currently has traffic jams and the route is a steep and winding road, causing frequent accidents. Failure to take immediate corrective action will result in travel delays. It has a negative impact on the livelihood of the people and tourists, as well as affects the economic and social sectors of Phuket Province and the country in the long term.

Expressway Authority of Thailand (EXAT) The Phuket Expressway Project has been implemented to upgrade road transport infrastructure. Solve traffic problems and facilitate fast travel for locals and tourists, including: The 2 phases of the expressway project are the Phase 1 project with a distance of 3.98 kilometers and the Phase 2 project with a distance of 30.62 kilometers.

2. Objectives

2.1 To assess the level of interest of the private sector in joint investment projects (Market Sounding) and interview interested private sectors (Interview Session).

2.2 To listen to the opinions of the private sector on the options for private investment in various forms of projects. For private investment in the operation and maintenance (O&M) of the Phuket Expressway Project, Phase 1 of the Kathu-Patong section and Phase 2 of the Mueang Mai - Ko Kaeo - Kathu section, the results of the hearing will be used to prepare a study and analysis report on the project in accordance with the Act. Joint Investment B.E. 2562 (2019)

2.3 To publicize the project development plan and present information about the project.

3. Target Groups

3.1 Government agencies and related organizations.

3.2 Private sector entities, including expressway operators, infrastructure developers, construction companies, system integrators, and transport service providers (Operators).

3.3 Financial Institutions and Potential Investors.

3.4 Associations and Chambers of Commerce

3.5 Foreign Embassies in Thailand

3.6 Media Representatives

4. Market Sounding Methods

A Market Sounding session will be organized to allow the private sector to provide feedback during the meeting. Additionally, announcements regarding the feedback process will be posted at the Expressway Authority of Thailand (EXAT) office and sent to relevant private sector entities and embassies in Thailand.

Session documents, including key project details and a private sector interest assessment questionnaire, are available for download at www.exat.co.th and www.phuket-expressway.com. com from February 19, 2025, to March 7, 2025. Private sector feedback can be submitted via the questionnaire and sent to EXAT's email (exat_phuket@exat.co.th) between February 19, 2025, to March 10, 2025

5. Date and Location

Date: Friday, March 7, 2025 (08:30 AM. - 04:00 PM.)

Time: 08:30 AM - 04:00 PM

Location: Carlton Grand Ballroom, 9th Floor, Carlton Hotel Bangkok Sukhumvit.

6. Expected Outcomes

EXAT will compile and summarize the feedback received from the private sector to incorporate into the project study and analysis report in accordance with the Public-Private Partnership Act, B.E. 2562. The feedback will be considered appropriately, with a focus on ensuring the project's success.

7. Disclaimer

7.1 The information in this document is preliminary and intended solely to facilitate the collection of private-sector feedback on the project. It does not constitute any binding terms or conditions related to the bidding or selection process for private sector participation. The information provided herein is subject to future revisions or updates. EXAT does not certify or guarantee the accuracy, completeness, or reliability of the information in this document and assumes no liability for any inaccuracies. Interested parties are advised to conduct their own thorough research and verification of project-related information. The use of any information in this document for decision-making is at the sole discretion and responsibility of the private sector participants.

7.2 EXAT will not be responsible for any expenses incurred in providing feedback and is under no obligation to act on any suggestions received.

8. Relevant Laws

The laws related to this document are in both Thai and English. Additional downloads are available at www.ppp.sepo.go.th and https://www.exat.co.th/

9. Key Project Details

9.1 Project Objectives and Goals

1) To study and analyze the appropriateness of allowing the private sector to invest in the project in accordance with the details set out in Section 22 of the Public-Private Joint Investment Act, B.E. 2562 (2019).

2) To conduct a market-sounding test and interview session for the private sector interested in the Phuket Expressway Project.

9.2 Project Benefits

1) Help solve traffic congestion problems. On Highway 402 and Highway 4029, especially during peak hours.

2) It helps alleviate traffic problems as well as increase transportation potential in Phuket.

3) Increase travel options and shorten travel time. Facilitate the public

9.3 Project Location

Phuket Expressway Project, Phase 1 Katu-Patong Section, and Phase 2 Project, Mueang Mai - Ko Kaeo - Kathu Section. The study area of the project covers an area of 5 sub-districts, 3 districts, and 1 province as shown in **Table 9-1.**

Table 9-1 Project Area

province	district	district
Phuket	Thalang	Thep Kasattri
		Srisoonthorn
	Kathu	Kathu
		Patong
	Phuket Town	Koh Kaew

9.4 Project Structure

9.4.1 Route Alignment

The route of the Phuket Expressway project is divided into 2 phases: Phase 1 Kathu - Patong and Phase 2 Mueang Mai - Ko Kaeo - Kathu The details are as follows:

1) **Phuket Expressway Project Phase 1 Kathu - Patong**

The route pattern of the construction project is an elevated road. There is a tunnel in the middle of the road with a total distance of 3.98 kilometers and the starting point of the project is connected to Phra Metta Road in Patong Sub-district, Kathu District, which is an elevated road with 4 traffic lanes per direction (for cars with 2 traffic lanes per direction and motorcycles with 2 traffic lanes per direction), elevated across Pisit Khao Road to Khao Nakkert with a distance of 0.90 kilometers, and then a tunnel through Khao Nakkert with a distance of 1.85 kilometers. At the intersection with National Highway No. 4029

2) **Phuket Expressway Project Phase 2 Mueang Mai - Ko Kaeo - Kathu**

consist The main line (24.45 km) and the spur line (6.17 km) are as follows:

- Main Line: The project route starts from Km.0+000. Highway 4026 is about 850 meters from the intersection of Highway 402 and Highway 4026 and connects to Highway 4026 in the form of an interchange (New City Interchange) before heading south to become a bridge over Highway 4031 at km 4+450 via Highway 4030 at km 9 + 150. It is connected to an interchange (Bandon interchange) and then crosses to form an elevated bridge over the rural highway Pak.4015. Km.13+050 area before arriving at

the Km.14+450 Connect Highway No. 4025 to the interchange (Mahnik 1 interchange). Km.16+100 The route will converge with the Spur Line to Koh Kaew (Spur Line) and connect as an interchange (Ma Nik 2 Interchange) before entering the Kamala Mountains area in the form of a tunnel at Km.17+504 - Km.19+210 Then the route will be elevated across the Rural Highway Pak.3030. Km.19+600 area with a continuous elevation heading south, before elevating on Wichit Songkram Road in the area. Km.21+400 - See map Km.22+000 The southbound route crosses Highway No. 4029 and then meets the Phuket Expressway Project. Phase 1 Kathu – Patong section ends at km 24 + 447

- Spur Line: Route starting at km.0+000 Separated from the area of km 16 + 100 of the main road. The route headed east before being upgraded to a bridge over the Rural Highway B.K.3030. Km.3+600 and end at the junction of Highway No. 4024 as an interchange (Bang Khu interchange) at km.6+166.

