Office of Transport and Traffic Policy and Planning

The development of an Intelligent Transportation System (ITS) to enhance the efficiency of traffic and transportation management in the areas of Chachoengsao, Chonburi and Rayong, Bangkok

Executive Summary Report

Proposed by

TKN Engineering and Technology Co., Ltd.

King Mongkut's Institute of Technology Ladkrabang

Integrated Engineering Consultants Co., Ltd.

January 2025

PREFACE

Currently, goods are transported from various regions of the country to destinations in the Chachoengsao, Chonburi, and Rayong provinces, or to the Eastern Economic Corridor (EEC) area, for shipment via the Laem Chabang Port, Map Ta Phut Port, and U-Tapao Airport to other regions. In the Chachoengsao, Chonburi, and Rayong provinces, various agencies have been working on the development of transportation and traffic technology systems, such as the use of Closed-Circuit Television (CCTV) and Global Positioning System (GPS), to gather data for analysis and planning of traffic management, such as traffic volume and travel speed. However, there is still a lack of an integrated data linkage system for comprehensive traffic analysis and management. Therefore, in order to support the movement of people and goods, as well as to provide traffic-related information in alignment with the master plan under the national strategy for infrastructure, logistics systems, and digital technologies, the management of logistics systems that utilize modern technologies is essential. This will support seamless, multi-modal transportation of goods, along with the development and integration of travel and transportation data systems across all modes, leading to efficient control and management of intelligent traffic systems at both local and national levels.

The Office of Transport and Traffic Policy and Planning (OTP) recognizes the need to improve the efficiency of traffic and transportation management in the Chachoengsao, Chonburi, and Rayong provinces. This will be achieved by planning and developing an Intelligent Transportation System (ITS) to define the framework for operations and the overall development of the ITS system. Additionally, efforts will focus on connecting and integrating data for analysis, processing, and presentation to support planning and decision-making for traffic and transportation management. This will facilitate the development of the ITS system in the Chachoengsao, Chonburi, and Rayong provinces. The project has been entrusted to the consultants, which include TKN Engineering and Technology Co., Ltd., King Mongkut's Institute of Technology Ladkrabang, and Integrated Engineering Consultant Co., Ltd., to conduct the project study.

The consultants sincerely hope that this report will be beneficial to the Ministry of Transport, as well as to relevant government agencies and private sector organizations. It is intended to be applied as a guideline for the development of an Intelligent Transport System (ITS) to enhance the efficiency of traffic and transportation management in the Chachoengsao, Chonburi, and Rayong provinces, ensuring its effective implementation moving forward.

Consultants
January 2025

ACKNOWLEDGEMENT

Throughout the course of this study, TKN Engineering and Technology Co., Ltd., King Mongkut's Institute of Technology Ladkrabang, and Integrated Engineering Consultant Co., Ltd. would like to express our sincere gratitude to the project acceptance committee for the consultancy project on "Development of an Intelligent Transport System (ITS) to Enhance the Efficiency of Traffic and Transportation Management in the Chachoengsao, Chonburi, and Rayong Provinces, Bangkok." We would also like to thank the experts, representatives from relevant agencies including the Ministry of Transport and other ministries, as well as private sector organizations, for their invaluable support and cooperation. Their assistance in providing detailed data, facilitating interviews, conducting field surveys, attending seminars, and offering various suggestions and feedback greatly contributed to the success of the project and the achievement of its objectives.

Finally, the consultants would like to express their sincere gratitude to the Office of Transport and Traffic Policy and Planning (OTP) for entrusting us with the study on the development of an Intelligent Transport System (ITS) to enhance the efficiency of traffic and transportation management in the Chachoengsao, Chonburi, and Rayong provinces, Bangkok.

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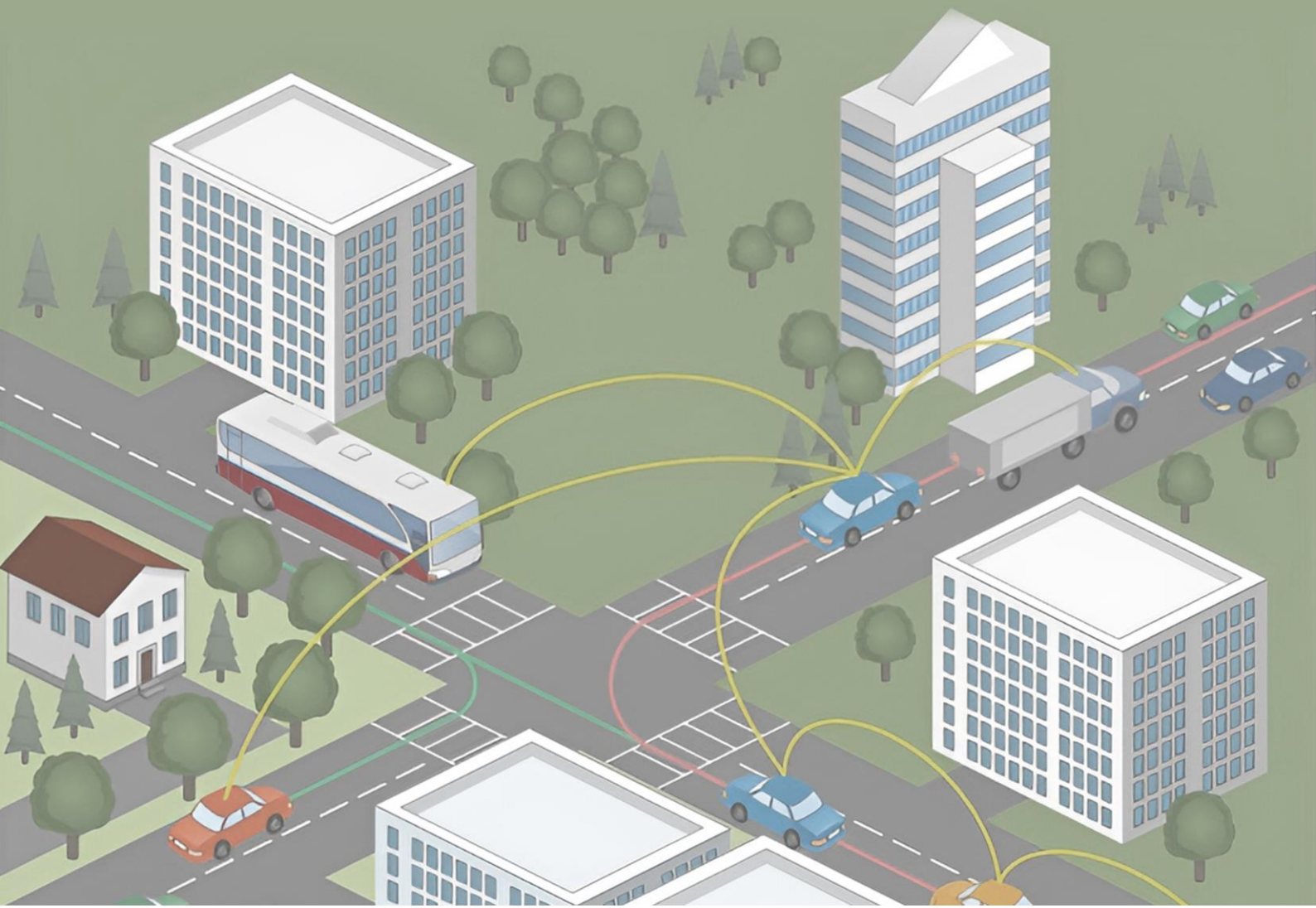
Chapter 1

Introduction



Chapter 1

Introduction

1.1 Background

1.1.1 **Master Plan under the National Strategy on Infrastructure, Logistics and Digital Systems**, This master plan prioritizes the integration of various transportation modes and the management of logistics systems through modern technology. The goal is to support seamless multimodal freight transport and maintain logistics costs at a nationally competitive level. It also emphasizes the development and integration of comprehensive databases for travel and transportation across all forms purpose to leading to intelligent traffic control and management at both local and national levels. Also, **The National Digital Economy and Society Development Plan (2018–2037)** defines the vision of "Transforming Thailand into a Digital Thailand." that focuses on leveraging digital technologies to their fullest potential for the development of infrastructure, innovation, data, human capital and other resources that driving the country's economic and social development toward stability, prosperity, and sustainability. **The Eastern Economic Corridor (EEC) Development Master Plan (2017–2022)** outlines key development strategies for the EEC. These include advancing infrastructure and utility systems, particularly by integrating seamless multimodal transport systems (road, rail, water, and air), along with relevant logistics systems. This connectivity aims to link the EEC's major economic zones and enhance its competitiveness. Moreover, **the plan incorporates the development of smart cities** to foster high-quality urban living environments. These smart cities will promote innovation to improve residents' quality of life, ensuring convenience, safety, a high-quality society and environmental sustainability.

1.1.2 The Road Traffic Management Committee (during 1/2019 meeting on 3 January 2019) reviewed the Study results of the Master Plan for Intelligent Transport System (ITS) in Bangkok and surrounding areas. The plan includes a nationwide ITS development master plan as well as a regional 10-year ITS development plan (2018–2027) for Bangkok and metropolitan areas. The vision of the plan is to position Thailand as a "Smart Transportation" to meet the public needs by enabling convenient and efficient travel from both traveler planning and state management. Also, The plan aims to enhance travel safety, promote efficient freight transport and reduce transport-related pollution. Lastly, the committee approved the ITS master plan and tasked the Ministry of Transport with implementing it. and The Ministry acknowledged the meeting’s resolutions on 22 January 2019.

1.1.3 Currently, There are many significant volume of goods is transported from various regions across the country to destinations in Chachoengsao, Chonburi and Rayong provinces, these province known as the Eastern Economic Corridor (EEC) that be a major the country's key trade gateway which Goods are exported through to key facilities such as Laem Chabang Port, Map Ta Phut Port and U-Tapao Airport to various regions. In the area of Chachoengsao, Chonburi, and Rayong provinces, The relevant agencies have implemented transportation and traffic technologies, such as Close Circuit Television (CCTV) systems and Global Positioning System (GPS) technology. Data derived from these systems can be utilized for traffic management planning such as traffic volume and travel speeds. However, there remains a lack of integrated data linkage systems for comprehensive traffic analysis and management to support passenger and freight transportation. Also, there is a need to improve traffic information dissemination for better travel planning. Based on the government's policies and strategies at various levels, combined with the implementation of the ITS Master Plan's Office of Transport and Traffic Policy and Planning (OTP) are leaded to recognizes the necessity of enhancing traffic and transport management efficiency in the Chachoengsao, Chonburi, and Rayong provinces. By planning and developing the Intelligent Transport System (ITS) to establish a comprehensive framework for ITS operations and development. Also, includes creating integrated and connected data systems for analysis, processing and visualization. for the purpose to gathering data that will be serve as critical inputs for planning and managing traffic and transportation. Also, development of the ITS in the Chachoengsao, Chonburi, and Rayong provinces.

1.2 Objectives of the Study

1.2.1 Develop a plan for the implementation of an Intelligent Transportation System (ITS) to manage traffic with in the areas of Chachoengsao, Chonburi, and Rayong provinces.

1.1.2 Establish a centralized database and traffic management system to analyze, process and present data for traffic management purposes.