As shown in **Figure 9-1.**



Figure 9-1 Project Route Map

9.4.2 entrances and exits and interchanges in the project.

To control the entry and exit of the project, there is a point where entry and exit can be made. The project can be summarized as shown in **Figure 9-2.**



New city interchange Connecting Highway No. 4026 designed as Trumpet Interchange



Bandon interchange Connecting Highway No. 4030 and designing the main road as a bridge over Highway No. 4030.



Ma Nik Interchange 1 Connecting Highway No. 4025 designed as Trumpet Interchange



Mahnik Interchange 2 The connection between the main road and the common road converges into a System Interchange, designed as a Y-interchange.



Bang Khu interchange Connecting Highway 4024 (Junction End) It looks like a Y-Interchange.



The way up and down the war it is connected to Wichit Songkram Road in a 3-way way before being elevated to connect with the main road of the project.



The interchange on the Kathu side is connected to Highway 4029 in the form of a Directional Ramp.



The interchange on the Patong side Connected to Phra Metta Road, designed as the Trumpet Interchange.

Figure 9-2 Entrance-Exit and Interchange Layout in the Project

9.4.3 Civil Design and Construction (Operated by EXAT)

1) Phuket Expressway Project Phase 1 Kathu - Patong

The elevated road structure of the main road is an I-Beam Girder with 4 lanes per direction. Each lane is 3.50 meters wide, with a shoulder on the left side that is 2.00 meters wide, a shoulder on the right side that is 0.50 meters wide, and 2 lanes for motorcycles. Each lane is 1.75 meters wide, with the left shoulder 1.00 meters wide and the right shoulder 0.50 meters wide. The tunnel is a double tunnel with 4 lanes in each direction, divided into 2 lanes for cars. Each lane is 3.50 meters wide, with a shoulder on the left side that is 2.00 meters wide, a shoulder on the right side that is 0.50 meters wide, and 2 lanes for motorcycles. Each lane is 1.75 meters wide, with the left shoulder 1.00 meters wide and the right shoulder 0.50 meters wide. There are sidewalks on each side of the tunnel that are 1.00 meters wide for maintenance and emergencies, with each tunnel having a total internal width of 17.10 meters, as shown in **Figure 9-3** and **Figure 9-4.**

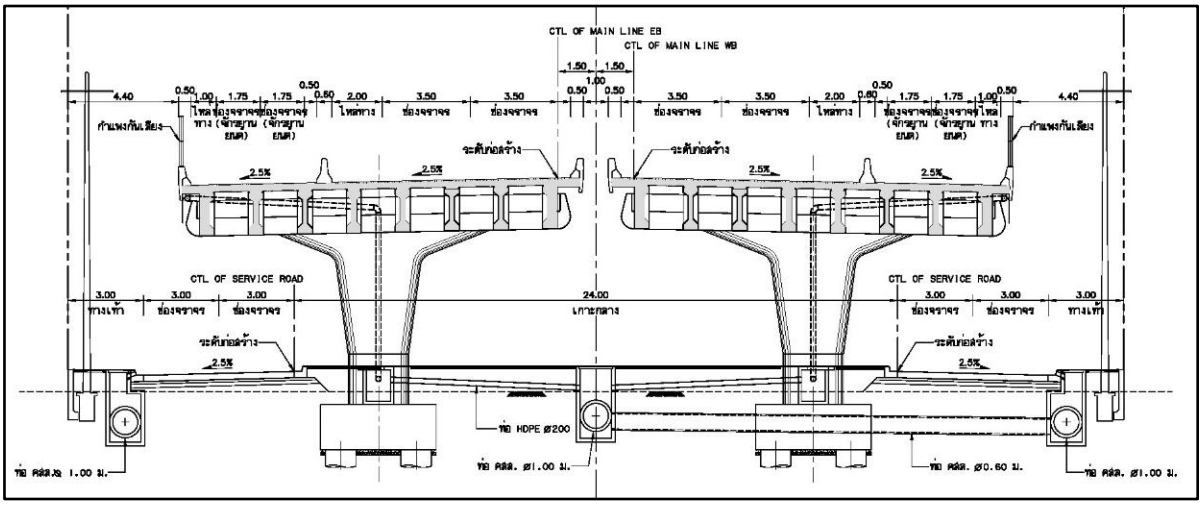


Figure 9-3 Cross-section of Phase 1 Project, 2-lane elevated road in each direction.

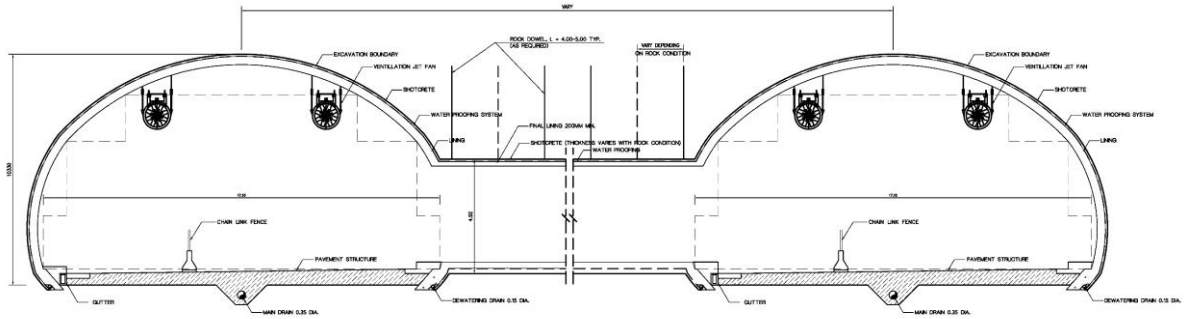


Figure 9-4 Cross-section of Phase 1 Project, 2-lane double tunnel in each direction.

Control Center Building (CCB) It is located at the Phuket Provincial Expressway Project. Phase 1 of the Kathu-Patong section on the side of the Kathu toll gate by the Expressway Control Center is a 3-storey building with a usable area of about 3,168 square meters, as shown in **Figure 9-5.**

- Kathu Toll Canopy as shown in **Figure 9-6.**
- 2 Dormitory Buildings
- Staff canteen building and toilets
- Truck Garage
- Storage
- Building Backup Generator for Building Group (Generator)
- Guardhouse
- Parking Lot and Parking Canopy
- Kathu EE System Building and Generator Building
- Rescue Building Kathu Sub Rescue
- Rescue Building Patong Sub Rescue

- Pump Station
- Kathu Tunnel Façade and Tunnel Entrance and Exit Façade Patong Tunnel Façade as shown in **Figure 9-7.**
- The Patong EE System Building is located on the Service Road under the elevated expressway and the Generator Building.



Figure 9-5 View of the Control Center Building (CCB)



Figure 9-6 Scenery of the toll canopy



Figure 9-7 View of the Tunnel Facade

2) Phuket Expressway Project Phase 2 Mueang Mai - Ko Kaeo - Kathu

The project is an expressway with full control of access by fencing and allowing access to the main road of the project at a specific point. The main road is designed as a 4-lane expressway. Each lane is 3.50 meters, and the central island is 16.20 meters, supporting the expansion of traffic lanes in the future. The inner shoulder is 1.50 meters, the outer shoulder is 2.50 meters, and because the project is a highway with access control, it is necessary to design a service road with 2 lanes on each side that runs in the opposite direction of traffic so that people in the area can travel as before. and for areas in Kathu City to reduce the impact of relocation and expropriation. The project format will be a 4-lane elevated road. 3.50 meters per channel, 2.60 meters on the middle island, 2.00 meters on the outer shoulder.

In addition, in the Khao Kamala area transit project. The area of km 17+504 – km 19+210 due to the terrain is a steep hill area to reduce environmental impacts. Therefore, the design was carried out as a double tunnel. There are 2 lanes of traffic in each tunnel. Each channel is 3.50 meters, the inner shoulder is 0.50 meters, the outer shoulder is 1.50 meters, with each tunnel having a total internal width of 12.00 meters, as shown in **Figures 9-8** to **9-10.**

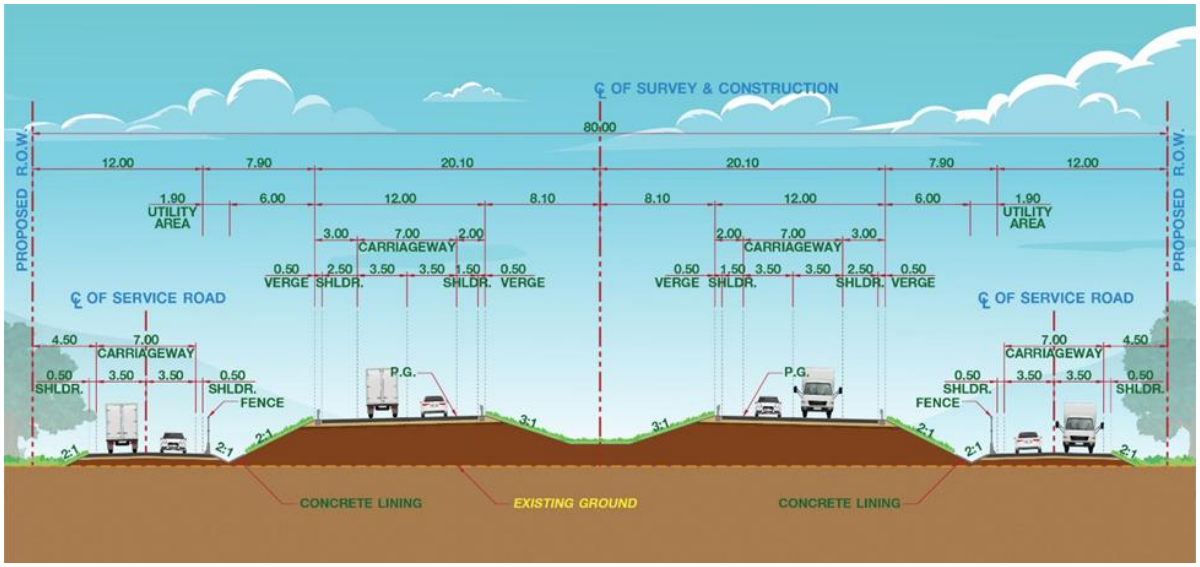


Figure 9-8 Cross-section of Phase 2 Project,2-lane elevated road in each direction.

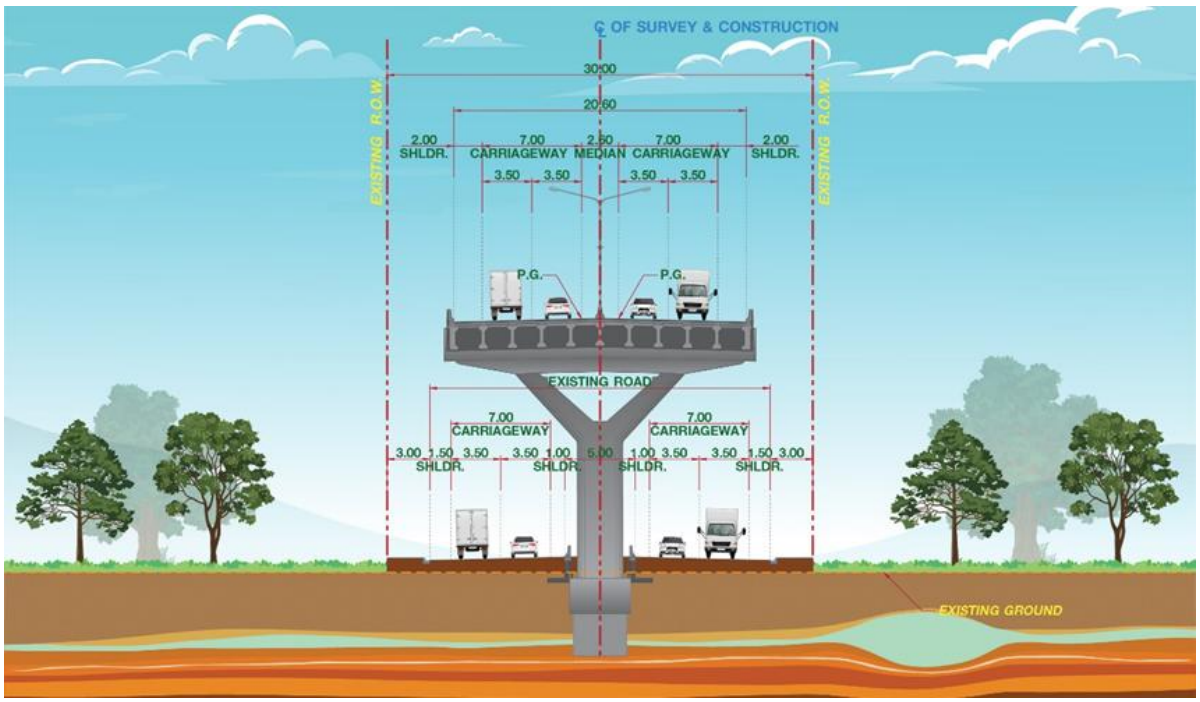


Figure 9-9 Cross-section of Phase 2 Project,2-lane elevated road in each direction.