1.3 Scope of the Study

The summarized of overall scope of the study, guidelines and procedural steps for the project as illustrated in **Figure 1.3-1**

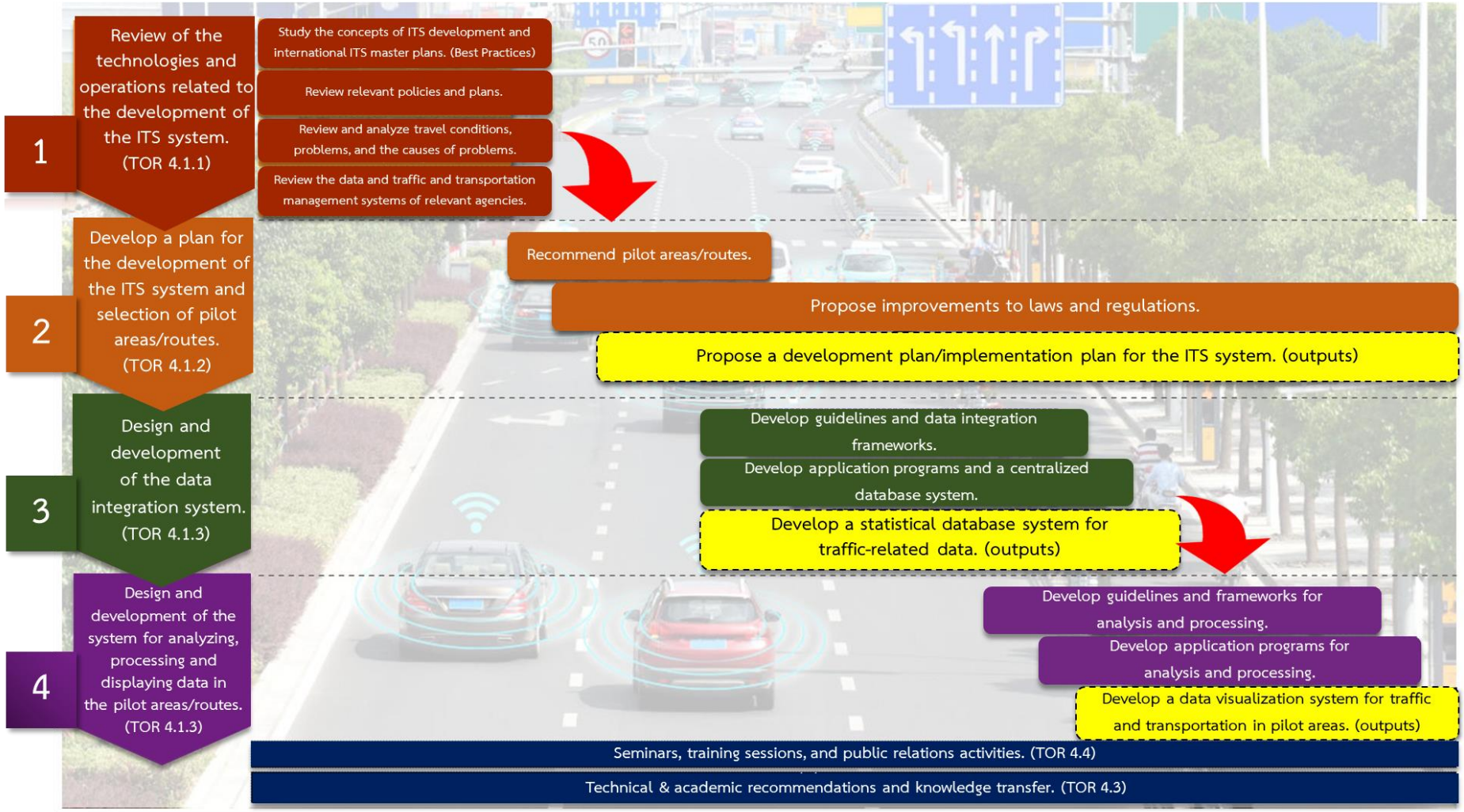
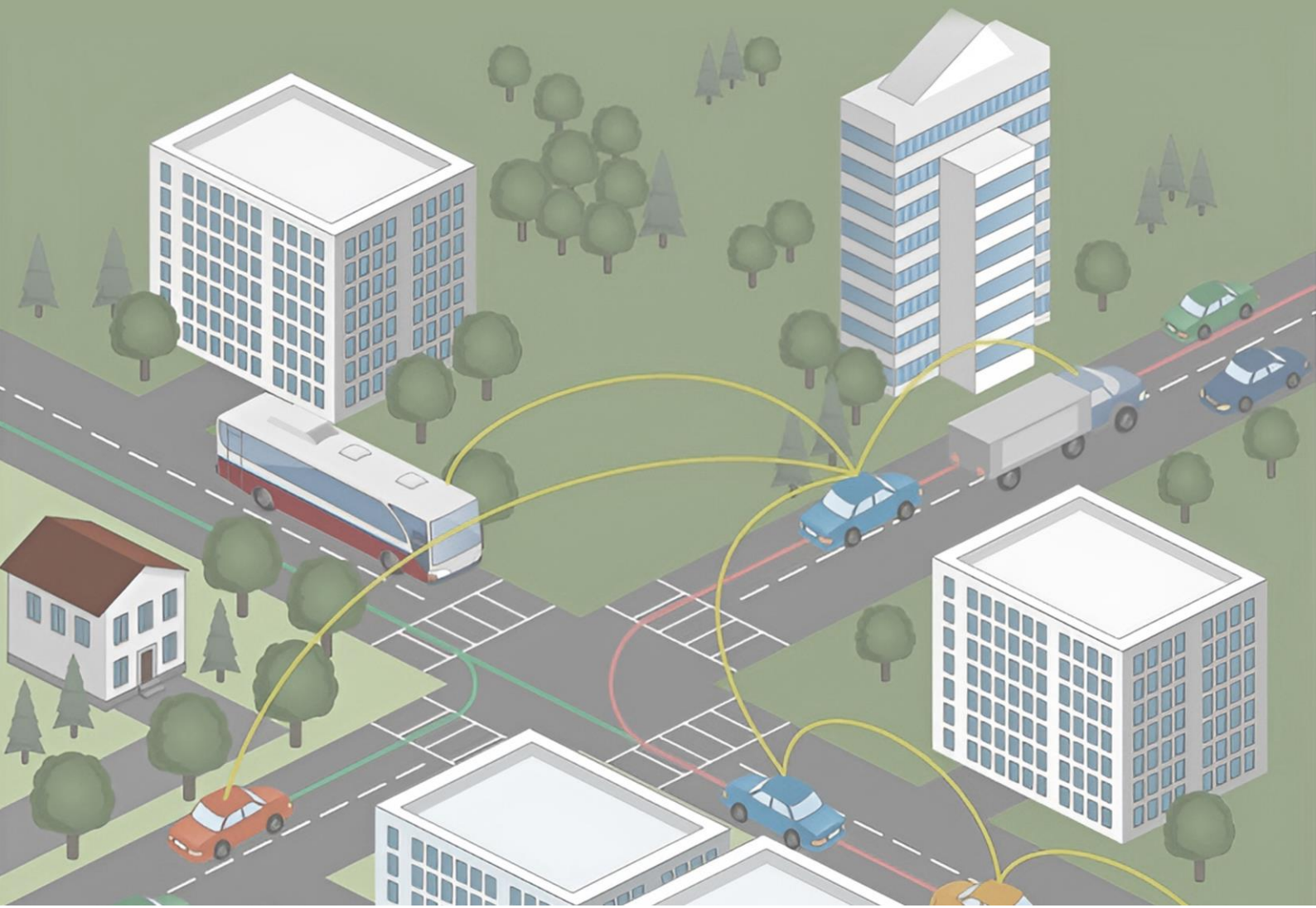


Figure 1.3-1 Guidelines and Procedural Steps for the Project Study.

Chapter 2

Study and review technologies and operations related to the development of ITS systems and advancements within the areas of Chachoengsao, Chonburi, and Rayong provinces



Chapter 2
Study and review technologies and operations related to the development of ITS systems and advancements within the areas of Chachoengsao, Chonburi, and Rayong provinces

2.1 Study concepts and theories related to the development of ITS systems and the ITS master plan focusing on best practices from international case studies.

The study reviewed the concept of developing ITS (Intelligent Transport Systems) and ITS master plans based on best practices from countries such as Singapore, Seoul (Republic of Korea), the Hong Kong Special Administrative Region (People's Republic of China), the Shenzhen Special Economic Zone (People's Republic of China), Texas (United States), the United Kingdom, and Western Australia (Australia). These were studied for lessons learned and to assess the suitability of ITS systems for the study area's context and environment. The review found that internationally, various ITS components have been developed, including traffic monitoring devices, automatic traffic signal control systems, communication of travel information to travelers via Variable Message Signs (VMS), intelligent public transportation systems, smart freight management systems, traffic and transport management centers, and recent advancements toward autonomous vehicles. The ultimate goal across all these efforts is to improve the efficiency, effectiveness, convenience, safety, and environmental friendliness of travel and transportation.

2.2 Study of Policies and Plans Related to Development in the Chachoengsao, Chonburi and Rayong Provinces.

2.2.1 Study of Relevant Policies, Strategies and Plans.

The policies, strategies and plans related to the study of the development of Intelligent Transport Systems (ITS) to enhance traffic and transportation management efficiency in the Chachoengsao, Chonburi and Rayong provinces are aligned across national/ ministry/department/provincial levels. These developments are interconnected in various parts including safety, automated transportation, support for technology development and transportation and logistics, as shown in **Figure 2.2.1-1.**