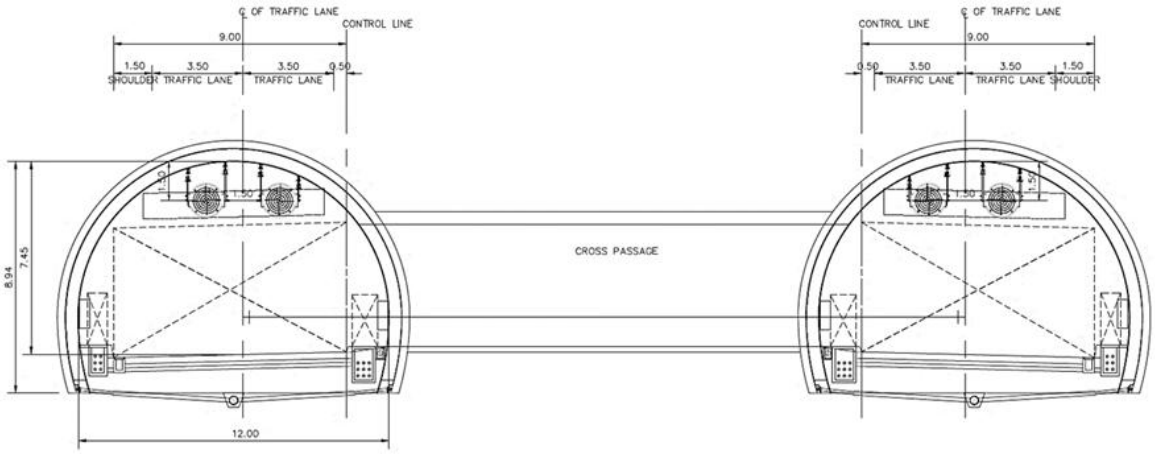


Figure 9-10 Cross-section of Phase 2 Project with 2-lane double tunnel in each direction.

In summary, the project consists of 24.45 km of main roads, 6.17 km of intersection roads, a total distance of about 30.62 km, 19.43 km of ground-level roads and bridges, 1.71 km of tunnels, and 3.31 km of elevated roads.

Location and building layout in Phase 2 of the New City - Koh Kaew - Kathu section consists of:

- Toll Surveillance Building (TSB) and Toll Canopy at Kilometer 2+900 (STA. 2+900)
- Toll Surveillance Building (TSB) and Toll Canopy at Kilometer 8+700 (STA. 8+700)
- Toll Surveillance Building (TSB) and Toll Canopy at Kilometer 9+570 (STA. 9+570)
- Toll Surveillance Building (TSB) and Toll Canopy at Kilometer 14+900 on the left (STA. 14+900 LT)
- Toll Surveillance Building (TSB) and Toll Canopy at Kilometer 16+900 (STA. 16+900)
- Toll Surveillance Building (TSB) and Toll Canopy at Kilometer 1+600 (STA. 1+600)
- Toll Surveillance Building (TSB) and Toll Canopy at Kilometer 21+500 (STA. 21+500)

The Toll Surveillance Building (TSB) is shown in **Figure 9-11** and the Toll Canopy is shown in **Figure 9-12.**

- North Kamala Tunnel Façade and South Kamala Tunnel Façade
- North Tunnel Control Building & EE System Building 1 and Tunnel Generator and South EE System Building

- North Tunnel Fire Pump Station
- Rest Stop is located on Km 16+400 on the urban side of the road, there is a service area of about 13 rai, consisting of various facilities such as public toilets, parking for 159 cars, and temporary accommodation pavilions.



Figure 9-11 Toll Surveillance Building (TSB)

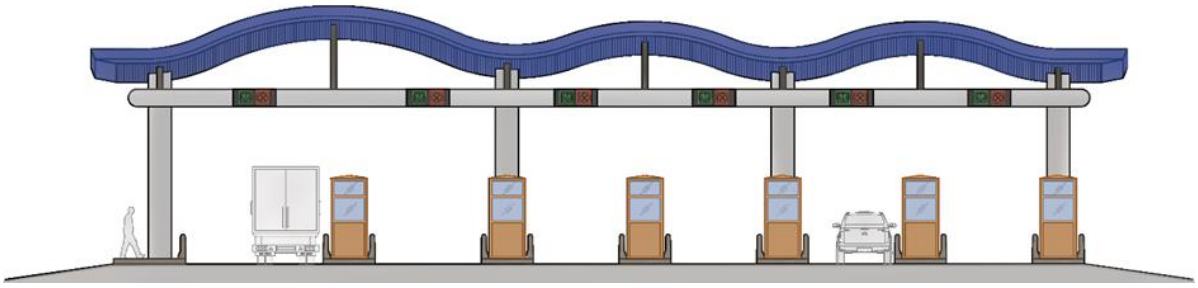


Figure 9-12 Toll Canopy

9.4.4 System work (Operated by the EXAT)

1) Tunnel system

The Ventilation system

It is used to vent hazardous pollutants from vehicle exhaust fumes. This project, it is a longitudinal ventilation system of the tunnel using Jet Fans every 500 meters and has air filters before releasing them to the public according to environmental measures.

Emergency system

Emergency equipment has been designed and installed to prevent and minimize damage due to fire or accident in tunnels. This system is therefore of great importance in the planning of tunnel construction.

Lighting system

It is intended to reduce accidents and agile driving during the day and night. The lighting system in the tunnel is different from the lighting system in open areas, especially at the entrance and exit during the day. This is to reduce the level of difference between the lighting in the tunnel and the outside.

Security/Operation Control/Communication (Controller System)

It consists of information and alarm equipment, fire extinguishers, Fire Fighting Equipment Road signs, and smoke hoods. Emergency tunnels, as well as arranging ambulances or shuttle buses to pick up evacuees from the tunnels.

Drainage System

Design of drainage systems inside tunnels so that there is no flooding. This may be caused by groundwater leakage. Water generated from cleaning and/or water generated from the use of water for firefighting.

2) Drainage system of expressways

It consists of three parts: the first part is the drainage system in the interchange, which will drain the water from the interchange system so that it does not flood the area and endanger the road at ground level. The second part is the drainage system for the elevated structure, and the third part is the drainage inside the tunnel.

9.4.5 System construction and management and maintenance work (operated by the private sector)

1) Construction of toll collection system

Toll collection of the Phuket Expressway Project Phase 1 of the Kathu-Patong section is an open system with a flat rate of toll collection and the Phuket Provincial Expressway Project Phase 2 of the Mueang Mai - Ko Kaeo - Kathu section is a closed system with a toll collection based on distance.

2) Construction of Traffic Control and Management System

It must be designed to be efficient and safe for road users, at least it must consist of an automatic traffic volume counting system. CCTV camera system Communication System Automated message signage, emergency phone system, and vehicle speed detection system.

3) Operation and Maintenance

Civil Maintenance

The private sector must supervise and maintain the project's assets in a ready condition according to the standards set by the CAT. Staff with materials and tools, as well as spare equipment for repair and maintenance of the project, must be arranged to be ready for use.