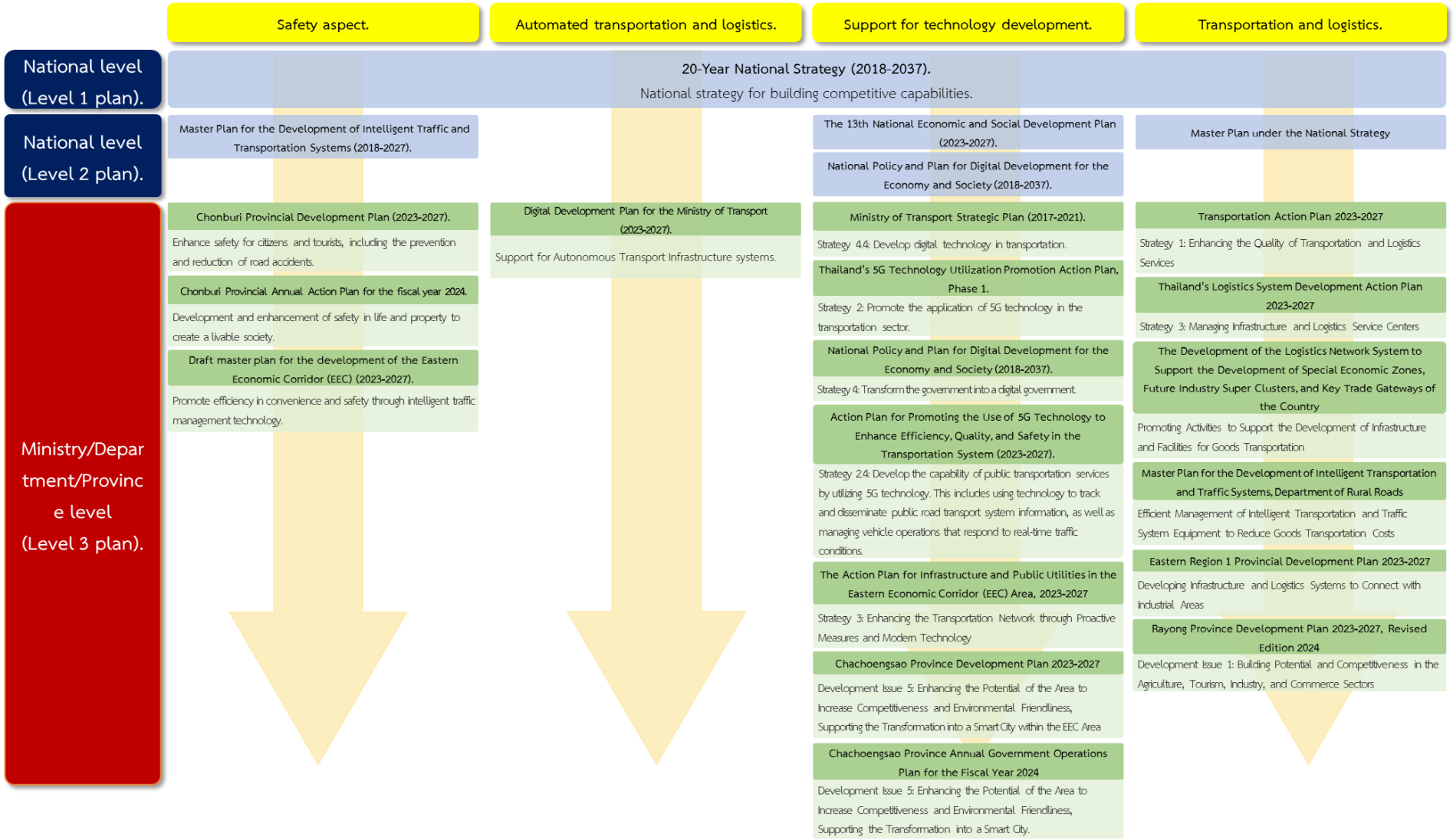


Figure 2.2.1-1 Summarizes the alignment and connection of key development plans related to the study project.

2.2.2 Study of Related Projects and Research.

The study of projects involved a review of reports on the outcomes of studies, projects and research conducted by various relevant agencies, to gather basic information, implementation approaches and study results to support the project study. The related projects and research such as:

- Project to Improve Traffic Signal Systems with ATC Systems, Pattaya, 2022
- Master Plan Study for Public Transportation Development in Chachoengsao, Chonburi and Rayong Provinces to Support Eastern Economic Corridor Development, OTP, 2020
- Research Document: "Strategic Development of Intelligent Travel and Transport for Tourism in the Eastern Economic Corridor", The Faculty of Environmental Development Administration, National Institute of Development Administration, 2019
- Proposal for Smart City Development Plan: "Chachoengsao - A City to Live, Visit and Invest", The Smart City Office of Chachoengsao, 2021
- Proposal for Smart City Development Plan: "Saen Suk Smart City", Saen Suk Municipality, 2021
- Ban Chang Model: 5G Smart City Prototype Project, Eastern Economic Corridor Office of Thailand, National Telecom Public Company Limited, Rayong Provincial Administrative Organization, 2021
- Study for Master Plan Development of Intelligent Traffic and Transportation System in the Bangkok and perimeter areas, OTP, 2019
- Intelligent Transport System (ITS) Center Phase 4 , Expressway Authority of Thailand, 2018-2020
- High-Speed Rail Connecting Three Airports Project, State Railway of Thailand, 2018
- Study on Comprehensive Traffic Solutions on Major Roads in Bangkok and perimeter areas (Main road traffic relief plan in Bangkok), OTP, 2024

2.3 Review of Data and Technology Systems for Traffic and Transportation Management by Relevant Agencies in the Country.

Thailand has implemented intelligent traffic and transportation management technologies, which can be categorized into 6 section: 1) Traffic Management, 2) Travel Information Provision, 3) Automated Fare Collection or Toll Payment Systems, 4) Vehicle Safety and Emergency Management, 5) Freight Transport Management and 6) Public Transport Management

A summary of these is shown in **Figure 2.3-1.** And Both government and private agencies have applied these technologies in various aspects, as summarized in **Figure 2.3-2.**

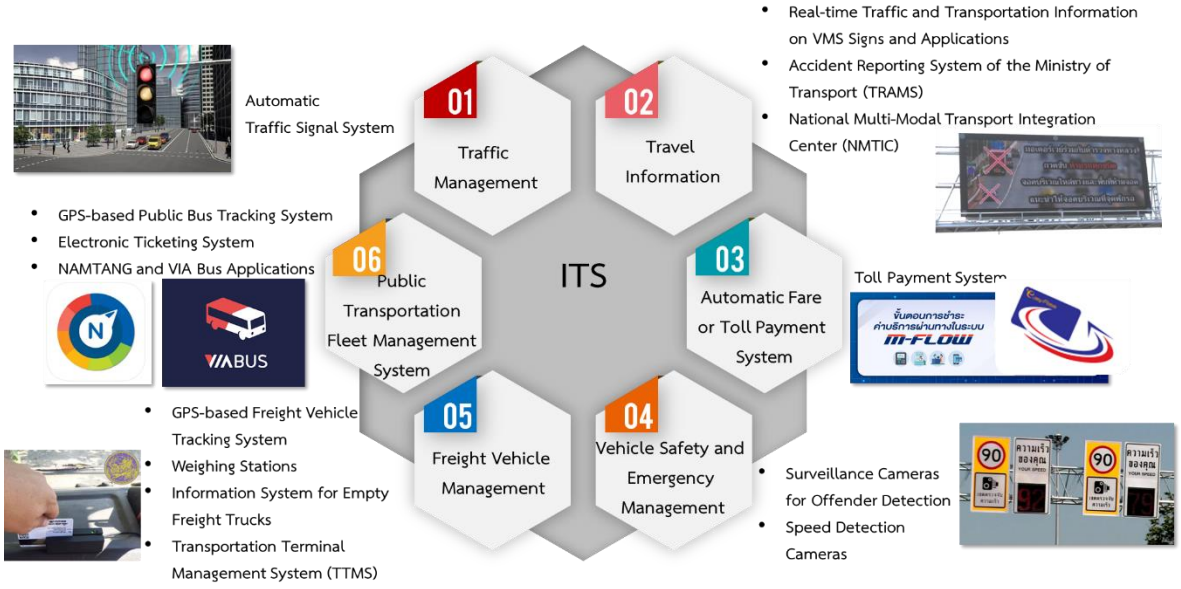


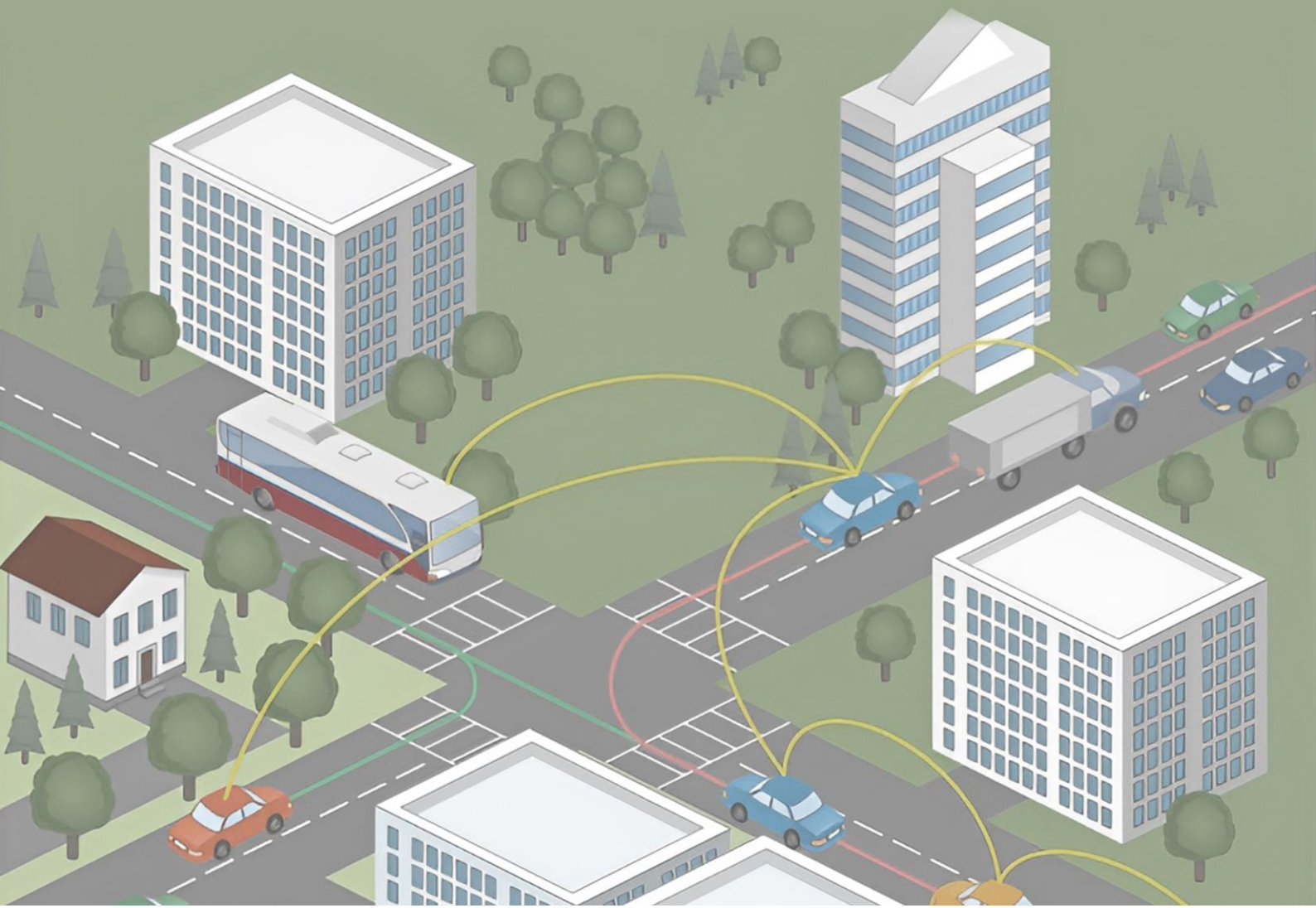
Figure 2.3-1 Use of Intelligent Traffic and Transportation Management Systems in Thailand

Development of ITS	MOT	OTP	DOH	DRR	EXAT	DLT	PP 2	Pattaya	TTD	iTIC	Longdo	Google
1) Automatic Traffic Signal Control System.			☑					☑	☑			
2) Traffic condition data. (CCTV)		☑	☑	☑	☑		☑	☑	☑	☑	☑	☑
3) Freight transportation route management.						☑					☑	☑
4) Public transportation travel.	☑	☑				☑			☑		☑	☑
5) Incident notification system.	☑		☑	☑	☑			☑	☑	☑	☑	
6) Automatic fare or toll payment system.			☑		☑							

Figure 2.3-2 Use of Intelligent Traffic and Transportation Management Systems by Each Agencies

Chapter 3

Development Plan for the ITS System for Traffic Management in Chachoengsao, Chonburi and Rayong Provinces, Including the Selection of Pilot Areas/Routes



Chapter 3
Development Plan for the ITS System for Traffic Management in Chachoengsao, Chonburi and Rayong Provinces, Including the Selection of Pilot Areas/Routes

3.1 Master Plan for the Development of the Intelligent Transport System (ITS) in Chachoengsao, Chonburi, and Rayong Provinces

1) Vision

"To achieve efficient, convenient, safe and environmentally friendly travel and transport through an intelligent traffic and transport system, driving sustainable economic growth in the Eastern Economic Corridor (EEC)."