System Maintenance

The private sector must take care of and maintain all the system works of the project to ensure that they are in good condition and can be used efficiently at all times, as well as must plan to reserve various equipment parts that are sufficient for the maintenance of the project's system work.

9.4.6 Commercial Space Development

Based on the review of the report of the New Town Expressway – Koh Kaew – Kathu Expressway Project, Phuket Province (original study), it has been determined that the service area is located on km 3+900 on the out-of-town side of the road, with a service area of about 37 rai, consisting of: Facilities such as food court and shops, public toilets, parking can accommodate more than 300 cars. Information Service Station Building and Temporary Accommodation Pavilion as shown in **Figure 9-13** and **Figure 9-14.**



Figure 9-13 Area plan of the service area



Figure 9-14 Scenery of the Service Area

9.4.7 Project Investment Cost

1) Price at the year of construction of the Phuket Expressway Project Phase 1

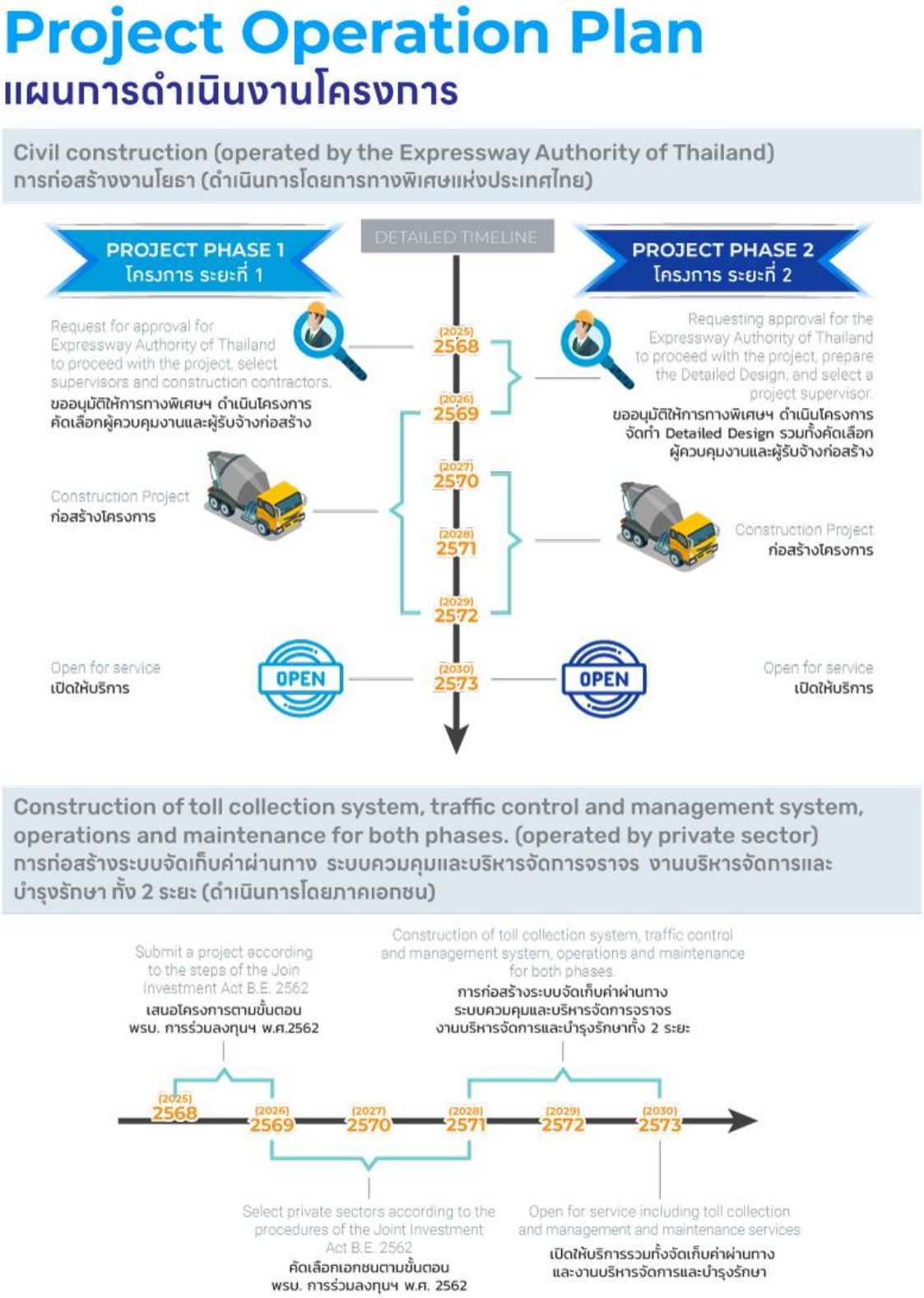
- Civil construction cost 9,975 million baht.
- Construction costs for toll collection systems and traffic control systems. 712 Million Baht
- Construction control cost of 279 million baht.
- Land ownership management fee of 5,793 million baht

2) Price at the year of construction of the Phuket Expressway Project Phase 2

- Civil construction cost 22,620 million baht.
- Construction costs for toll collection systems and traffic control systems. 1,518 million baht
- Construction control costs of 604 million baht.
- Land ownership management fee 21,188 million baht.

3) Operation and maintenance costs for both phases (30 years) 24,800 million baht

9.5 Project Development Timeline



9.6 Project Feasibility

9.6.1 Commercial Feasibility

The commercial feasibility of the project is an analysis to predict the traffic volume and toll revenue of the Phuket Expressway Project for a period of 30 years from the opening year of the 2030 to the 2060 fiscal year. The details are as follows:

Toll Structure Price at the Year of Opening of the Project Phase 1 of the Kathu – Patong Phase 1 Toll Collection Flat Toll

- Toll 15/ 40/ 85/ 125 Baht for motorcycles/ 4 wheels/ 6-10 wheels/ more than 10 wheels

Toll Structure Price at the Year of Operation Phase 2 of the project in the Mueang Mai - Ko Kaeo - Kathu section Distance-base toll is collected.

- Entrance fee 40/ 80/ 120 Baht for 4 wheels/ 6-10 wheels/ more than 10 wheels
- Toll per distance 1.50/ 3.00/ 4.50 baht per km. For 4 Wheels/ 6-10 Wheels/ More than 10 Wheels

Toll rates are adjusted every five years based on the assumed Consumer Price Index (CPI) growth rate of 2% annually. Upon the project's commencement, toll rates will align with the prevailing CPI during that period.

- The toll rate of Phase 1 of the project for motorcycles/ 4 wheels/ 6-10 wheelers/ vehicles with more than 10 wheels is at the rate of 15/ 40/ 85/ 125 baht per vehicle.
- The lowest toll rate of Phase 2 of the project for 4-wheelers/ 6-10 wheels/ vehicles with more than 10 wheels is 45/ 85/ 130 baht per vehicle.
- The maximum toll rate of Phase 2 of the project for 4-wheelers/ 6-10-wheelers/ vehicles with more than 10 wheels is 75/ 145/ 220 baht per vehicle.
- The maximum toll rate if travelers use both distances for 4-wheelers/ 6-10-wheelers/ vehicles with more than 10 wheels is 115/ 240/ 355 baht per vehicle.