2) Objectives

To enhance the efficiency of traffic and transport systems in Chachoengsao, Chonburi and Rayong provinces by integrating intelligent technologies with infrastructure and vehicles through projects and activities undertaken by relevant organizations.

3) Goals and Key Performance Indicators (KPIs)

As per the Cabinet resolution on January 22, 2019, acknowledging the results of the Land Traffic Management Committee (LTMC) Meeting No. 1/2562 held on January 3, 2019 which approved the Master Plan for the Development of the Intelligent Transport System (ITS) in Bangkok and its vicinity for the year 2019, this plan aligns with the objectives of the aforementioned master plan approved by the LTMC. Accordingly, the goals of the ITS Master Plan for Chachoengsao, Chonburi and Rayong provinces are defined as follows:

1. Goal 1: Development of ITS Data (Informative ITS)

To enhance traffic and transport data collection and integrate information across agencies to comprehensively cover the Eastern Economic Corridor (EEC), supporting future traffic and transport planning and management within the EEC.

<u>Key Performance Indicators (KPIs)</u>

- Increased number of data collection devices for traffic information on major roads.
- Increased number of agencies with integrated data-sharing connections.

2. Goal 2: Supporting the Application of ITS (Assistive ITS)

To promote the application of ITS to enhance convenience, safety, and environmental sustainability in travel and transport within the EEC area.

Key Performance Indicators (KPIs)

- Increased number of intersections with resolved traffic issues.
- Reduction in queue lengths at intersections equipped with intelligent traffic signal control systems.
- Improvement in average speed on major roads during peak hours.
- Decrease in the number of trucks exceeding legal speed limits.
- Reduction in the number of trucks entering restricted areas or parking during designated times.
- Availability of tools or applications for public transport planning within the EEC area.

3. Goal 3: Integrating Cooperation for ITS Management (Integrate ITS)

To establish agencies responsible for supporting the development of intelligent traffic and transport management systems in the EEC area and to set up an ITS management center within the EEC.

Key Performance Indicator (KPI):

- Establishment of an ITS management center in the EEC area.

4) Development Strategies

To drive the development of intelligent traffic and transport systems in the Chachoengsao, Chonburi and Rayong provinces and achieve the defined goals, five development strategies have been outlined, as follows:

1. **Development Strategy 1: Development and Integration of Traffic and Transport Data in the EEC Area,** includes 2 sub-strategies and 7 projects.
2. **Development Strategy 2: Intelligent Transport for Supporting Convenient and Fast Private Car Travel in the EEC Area,** includes 4 sub-strategies and 8 projects.
3. **Development Strategy 3: Intelligent Transport to Promote Public Transport Systems in the EEC Area,** includes 2 sub-strategy and 4 project.
4. **Development Strategy 4: Intelligent Transport for Freight Transport in the EEC Area,** includes 2 sub-strategies and 5 projects.

5. **Development Strategy 5: Development for ITS Management,** includes 1 sub-strategy and 2 projects.

5) Summary of the Master Plan for the Development of the Intelligent Transport System (ITS) in Chachoengsao, Chonburi and Rayong Provinces

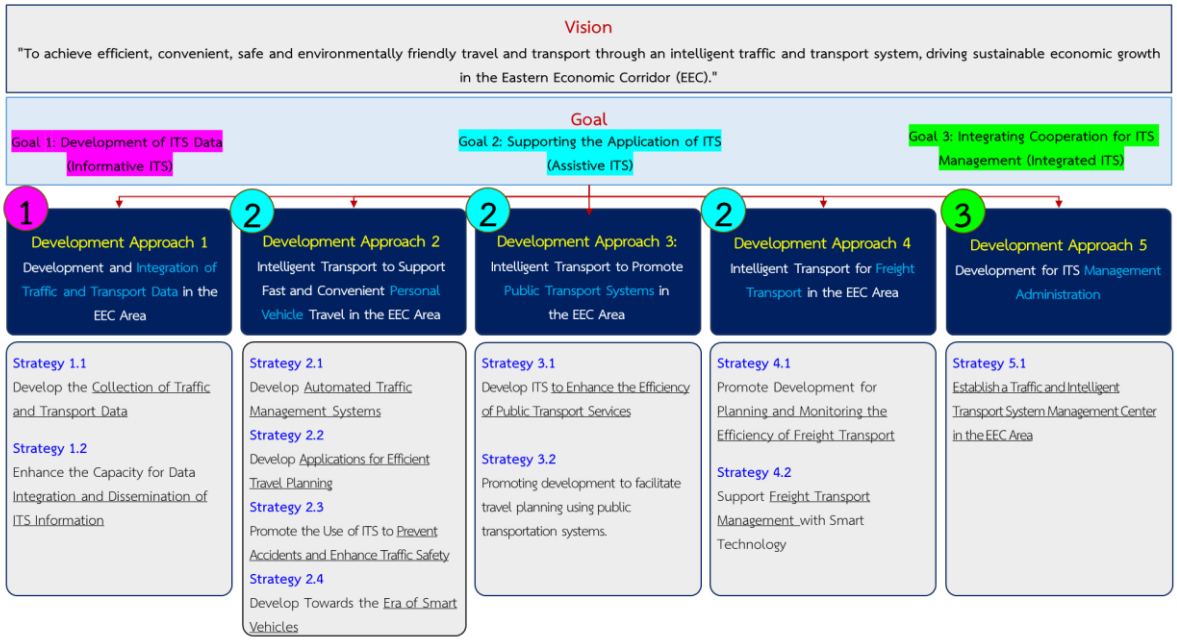


Figure 3.1-1 Overview of the ITS Development Strategic Plan in the EEC Area

3.2 ITS Development Action Plan

The ITS Development Action Plan will align with the ITS Development Plan for Traffic Management in Chachoengsao, Chonburi and Rayong provinces. It is divided into three phases: short-term (2026-2027), medium-term (2028-2032) and long-term (2033-2037), with a total of 20 projects. The plan demonstrates the linkage between the ITS Master Plan for the EEC area and the ITS Development Action Plan for the Chachoengsao, Chonburi and Rayong provinces, as shown in **Figure 3.2-1.** The details of the projects, responsible agencies, implementation years, and budget frameworks are presented in **Table 3.2-1.**

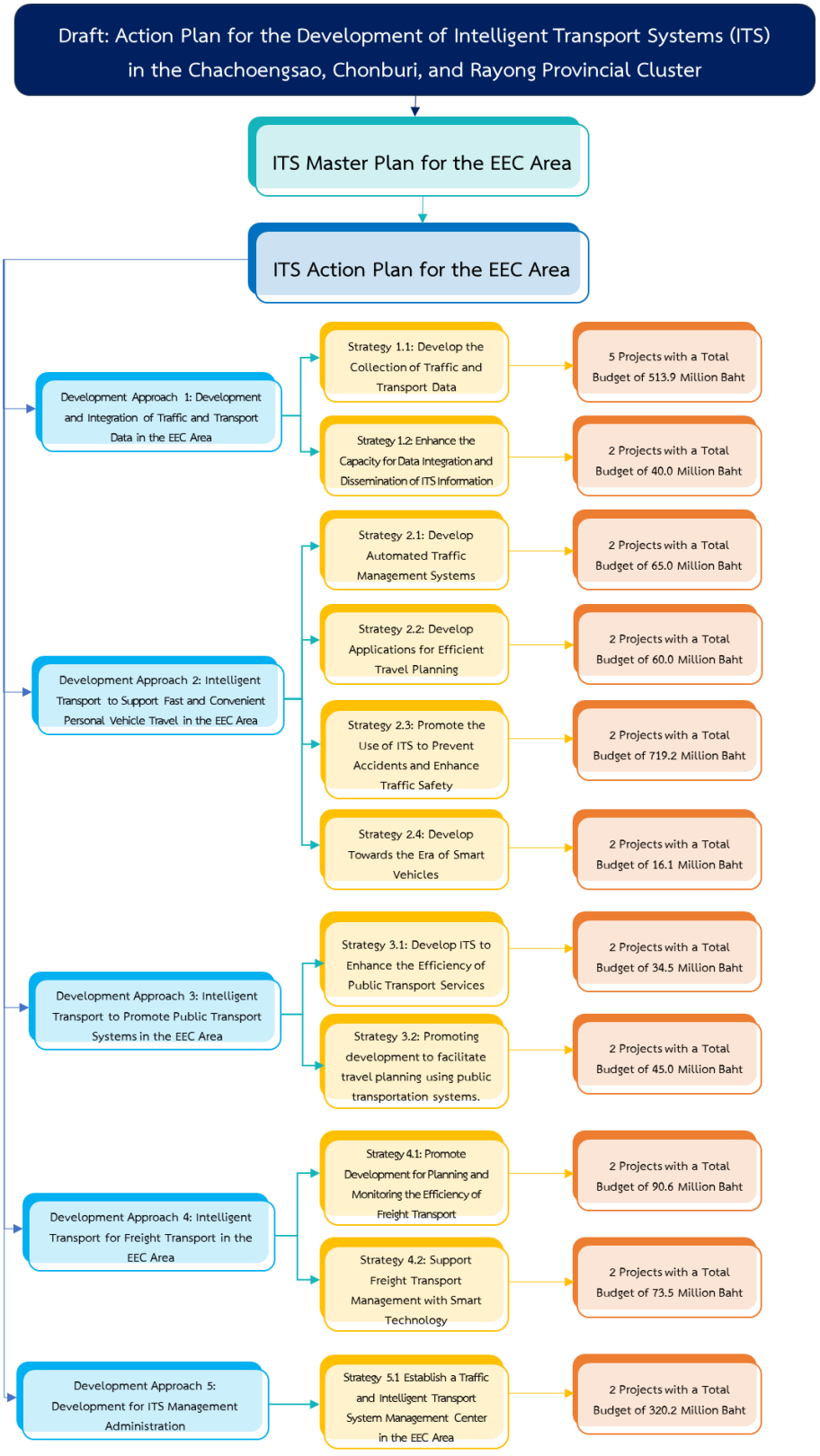


Figure 3.2-1 Linkage between the ITS Development Plan for Traffic Management in Chachoengsao, Chonburi and Rayong Provinces and the ITS Development Action Plan for the Chachoengsao, Chonburi and Rayong Provinces.