The results of the forecast of the number of vehicles entering the project and the revenue from tolls are shown in **Figure 9-15.**

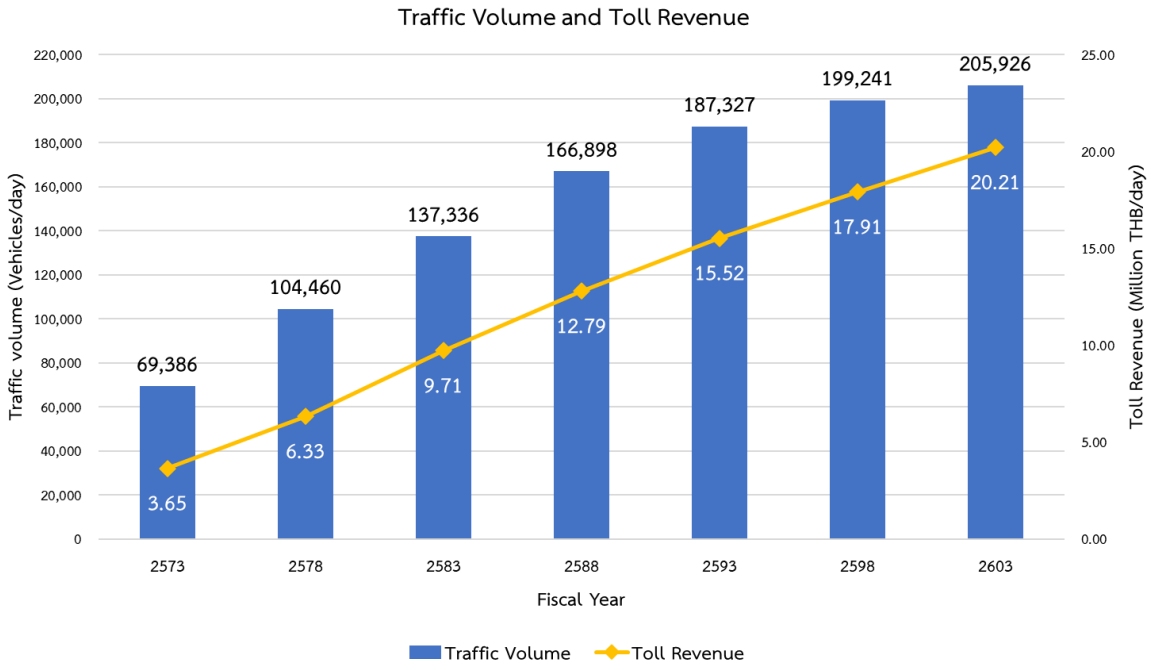


Figure 9-15 Results of Traffic Volume and Project Revenue Forecast Analysis

9.6.2 Technical Feasibility

Network Suitability: The Phuket Expressway Project enhances the efficiency of the intercity network in the Phuket area. It accommodates future travel demand and mitigates traffic congestion on Highway 402 and Highway 4029. The project also improves overall travel convenience and safety while supporting economic activities and freight transportation with continuous potential growth.

9.6.3 Feasibility of Technology Projects

1) Toll Collection System (TCS)

The private sector must design and install the toll collection of the project to accommodate the expressway project. Phase 1 of the Kathu-Patong section is an open system with fixed toll collection, supporting trucks, small cars, and motorcycles, with an MTC cash payment system and an automatic system called ETC Easy Pass / M–Pass.

For the Phuket Provincial Expressway Project, Phase 2 of the Mueang Mai - Ko Kaeo - Kathu section is a closed system that collects tolls according to distance. Supports trucks, small cars, MTC cash payment system, ETC Easy Pass / M–Pass automation

2) Traffic Management and Control System (TMCS)

The private sector must design and install a safety control and traffic management system along the expressway to achieve efficiency and safety for road users.

- Traffic CCTV
- Automatic Traffic Incident Detection
- Information communication system, toll collection system, and traffic control and management in expressway areas, including CCB control centers.
- Automatic Message Modification Signage System and Traffic Symbol Modification Signs (VMS, LCS)
- Emergency Telephone System ETS
- Traffic Detection System
- Radio Communication Systems and Signal Towers.
- Traffic Control and Command Room System (Traffic Operation Center TOC)
- Electricity supply system for traffic control and management equipment. Expressway Area (Power Distribution System)

9.6.4 Environmental Feasibility of the Project

1) Phuket Expressway Project Phase 1 Kathu - Patong

Approved the Environmental Impact Analysis Report from the National Environment Committee in March 2018

2) Phuket Expressway Project Phase 2 Mueang Mai - Ko Kaeo - Kathu

The Environmental Impact Assessment Report is in the process of preparing a complete report to be submitted to the National Environment Committee.

9.6.5 Legal Feasibility of the Project

1) Laws and regulations related to the authority and duties of the Authority of the Agency

Expressway Authority of Thailand Act, B.E. 2550 (2007)

"Expressway" refers to a road or highway constructed, acquired, or transferred,

whether at ground level, above ground, underground, or underwater, for the purpose of providing special traffic facilitation. It also includes bridges, tunnels, ferries for vehicle transport, piers for vehicle boarding or disembarking, sidewalks, parking areas, right-of-way zones, road shoulders, embankments, drainage pipes or channels, retaining walls, boundary fences, milestones, traffic signals, traffic

signs, buildings, or any other facilities within the right-of-way area designed to enhance convenience or safety in expressway operations.

Considering the objectives of the agency under this Act, specifically Sections 8, 10, and 19, it is evident that the Expressway Authority of Thailand (EXAT) is authorized to undertake the construction of projects, collect toll fees, and grant concessions for private sector participation in projects under the Public-Private Partnership (PPP) Law. For granting concessions for the construction or expansion of expressways, EXAT must first obtain Cabinet approval as stipulated in Section 57 of the Act.

2) Laws, Announcements, and Regulations Related to Public-Private Partnerships (PPP)

Public-Private Partnership Act, B.E. 2562 and Relevant Announcements by PPP Policy Committee Under Public-Private Partnership Act, B.E. 2562, and related announcements issued by PPP Policy Committee, granting concessions for activities aligned with the agency's objectives requires not only Cabinet approval but also compliance with Section 7 of the Act, which specifies eligible activities for private sector participation.

For the selection of a private entity to engage in a PPP project, EXAT must follow the procedures outlined in PPP Act and relevant announcements issued by the PPP Policy Committee. Additionally, the private entity selected must meet all legal qualifications and must not fall under any prohibited categories specified by law.