Table 3.2-1 Summary of Project Details under the ITS Development Action Plan in the EEC Area

Project Plan for the Development of ITS in the EEC Area	Budget (Million Baht)	Main Responsible Agency	Supporting Agencies	Project Source	Implementation Year												
					Short-Term			Medium-Term					Long-Term				
					68	69	70	71	72	73	74	75	76	77	78	79	80
Development Approach 1: Development and Integration of Traffic and Transport Data in the EEC Area																	
Strategy 1.1: Develop the Collection of Traffic and Transport Data																	
1.1.1 Project for the Improvement and Enhancement of the Efficiency of the Closed-Circuit Television (CCTV) System in Pattaya Urban Areas, Phase 1 Note: Implementation initiated in the fiscal year 2024 with a budget of 2,800,000 THB.	11.2	The City of Pattaya	-	The City of Pattaya	11.2												
1.1.2 Project for the Improvement and Enhancement of the Efficiency of the Closed-Circuit Television (CCTV) System in Pattaya Urban Areas, Phase 2	12.0	The City of Pattaya	-	The City of Pattaya	2.4	9.6											
1.1.3 Project for Replacing Cameras in the Pattaya Beach Area	6.2	The City of Pattaya	-	The City of Pattaya	1.2	5.0											

Table 3.2-1 Summary of Project Details under the ITS Development Action Plan in the EEC Area (continue)

Project Plan for the Development of ITS in the EEC Area	Budget (Million Baht)	Main Responsible Agency	Supporting Agencies	Project Source	Implementation Year												
					Short-Term			Medium-Term					Long-Term				
					68	69	70	71	72	73	74	75	76	77	78	79	80
1.1.4 Development Project for the Support System and Information Services of the Railway Network and Routes of the State Railway of Thailand (SRT) (This project is related to the EEC area.)	469.0	SRT	-	SRT		469.0											
1.1.5 Project for Installing Traffic Counting Devices on Main Routes in the EEC Area	15.5	DOH	-	Consultant				3.1	12.4								
Strategy 1.2: Enhance the Capacity for Data Integration and Dissemination of ITS Information																	
1.2.1 Project for Developing Methods to Connect and Store Data for the Intelligent Transport System (ITS)	20.0	OTP	-	Consultant			20.0										
1.2.2 Project for Studying and Developing a System for Connecting and Integrating Data of Public and Private Sector Organizations	20.0	OTP	-	Consultant			20.0										

Table 3.2-1 Summary of Project Details under the ITS Development Action Plan in the EEC Area (continue)

Project Plan for the Development of ITS in the EEC Area	Budget (Million Baht)	Main Responsible Agency	Supporting Agencies	Project Source	Implementation Year												
					Short-Term			Medium-Term					Long-Term				
					68	69	70	71	72	73	74	75	76	77	78	79	80
Development Approach 2: Intelligent Transport to Support Fast and Convenient Personal Vehicle Travel in the EEC Area																	
Strategy 2.1: Develop Automated Traffic Management Systems																	
2.1.1 Project for the Automatic Traffic Signal System Implementation Start Budget for Fiscal Year 2024: 25,000,000 THB Budget for Fiscal Year 2025: 25,000,000 THB	25.0	DRR	-	DRR	25.0												
2.1.2 Project for Installing Smart Traffic Signals in the EEC Area	40.0	DOH	-	Consultant				8.0	16.0	16.0							
Strategy 2.2: Develop Applications for Efficient Travel Planning																	
2.2.1 Project for Improving the Duration of Traffic Signal Phases and Signal Systems	-	PPR2	-	Consultant	-	-	-	-	-	-	-	-	-	-	-	-	-
2.2.2 Project for Installing Intelligent Traffic Signs (Variable Message Signs, VMS)	60.0	DOH	-	Consultant									12.0	24.0	24.0		

Table 3.2-1 Summary of Project Details under the ITS Development Action Plan in the EEC Area (continue)

Project Plan for the Development of ITS in the EEC Area	Budget (Million Baht)	Main Responsible Agency	Supporting Agencies	Project Source	Implementation Year												
					Short-Term			Medium-Term					Long-Term				
					68	69	70	71	72	73	74	75	76	77	78	79	80
Strategy 2.3: Promote the Use of ITS to Prevent Accidents and Enhance Traffic Safety																	
2.3.1 Development of an Intelligent Transport System to Support the Operations of the Highway Traffic and Accident Management Center (HTOC) Department of Highways (This project is related to the EEC area) Implementation Start Budget for Fiscal Year 2025: 120,000,000 THB	670.0	DOH	-	DOH	170.0	370.0	130.0										
2.3.2 Project for Enhancing the Efficiency of the Base Map System for Road Safety (This project is related to the EEC area)	49.2	DLT	-	DLT		49.2											

Table 3.2-1 Summary of Project Details under the ITS Development Action Plan in the EEC Area (continue)

Project Plan for the Development of ITS in the EEC Area	Budget (Million Baht)	Main Responsible Agency	Supporting Agencies	Project Source	Implementation Year												
					Short-Term			Medium-Term					Long-Term				
					68	69	70	71	72	73	74	75	76	77	78	79	80
Strategy 2.4: Develop Towards the Era of Smart Vehicles																	
2.4.1 Project for Studying and Developing a Strategic Roadmap for the Regulation and Supervision of Connected and Autonomous Vehicles and Related Systems for Road Safety (This project is related to the EEC area) Implementation Start Budget for Fiscal Year 2025: 3,530,000 THB Note: The study is scheduled to be completed in December 2025.	1.1	DLT	DLT	DLT	1.1												
2.4.2 Project for Studying and Developing Guidelines for Infrastructure Development to Support Autonomous Vehicles (CAVs)	15.0	OTP	-	Consultant			15.0										

Table 3.2-1 Summary of Project Details under the ITS Development Action Plan in the EEC Area (continue)

Project Plan for the Development of ITS in the EEC Area	Budget (Million Baht)	Main Responsible Agency	Supporting Agencies	Project Source	Implementation Year												
					Short-Term			Medium-Term					Long-Term				
					68	69	70	71	72	73	74	75	76	77	78	79	80
Development Approach 3: Intelligent Transport to Promote Public Transport Systems in the EEC Area																	
Strategy 3.1: Develop ITS to Enhance the Efficiency of Public Transport Services																	
3.1.1 Project for Studying and Preparing for the Operation of Autonomous Public Transport	30.0	DLT	-	Consultant				6.0	24.0								
3.1.2 Project for Developing and Enhancing the "Nam Tang" Navigation Application to Cover the EEC Area	4.5	OTP	-	Consultant			4.5										
Strategy 3.2: Promoting development to facilitate travel planning using public transportation systems.																	
3.2.1 Project for Feasibility Study on the Development of a Public Transport Tracking System	15.0	The City of Pattaya	-	Consultant			15.0										
3.2.2 Project for Installing a Public Transport Tracking System and Developing Smart Bus Stops	30.0	The City of Pattaya	-	Consultant				6.0	24.0								

Table 3.2-1 Summary of Project Details under the ITS Development Action Plan in the EEC Area (continue)

Project Plan for the Development of ITS in the EEC Area	Budget (Million Baht)	Main Responsible Agency	Supporting Agencies	Project Source	Implementation Year												
					Short-Term			Medium-Term					Long-Term				
					68	69	70	71	72	73	74	75	76	77	78	79	80
Development Approach 4: Intelligent Transport for Freight Transport in the EEC Area																	
Strategy 4.1: Promote Development for Planning and Monitoring the Efficiency of Freight Transport																	
4.1.1 Project for Developing an Information Technology System for Road Freight Management to Support and Enhance the Standards of Road Freight Operators in Thailand (This project is related to the EEC area) Implementation Start Budget for Fiscal Year 2025: 10,050,000 THB	56.9	DLT	-	DLT	27.9	29.0											
4.1.2 Project for an Automatic Violation Notification System for Transport Operators (This project is related to the EEC area) Implementation Start Budget for Fiscal Year 2025: 1,560,000 THB	3.7	DLT	-	DLT		3.7											

Table 3.2-1 Summary of Project Details under the ITS Development Action Plan in the EEC Area (continue)

Project Plan for the Development of ITS in the EEC Area	Budget (Million Baht)	Main Responsible Agency	Supporting Agencies	Project Source	Implementation Year												
					Short-Term			Medium-Term					Long-Term				
					68	69	70	71	72	73	74	75	76	77	78	79	80
4.1.3 Project for Studying to Enhance the Efficiency of Freight Transportation at Laem Chabang Port and Adjacent Areas	30.0	PAT	-	Consultant			30.0										
Strategy 4.2: Support Freight Transport Management with Smart Technology																	
4.2.1 Project for Developing a Control and Supervision System for Hazardous Road Freight Transportation (This project is related to the EEC area) Implementation Start Budget for Fiscal Year 2025: 4,500,000 THB	23.5	DLT	-	DLT	21.9	1.6											
4.2.2 Project for Establishing Standards for Linking and Integrating Freight Transport Data with Relevant Agencies to Define the Direction for Infrastructure Development Supporting the Logistics System and Intelligent Transport System of Thailand (This project is related to the EEC area) Budget Request Fiscal Year 2027	50.0	DLT	-	DLT			25.0	25.0									

Table 3.2-1 Summary of Project Details under the ITS Development Action Plan in the EEC Area (continue)

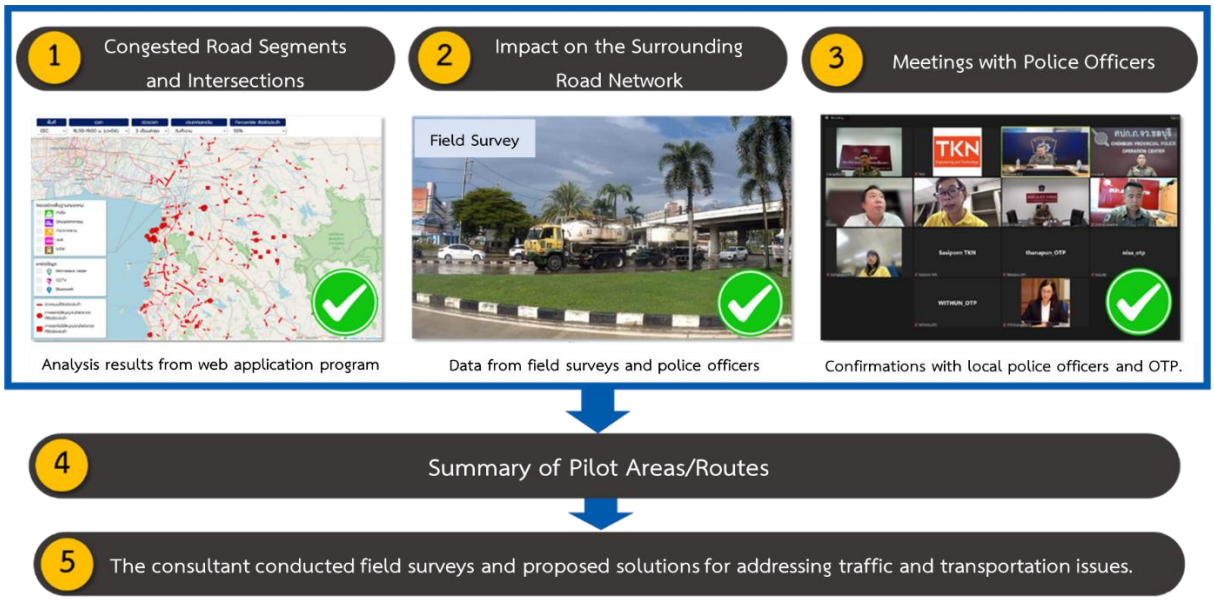
Project Plan for the Development of ITS in the EEC Area	Budget (Million Baht)	Main Responsible Agency	Supporting Agencies	Project Source	Implementation Year												
					Short-Term			Medium-Term					Long-Term				
					68	69	70	71	72	73	74	75	76	77	78	79	80
Development Approach 5: Development for ITS Management Administration																	
Strategy 5.1 Establish a Traffic and Intelligent Transport System Management Center in the EEC Area																	
5.1.1 Project for Studying the Development of Thailand's Transport Data Center (This project is related to the EEC area) Implementation Start Budget for Fiscal Year 2025: 5,034,400 THB	20.2	OTP	-	OTP	10.5	9.7											
5.1.2 Project for Establishing the EEC Intelligent Transportation System (EEC-ITS) Traffic and Transport Management Center in the EEC Area	300.0	LAOs or Designated Agencies	EEC or OTP	Consultant									60.0	60.0	60.0	60.0	60.0

DOH *Department of Highways*
DRR *Department of Rural Roads*
PAT *Port Authority of Thailand*
SRT *State Railway of Thailand*
The City of Pattaya *The City of Pattaya*
DLT *Department of Land Transport*
OTP *Office of Transport and Traffic Policy and Planning*
LAOs *Local Administrative Organizations*
PPR2 *Police Region 2*
Source: Consultants, 2024

To facilitate the development of intelligent traffic and transportation systems within the EEC area, it is essential to establish an Intelligent Traffic and Transportation Management Center. This center would serve as a hub for integrating and exchanging data, as well as applying the data for future traffic and transportation management within the EEC region.

3.3 Proposal for Suitable Pilot Areas/Routes

The proposal for suitable pilot areas/routes covers at least three areas/routes across three provinces. These areas/routes are selected based on their readiness and feasibility for implementation, such as traffic lane management, traffic signal management, and traffic management to improve freight transport efficiency. The suitable pilot areas/routes are chosen from areas/routes facing traffic and transport issues within the study area. The selection process involves using the application developed in the project to analyze and process data for frequently congested road sections/intersections, combined with on-site survey data and outcomes from discussions between the Office of Transport and Traffic Policy and Planning (OTP), the Provincial Police Region 2 and the police departments of Chachoengsao, Chonburi and Rayong provinces, along with the consultant. This collaboration led to a consensus on the appropriate pilot areas/routes, as shown in **Figure 3.3-1.**



Source: Consultants, 2024

Figure 3.3-1 Process for Selecting Suitable Pilot Areas/Routes

The pilot areas/routes were determined through discussions with the Office of Transport and Traffic Policy and Planning (OTP), the Provincial Police Bureau 2 , the Chachoengsao Provincial Police, the Chonburi Provincial Police and the Rayong Provincial Police, who serve as the traffic directors for the Chachoengsao, Chonburi, and Rayong provinces. These areas/routes are as follows:

- **Chachoengsao**

  The elevated intersection at 11 Infantry Regiment Intersection, the junction of Highway 315, Highway 304, and Highway 365.

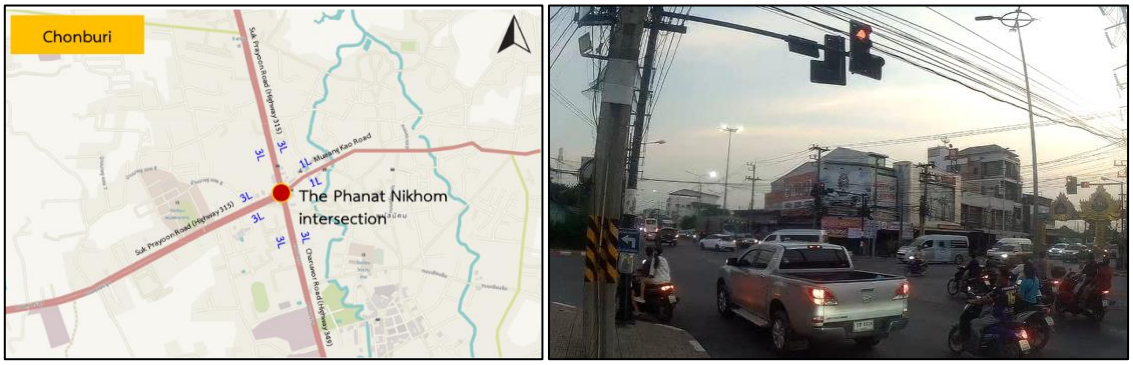
  This area experiences heavy traffic congestion during peak hours in the morning and evening. Therefore, this route is recommended as a pilot area/route for Chachoengsao Province.

Source: Consultants, 2024

Figure 3.3-2 Pilot Area/Route in Chachoengsao Province, The elevated intersection at 11 Infantry Regiment Intersection

- **Chonburi**

  1) **The Phanat Nikhom intersection, the junction of Highway 315 and Highway 349,** is an area with significant traffic congestion during both morning and evening rush hours. Therefore, this route is recommended as a pilot area/route for Chonburi Province



Source: Consultants, 2024

Figure 3.3-3 Pilot Area/Route in Chonburi Province, The Phanat Nikhom intersection

2) **Sukaprayoon Road (Highway 315), from the Don Hua Lo intersection to the On-Off Ramps of Motorway No. 7 intersection** These two areas are approximately 360 meters apart and experience significant traffic congestion during both morning and evening rush hours

Source: Consultants, 2024

Figure 3.3-4 Pilot Area/Route in Chonburi Province, Don Hua Lo intersection

Source: Consultants, 2024

Figure 3.3-5 Pilot Area/Route in Chonburi Province, On-Off Ramps of Motorway No. 7 intersection

- **Rayong**

  The Map Ta Phut intersection is a location currently experiencing significant traffic congestion. Therefore, the consultant is tasked with analyzing and recommending solutions to address the traffic issues.

Source: Consultants, 2024

Figure 3.3-6 Pilot Area/Route in Rayong Province, Map Ta Phut Intersection

3.3.1 Traffic Condition Analysis of Current Pilot Areas/Routes

The analysis of the traffic conditions in the current pilot areas/routes is based on traffic volume survey data during morning and evening rush hours. The analysis will focus on the Level of Service (LOS) for road segments, average delay at intersections, and queue length in each direction. These metrics will be used as indicators to compare the current traffic conditions with the proposed traffic improvement solutions. The criteria for assessing the service level of intersections are referenced from the "Highway Capacity Manual, 7th Edition, 2022."

- **Chachoengsao Province, The elevated intersection at 11 Infantry Regiment Intersection**

  The traffic conditions at the elevated intersection at 11 Infantry Regiment Intersection (Complex), which is controlled by traffic signals, are classified as Level of Service (LOS) F during both the morning and evening peak hours. Severe congestion is observed, with long vehicle queues extending from the intersection, particularly for traffic approaching from the southbound (SB) and eastbound (EB) directions. During the morning peak period, queue lengths of approximately 540 meters and 530 meters are recorded for southbound (SB) and eastbound (EB) traffic, respectively. In the evening peak period, the queue length for southbound (SB) traffic reaches approximately 820 meters

- **Chonburi Province, The Phanat Nikhom intersection**

  The traffic conditions at the Phanat Nikhom intersection, which is controlled by traffic signals, are classified as Level of Service (LOS) F during both the morning and evening peak hours. During the morning peak period, severe congestion is observed, with significant queue accumulation, particularly for traffic approaching from the eastbound (EB) direction, where the queue length reaches approximately 500 meters. In the evening peak period, congestion persists, with queue lengths of approximately 560 meters for eastbound (EB) traffic and 430 meters for northbound (NB) traffic.

- **Chonburi Province, The Don Hua Lo Intersection**

  The Don Hua Lo intersection and the On-Off Ramps of Motorway No. 7 serve as critical passageways for traffic entering and exiting the industrial estates in Chonburi Province. During the morning peak period, the Don Hua Lo intersection operates at Level of Service (LOS) F, experiencing severe congestion with long vehicle queues. Particularly, traffic approaching from the eastbound (EB) and westbound (WB) directions experiences queue lengths of approximately 500 meters and 300 meters. In the evening peak period, heavy traffic congestion persists, with significant queue accumulation. Traffic approaching from the eastbound (EB), westbound (WB) and southbound (SB) directions experiences queue lengths of approximately 400 meters, 300 meters and 280 meters, respectively.

- **Chonburi Province, On-Off Ramps of Motorway No. 7 intersection**

  The traffic conditions at the On-Off Ramps of Motorway No. 7 intersection during both the morning and evening peak hours are classified as Level of Service (LOS) E. During the morning peak period, significant queue accumulation is observed, particularly for traffic approaching from the eastbound (EB) direction, with a queue length of approximately 180 meters. In the evening peak period, congestion persists, with traffic approaching from both the eastbound (EB) and westbound (WB) directions, resulting in queue lengths of approximately 160 meters and 220 meters, respectively.

- **Rayong Province, The Map Ta Phut intersection**

  The traffic conditions at the Map Ta Phut intersection, which is controlled by traffic signals, are classified as Level of Service (LOS) F during both the morning and evening peak hours. During the morning peak period, traffic approaching from the westbound (WB) direction experiences a queue length of approximately 340 meters. In the evening peak period, congestion persists, with queue lengths of approximately 400 meters for eastbound (EB) traffic and 190 meters for northbound (NB) traffic.

3.3.2 Recommendations and Results of Comparative Traffic Condition Analysis: Current Scenario vs. Traffic Management Scenario.

Summary of traffic management recommendations for each pilot area is presented in **Table 3.3.2-1**. The results of the comparative analysis between the current traffic conditions and the conditions with traffic management implemented, using a traffic simulation model, are subsequently illustrated.

Table 3.3.2-1 Traffic Management Recommendations for Each Pilot Area

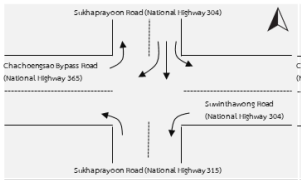
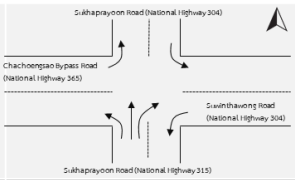
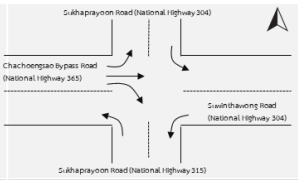
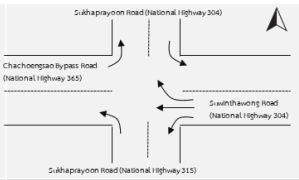
No.	Intersection	Recommendations for Traffic Management
1	The elevated intersection at 11 Infantry Regiment Intersection, Chachoengsao Province	• Adjust the traffic signal cycle length and green light duration to correspond with traffic volume. • Prohibit parking along the roadside during the morning and evening peak hours. • Install directional signage indicating lane-specific traffic movements before approaching intersections.

No.	Intersection	Recommendations for Traffic Management
2	The Phanat Nikhom intersection, Chonburi Province	• Adjust the traffic signal cycle length and green light duration to correspond with traffic volume. • Prohibit parking along the roadside during the morning and evening peak hours. • Install directional signage indicating lane-specific traffic movements before approaching intersections. • Strictly enforce traffic regulations by prohibiting truck movement during the morning and evening peak hours as stipulated by law.
3	The Don Hua Lo intersection and The On-Off Ramps of Motorway No. 7 intersection, Chonburi Province	• Short-term: Adjust the traffic signal cycle length and green light duration to align with traffic volume during peak periods. • Long-term: Modify the road by adding one additional traffic lane in each direction on Route 315 to create an elevated intersection, and adjust the traffic signal cycle length and green light duration at the at-grade intersection to correspond with traffic volume. • Install directional signage for each lane before approaching the intersection to guide drivers effectively.
4	The Map Ta Phut intersection, Rayong Province	• Adjust the traffic signal cycle length and green light duration to correspond with traffic volume. • Prohibit parking along the roadside during the morning and evening peak hours. • Install directional signage indicating lane-specific traffic movements before approaching intersections.