9.6.6 Feasibility of financial projects (FIRR) and the economy (EIRR)

1) The result of the Financial Suitability Analysis (FIRR) of the project is 1.82 percent, as shown in **Table 9-2.**

Table 9-2 Financial feasibility of the project

FIRR		
Financial returns (percent)	**Net Present Value (NPV) (Million Baht)**	**B/C Ratio (fold)**
1.82	-30,933.19	0.45

Remark: Discount Rate 7.24 % refer Weighted-Average Cost of Capital (WACC) by EXAT, average over the past 10 years from 2015-2024

2) Results of Economic Suitability Analysis The EIRR of the project is equal to 18.85 percent, as shown in **Table 9-3.**

Table 9-3 Economic feasibility of the project

EIRR		
Economic returns (percent)	Net Present Value (NPV) (Million Baht)	B/C Ratio (fold)
18.85	40,060.47	1.95

Remark: Discount rate 12.00 % refer Office of the National Economic and Social Development Council

9.7 Project Risks

The consultant has prepared project risk according to risk analysis guidelines of Australian/New Zealand Standard on Risk Management (AS/NZS 4360:1999).

1) Risk identification and risk assessment

Risk identification in this study is divided into 3 stages. After risk identification, risk assessment is performed by assessing the likelihood of risk occurrence (Likelihood) and assessing the severity of the impact that will occur (Impact). This is used to create a risk assessment diagram (Risk Analysis Matrix) which divides risks into 4 levels as shown in **Table 9-4.** and Risk Identification as shown in **Figure 9-16.**

Table 9-4 Risk Analysis Matrix

Likelihood Opportunities	Impact severity level				
	No effect (1)	A little (2)	Medium (3)	High (4)	Very High (5)
Regular (5)	M (5)	H (10)	H (15)	E (20)	E (25)
Often (4)	M (4)	M (8)	H (12)	E (16)	E (20)
Maybe (3)	L (3)	M (6)	M (9)	H (12)	H (15)
Not very often (2)	L (2)	M(4)	M (6)	M (8)	H (10)
Very little (1)	L (1)	L (2)	L (3)	M (4)	M (5)

E – Extreme Risk (Rating Level 16-25) It is a risk that needs to be addressed urgently.

H – High Risk (Rating Level 10-15) It is a risk that needs to be paid a lot of attention and corrected.

M – Medium Risk (Rating Level 4-9) It is a risk that may be managed without immediate resolution.

L – Low Risk (Rating Level 1-3) Most of them are acceptable risks.

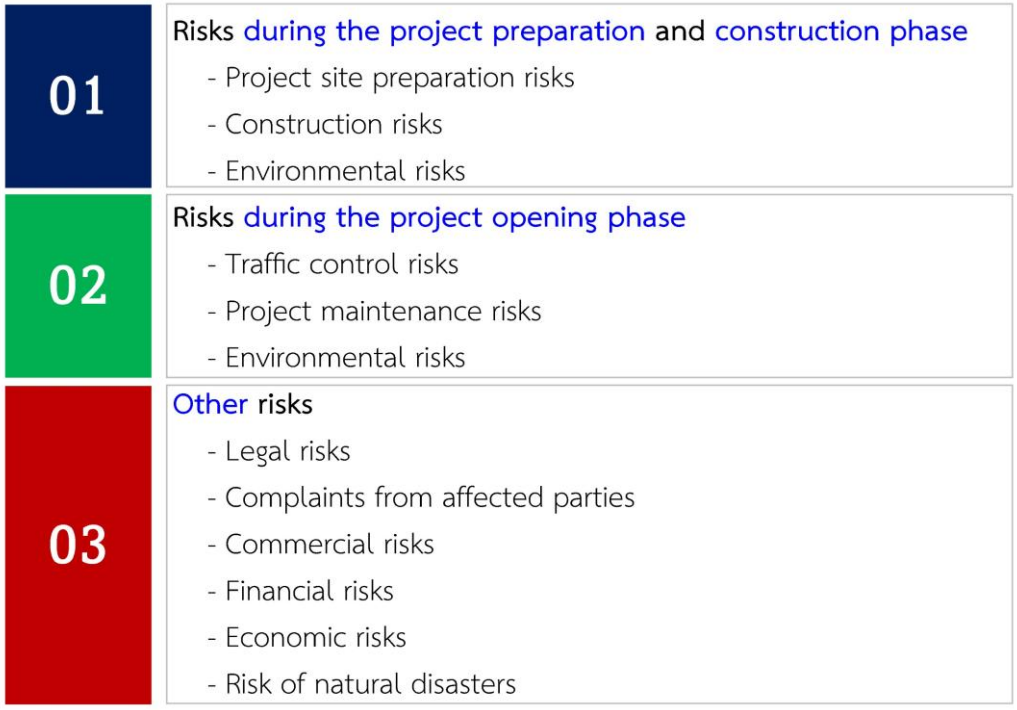


Figure 9-16 Risk identification

2) Guidelines for risk management

In managing each type of risk, there are strategies used to manage risk, including risk avoidance, risk control, risk transfer, and risk acceptance. From the risk assessment, it was found that there were 10 risks with high-risk scores, details as shown in **Table 9-5.**

Table 9-5 Risk Management

Risk Issues	Risk Level	Risk Management Guidelines	Risk level after management
Risks occurring during pre-construction and construction phases of the project			
Environmental risks			
Air quality pollution	5x2=10 high	**Risk bearers:** Public/Private Sector **Risk control** By strictly adhering to measures to prevent and mitigate air quality impacts, such as: Arrange personnel to spray water, covering piles of construction materials, opening the construction area in stages, completely covering the backs of construction material trucks, controlling weight and speed of the trucks, and clean road surface in the construction area once a day at night.	3x1=3 low
Noise and vibration	5x2=10 high	**Risk bearers:** Public/Private Sector **Risk control** By installing sound barrier walls, using bored piles, constructing only during the day (8:00 AM - 5:00 PM), inspecting and maintaining machinery and vehicles once a week, using rubber flooring under steel plates for temporary roads, and controlling weight and speed of trucks not to exceed the law and 30 km/hr.	4x1=4Medium