Source: Consultants, 2025

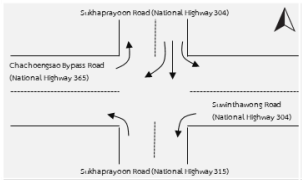
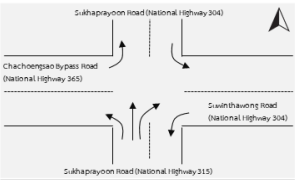
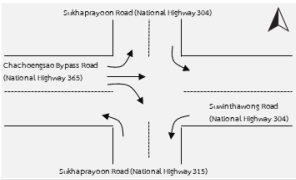
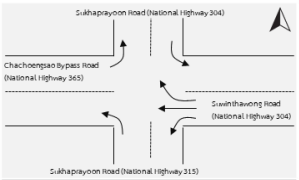
- **Chachoengsao Province, The elevated intersection at 11 Infantry Regiment Intersection**

  Recommendation for traffic management at the 11 Infantry Regiment Intersection, Chachoengsao Province, includes adjusting the traffic signal cycle length and green light duration to match the traffic volume during the morning and evening peak hours. This adjustment aims to improve traffic flow and reduce queue lengths as follows:

The Elevated Intersection at 11 Infantry Regiment Intersection, Chachoengsao Province (AM Peak)			
			
Phase 1	Phase 2	Phase 3	Phase 4
Green 71 s	Green 36 s	Green 36 s	Green 83 s
Amber 3 s	Amber 3 s	Amber 3 s	Amber 3 s
All Red 3 s	All Red 3 s	All Red 3 s	All Red 3 s
Cycle Length = 250 s			

Source: Consultants, 2025

Figure 3.3.2-1 Proposed Traffic Signal Cycle Adjustment at the Elevated Intersection at 11 Infantry Regiment Intersection, Chachoengsao Province, (AM Peak)

The Elevated Intersection at 11 Infantry Regiment Intersection, Chachoengsao Province (PM Peak)			
			
Phase 1	Phase 2	Phase 3	Phase 4
Green 74 s	Green 42 s	Green 29 s	Green 76 s
Amber 3 s	Amber 3 s	Amber 3 s	Amber 3 s
All Red 3 s	All Red 3 s	All Red 3 s	All Red 3 s
Cycle Length = 245 s			

Source: Consultants, 2025

Figure 3.3.2-2 Proposed Traffic Signal Cycle Adjustment at the Elevated Intersection at 11 Infantry Regiment Intersection, Chachoengsao Province, (PM Peak)

Table 3.3.2-2: Traffic Condition Analysis – Existing Scenario vs. Optimized Traffic Signal Cycle and Green Light Adjustment at the Elevated Intersection at 11 Infantry Regiment Intersection, Chachoengsao Province

Traffic conditions	Existing Scenario		Optimized Traffic Signal Cycle and Green Light Adjustment		Percentage change (%)	
	AM	PM	AM	PM	AM	PM
Level of Service (LOS)	F	F	E	E	**-29.8**	**-55.9**
Average delay (seconds per PCU)	94.9	133.5	66.7	58.9		

Source: Consultants, 2025

Table 3.3.2-3 Maximum Queue Length (Average) – Existing Scenario vs. Optimized Traffic Signal Cycle and Green Light Adjustment at the Elevated Intersection at 11 Infantry Regiment Intersection, Chachoengsao Province

Direction	Existing Scenario (meters)		Optimized Traffic Signal Cycle and Green Light Adjustment (meters)		Percentage change (%)	
	AM	PM	AM	PM	AM	PM
Maximum Queue Length (Average)						
Northbound (NB)	299	293	229	228	⬇ -23.4	⬇ -22.3
Southbound (SB)	537	820	372	346	⬇ -30.6	⬇ -60.8
Eastbound (EB)	528	168	384	112	⬇ -27.3	⬇ -33.5
Westbound (WB)	324	305	197	170	⬇ -39.0	⬇ -44.1

Source: Consultants, 2025

Table 3.3.2-4 Project Performance Evaluation Analysis at the Elevated Intersection at 11 Infantry Regiment Intersection, Chachoengsao Province

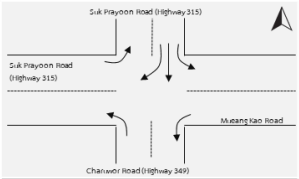
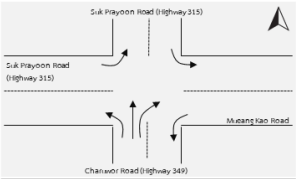
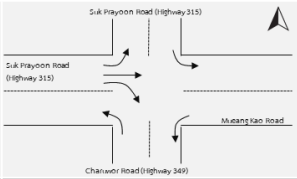
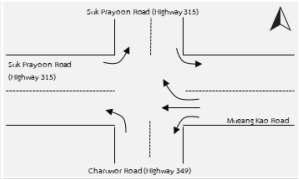
Traffic Variables	Existing Scenario		Optimized Traffic Signal Cycle and Green Light Adjustment		Percentage change (%)		Value of Travel Time Savings (THB/Hr.)	
	AM	PM	AM	PM	AM	PM	AM	PM
Total Travel Time (PCU-Hr.)	119.2	302.4	109.0	189	-7.7	-37.5	2,361	26,246

Note: The Value of Travel Time (VOT) is calculated based on data from the project report on the development of container freight stations supporting the EEC. The base year travel time value for Thailand (2019) is specified as 213.77 THB/PCU, which is further adjusted using the Consumer Price Index (CPI) for each province as of January 2025.

Source: Consultants, 2025

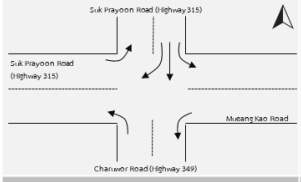
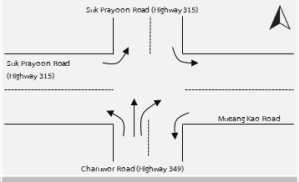
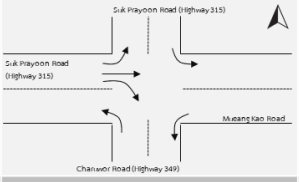
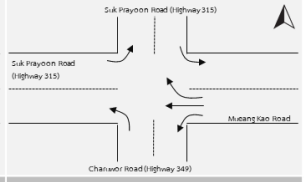
- **Chonburi Province, The Phanat Nikhom intersection**

  Recommendation for traffic management at the Phanat Nikhom Intersection, Chonburi Province, includes adjusting the traffic signal cycle length and green light duration to match the traffic volume during the morning and evening peak hours. This adjustment aims to improve traffic flow and reduce queue lengths as follows:

The Phanat Nikhom intersection, Chonburi Province (AM Peak)			
			
Phase 1	Phase 2	Phase 3	Phase 4
Green 44 s	Green 25 s	Green 55 s	Green 39 s
Amber 3 s	Amber 3 s	Amber 3 s	Amber 3 s
All Red 2 s	All Red 2 s	All Red 2 s	All Red 2 s
Cycle Length = 183 s			

Source: Consultants, 2025

Figure 3.3.2-3 Proposed Traffic Signal Cycle Adjustment at the Phanat Nikhom intersection, Chonburi Province, (AM Peak)

The Phanat Nikhom intersection, Chonburi Province (PM Peak)			
			
Phase 1	Phase 2	Phase 3	Phase 4
Green 49 s	Green 50 s	Green 65 s	Green 46 s
Amber 3 s	Amber 3 s	Amber 3 s	Amber 3 s
All Red 2 s	All Red 2 s	All Red 2 s	All Red 2 s
Cycle Length = 230 s			

Source: Consultants, 2025

Figure 3.3.2-4 Proposed Traffic Signal Cycle Adjustment at the Phanat Nikhom intersection, Chonburi Province, (PM Peak)

Table 3.3.2-5 Traffic Condition Analysis – Existing Scenario vs. Optimized Traffic Signal Cycle and Green Light Adjustment at the Phanat Nikhom intersection, Chonburi Province

Traffic conditions	Existing Scenario		Optimized Traffic Signal Cycle and Green Light Adjustment		Percentage change (%)	
	AM	PM	AM	PM	AM	PM
Level of Service (LOS)	F	F	E	F	-60.8	-41.8
Average delay (seconds per PCU)	174.8	236.4	68.5	137.5		

Source: Consultants, 2025

Table 3.3.2-6 Maximum Queue Length (Average) – Existing Scenario vs. Optimized Traffic Signal Cycle and Green Light Adjustment at the Phanat Nikhom intersection, Chonburi Province

Direction	Existing Scenario (meters)		Optimized Traffic Signal Cycle and Green Light Adjustment (meters)		Percentage change (%)	
	AM	PM	AM	PM	AM	PM
Maximum Queue Length (Average)						
Northbound (NB)	130	430	72	364	⬇ -44.6	⬇ -15.3
Southbound (SB)	206	289	127	176	⬇ -38.3	⬇ -39.1
Eastbound (EB)	502	556	161	209	⬇ -67.9	⬇ -62.3
Westbound (WB)	138	220	105	127	⬇ -23.9	⬇ -42.3

Source: Consultants, 2025

Table 3.3.2-7 Project Performance Evaluation Analysis at the Phanat Nikhom intersection, Chonburi Province

Traffic Variables	Existing Scenario		Optimized Traffic Signal Cycle and Green Light Adjustment		Percentage change (%)		Value of Travel Time Savings (THB/Hr.)	
	AM	PM	AM	PM	AM	PM	AM	PM
Total Travel Time (PCU-Hr.)	498.4	605.7	370.5	487.5	-25.7	-19.5	29,301	27,078

Note: The Value of Travel Time (VOT) is calculated based on data from the project report on the development of container freight stations supporting the EEC. The base year travel time value for Thailand (2019) is specified as 213.77 THB/PCU, which is further adjusted using the Consumer Price Index (CPI) for each province as of January 2025.

Source: Consultants, 2025

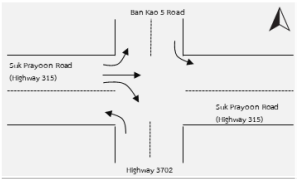
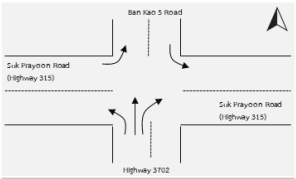
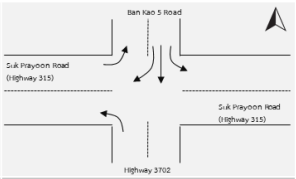
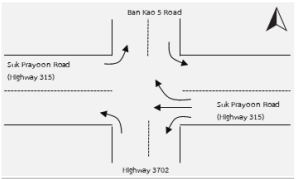
- **Chonburi Province, The Don Hua Lo intersection and The On-Off Ramps of Motorway No. 7 intersection**

  Recommendation for traffic management at the Don Hua Lo Intersection On-Off Ramps of Motorway No. 7, Chonburi Province, is divided into two phases: the short-term phase and the long-term phase, as follows:

  1. Short-term Phase

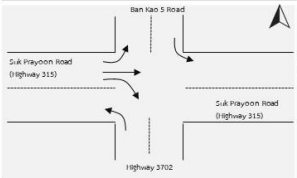
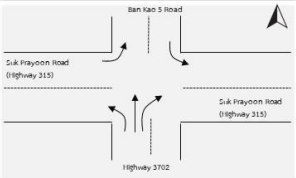
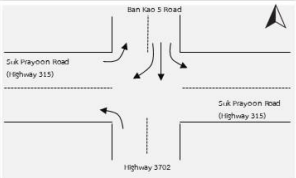
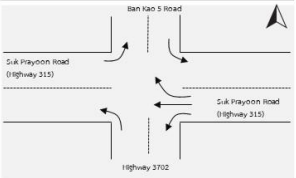
  recommended to adjust the traffic signal cycle and green light duration to align with traffic volumes during the morning and evening peak hours. This adjustment will improve traffic flow and reduce queue lengths.

(1) Adjusting the traffic signal cycle and green light duration to match the traffic volume at the Don Hua Lo Intersection, Chonburi Province, during the morning and evening peak hours.