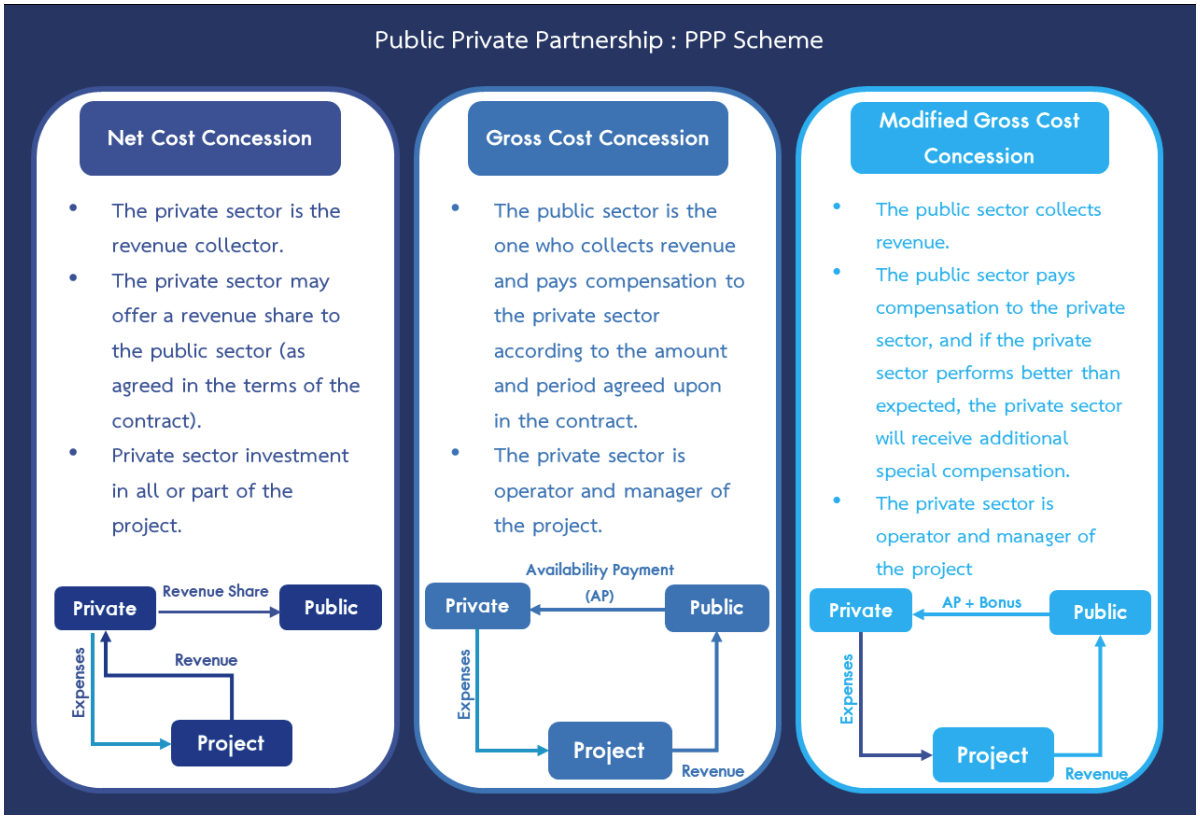
Table 9-5 Risk Management (Continued)

Risk Issues	Risk Level	Risk Management Guidelines	Post-management risk level
Wastewater or garbage	5x2=10 high	**Risk bearers:** Public/Private Sector **Risk Control** by providing sufficient toilets and installing a wastewater treatment system, as well as providing sufficient waste containers and contacting local agencies to properly dispose of waste.	3x1=3 low
Risks that arise during operation			
Project Maintenance Risks			
Electrical System Work	5x3=15 high	**Risk bearer,** private sectors **Risk control** Designed with a backup generator to supply necessary equipment.	2x2= 4Medium
Parts/Equipment Exchange Rates	3x4=12 high	**Risk bearer,** private sectors **Risk control and risk transfer** By making forward contracts and adjusting financial plans and management to be consistent with the project's financial status.	1x1= 1 Low
Material/Equipment Price Changes	3x4=12 high	**Risk bearer,** private sectors **Risk Control** by setting effective project cost management policies that are consistent with project conditions, and regularly updating and reviewing cost management plans to ensure they are consistent with the environment.	2x3= 6Medium
Environmental risks			
air pollution	5x2=10 high	**Risk bearers:** Public/Private Sector **Control risks** By organizing traffic flow to be smooth by installing traffic signals and various signs and specifying types and speeds of vehicles.	3x2=6 Medium
Noise and vibration	5x2=10 high	**Risk bearers:** Public/Private Sector **Risk Control** By organizing traffic flow to be smooth by installing traffic signals and various signs and specifying types and speeds of vehicles.	3x1=3Low
Wastewater or garbage	5x2=10 high	**Risk bearers:** Public/Private Sector **Risk Control** by providing ready-made toilets and wastewater treatment systems, providing sufficient waste containers, and contacting local agencies to properly dispose of waste.	3x1= 3Low
Other risks			
Commercial Risk			
Risk of lower than-expected expressway user volume	4x3=12 high	**Risk bearer:** In the case of PPP Net cost, the private sector bears the risk. In the case of PPP Gross cost, the public sector bears the risk. **Risk control** By considering appropriate investment formats, such as private sector co-investment, where private sector accepts income risks.	3x2=6 Medium

9.8 Options and models of Public Private Partnership investment

9.8.1 Public Private Partnership: PPP Scheme

The project's operational guidelines and investment formats.



9.8.2 The scope and responsibilities between the public and private sectors.

The scope of public-private partnership is divided into 4 main categories: land acquisition, civil works, system installation, and project operation and maintenance.

Scope of Responsibility	PPP Net Cost		PPP Gross Cost		PPP Modified Gross Cost	
	Public	Private	Public	Private	Public	Private
Land acquisition	☑		☑		☑	
Civil Works	☑		☑		☑	
System Installation		☑		☑		☑
Operation and Maintenance work		☑		☑		☑
Revenue	☑		☑		☑	

9.9 Feasibility of Relevant Government Agencies in Project Development and Implementation

	In terms of readiness to integrate transportation networks, the government, under the Ministry of Transport, has a policy that requires all agencies to based on principles of integration, participation, and public awareness through communication efforts. This policy aims to foster collaboration in the development of highway projects, rural roads, and expressway project. The approach includes building inter-agency cooperation in planning, studying, and designing projects, while also promoting innovation and investment in highways, rural roads, and expressways. Additionally, there is a focus on managing the integration of road networks and traffic data to analyze and resolve traffic issues within the national road transportation network, with the goal of maximizing efficiency.
EXAT Expressway Authority of Thailand	Currently, the Expressway Authority of Thailand (EXAT) is responsible for addressing traffic issues and improving systems to meet the needs of expressway users. These efforts have consistently supported and enhanced the development of the country's transportation sector. EXAT currently operates 8 expressway routes, with 4 connecting routes, covering a total distance of 224.6 kilometers. The organization has undergone structural improvements to adapt to change and strengthen its operations, aiming to achieve its goal of becoming an “innovation of better drive and better life” organization. EXAT is also focused on becoming a leader in the transportation business with Smart Expressways, elevating management practices and improving services for the public effectively. Although EXAT is ready to implement the Phuket Expressway project, the investment will be a long-term financial commitment for the government. Therefore, involving the private sector in the project is another option that will help ensure the project is successfully executed with the highest efficiency and effectiveness.

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