The Don Hua Lo intersection, Chonburi Province (AM Peak)			
			
Phase 1	Phase 2	Phase 3	Phase 4
Green 83 s	Green 51 s	Green 58 s	Green 82 s
Amber 4 s	Amber 4 s	Amber 4 s	Amber 4 s
All Red 2 s	All Red 2 s	All Red 2 s	All Red 2 s
Cycle Length = 298 s			

Source: Consultants, 2025

Figure 3.3.2-5 Proposed Traffic Signal Cycle Adjustment at The Don Hua Lo Intersection, Chonburi Province, (AM Peak)

The Don Hua Lo intersection, Chonburi Province (PM Peak)			
			
Phase 1	Phase 2	Phase 3	Phase 4
Green 65 s	Green 60 s	Green 100 s	Green 78 s
Amber 4 s	Amber 4 s	Amber 4 s	Amber 4 s
All Red 2 s	All Red 2 s	All Red 2 s	All Red 2 s
Cycle Length = 297 s			

Source: Consultants, 2025

Figure 3.3.2-6 Proposed Traffic Signal Cycle Adjustment at The Don Hua Lo Intersection, Chonburi Province, (PM Peak)

Table 3.3.2-8 Traffic Condition Analysis – Existing Scenario vs. Optimized Traffic Signal Cycle and Green Light Adjustment at The Don Hua Lo Intersection, Chonburi Province

Traffic conditions	Existing Scenario		Optimized Traffic Signal Cycle and Green Light Adjustment		Percentage change (%)	
	AM	PM	AM	PM	AM	PM
Level of Service (LOS)	F	F	F	F	-26.8	-25.9
Average delay (seconds per PCU)	182.5	193.3	133.7	143.7		

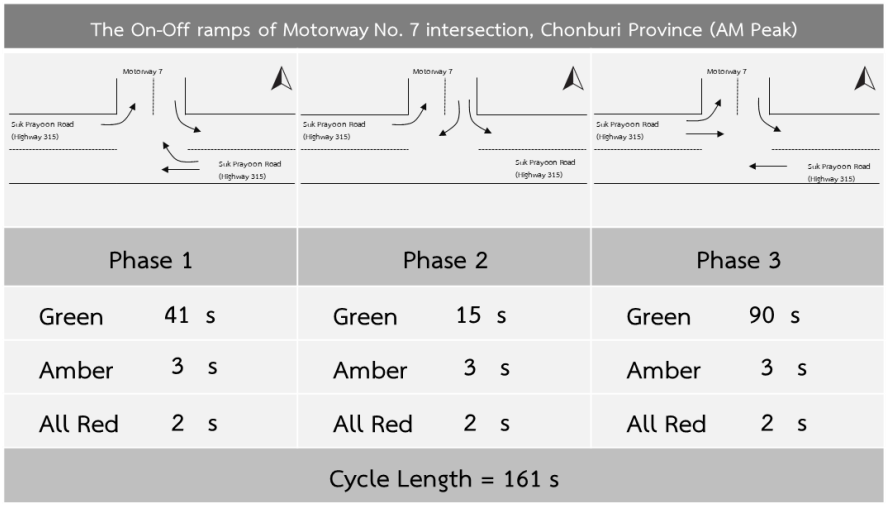
Source: Consultants, 2025

Table 3.3.2-9 Maximum Queue Length (Average) – Existing Scenario vs. Optimized Traffic Signal Cycle and Green Light Adjustment at The Don Hua Lo Intersection, Chonburi Province

Direction	Existing Scenario (meters)		Optimized Traffic Signal Cycle and Green Light Adjustment (meters)		Percentage change (%)	
	AM	PM	AM	PM	AM	PM
Maximum Queue Length (Average)						
Northbound (NB)	141	162	102	134	⬇ -28.2	⬇ -17.0
Southbound (SB)	179	281	128	185	⬇ -28.5	⬇ -34.2
Eastbound (EB)	491	415	361	320	⬇ -26.5	⬇ -22.9
Westbound (WB)	270	313	225	287	⬇ -16.7	⬇ -8.4

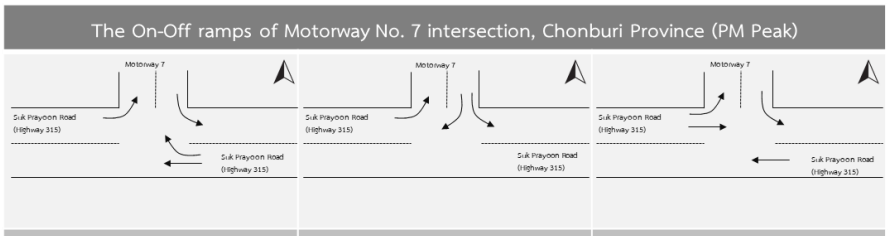
Source: Consultants, 2025

(2) Adjusting the traffic signal cycle and green light duration to match the traffic volume at the On-Off ramps of Motorway No. 7 intersection during the morning and evening peak hours.



Source: Consultants, 2025

Figure 3.3.2-7 Proposed Traffic Signal Cycle Adjustment at the On-Off ramps of Motorway No. 7 intersection, Chonburi Province, (AM Peak)



Source: Consultants, 2025

Figure 3.3.2-8 Proposed Traffic Signal Cycle Adjustment at the On-Off ramps of Motorway No. 7 intersection, Chonburi Province, (PM Peak)

Table 3.3.2-10 Traffic Condition Analysis – Existing Scenario vs. Optimized Traffic Signal Cycle and Green Light Adjustment at the On-Off ramps of Motorway No. 7 intersection, Chonburi Province

Traffic conditions	Existing Scenario		Optimized Traffic Signal Cycle and Green Light Adjustment		Percentage change (%)	
	AM	PM	AM	PM	AM	PM
Level of Service (LOS)	E	E	D	C	-39.3	-60.6
Average delay (seconds per PCU)	78.6	71.9	47.8	28.3		

Source: Consultants, 2025

Table 3.3.2-11 Maximum Queue Length (Average) – Existing Scenario vs. Optimized Traffic Signal Cycle and Green Light Adjustment at the On-Off ramps of Motorway No. 7 intersection, Chonburi Province

Direction	Existing Scenario (meters)		Optimized Traffic Signal Cycle and Green Light Adjustment (meters)		Percentage change (%)	
	AM	PM	AM	PM	AM	PM
Maximum Queue Length (Average)						
Southbound (SB)	62	54	47	39	⬇ -24.2	⬇ -26.8
Eastbound (EB)	177	162	115	98	⬇ -35.0	⬇ -39.5
Westbound (WB)	155	220	138	179	⬇ -11.0	⬇ -18.6

Source: Consultants, 2025

From the performance evaluation analysis of the project, considering the overall road network of Sukprayun Road (Highway No. 315) in Chonburi Province, specifically between the Don Hua Lo intersection and the On-Off Ramps of Motorway No. 7, a comparison was made between the existing conditions and the scenario with optimized traffic signal cycles and green light durations to align with traffic volume (during peak periods). The results indicate an improvement in overall network efficiency, contributing to measurable economic benefits in terms of travel time savings. The estimated economic impact and cost savings are presented as follows.

Table 3.3.2-12 Project Performance Evaluation Analysis at Sukprayun Road (Highway No. 315) between the Don Hua Lo intersection and the On-Off Ramps of Motorway No. 7 intersection, Chonburi Province

Traffic Variables	Existing Scenario		Optimized Traffic Signal Cycle and Green Light Adjustment		Percentage change (%)		Value of Travel Time Savings (THB/Hr.)	
	AM	PM	AM	PM	AM	PM	AM	PM
Total Travel Time (PCU-Hr.)	1,014.9	1,048.2	914.8	942.9	-9.9	-10.0	22,932	24,123

** Note: The Value of Travel Time (VOT) is calculated based on data from the project report on the development of container freight stations supporting the EEC. The base year travel time value for Thailand (2019) is specified as 213.77 THB/PCU, which is further adjusted using the Consumer Price Index (CPI) for each province as of January 2025.*

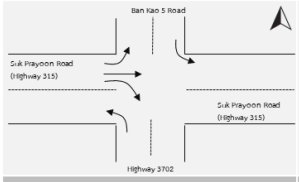
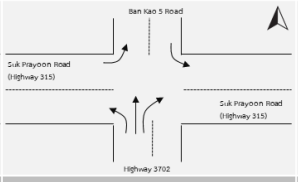
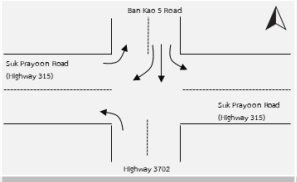
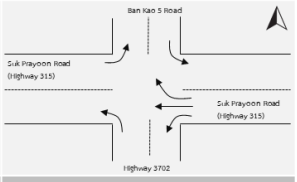
Source: Consultants, 2025

The analysis of the peak period scenario indicates that adjusting the traffic signal cycle and green light duration to align with traffic volume resulted in a slight improvement in traffic flow at the Don Hua Lo intersection during both the morning and evening peak periods. Specifically, the level of service improved slightly, with a minor reduction in average delay and queue length.

For the On-Off Ramps of Motorway No. 7 intersection, adjusting the traffic signals and green light duration to match traffic volume significantly improved traffic flow, leading to a more noticeable increase in overall network efficiency during both the morning and evening peak periods.

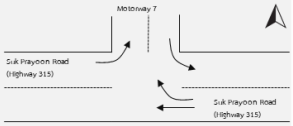
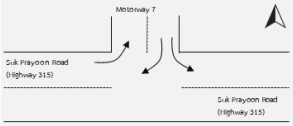
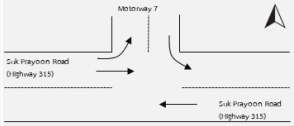
2. Long-term Phase

To improve traffic flow at the Don Hua Lo Intersection in the long term, it is recommended to develop an elevated road on Sukkhaprayun Road (Highway 315) passing through both intersections (Don Hua Lo Intersection and the on-off ramps of Motorway No. 7). This will facilitate uninterrupted traffic movement in the straight direction on Sukkhaprayun Road (Highway 315) through both intersections, without being hindered by traffic signals, significantly improving traffic conditions at both intersections.

The Don Hua Lo intersection, Chonburi Province (AM, PM Peak)			
			
Phase 1	Phase 2	Phase 3	Phase 4
Green 20 s	Green 30 s	Green 30 s	Green 16 s
Amber 4 s	Amber 4 s	Amber 4 s	Amber 4 s
All Red 2 s	All Red 2 s	All Red 2 s	All Red 2 s
Cycle Length = 120 s			

Source: Consultants, 2025

Figure 3.3.2-9 Proposed Traffic Signal Cycle Adjustment at The Don Hua Lo Intersection, Chonburi Province, (AM Peak and PM peak)

The On-Off ramps of Motorway No. 7 intersection, Chonburi Province (AM, PM Peak)		
		
Phase 1	Phase 2	Phase 3
Green 25 s	Green 18 s	Green 35 s
Amber 3 s	Amber 3 s	Amber 3 s
All Red 2 s	All Red 2 s	All Red 2 s
Cycle Length = 93 s		

Source: Consultants, 2025

Figure 3.3.2-10 Proposed Traffic Signal Cycle Adjustment at The On-Off ramps of Motorway No. 7 Intersection, Chonburi Province, (AM Peak and PM peak)

Table 3.3.2-13 Traffic Condition Analysis – Existing Scenario vs. Development of an Elevated Road at The Don Hua Lo Intersection, Chonburi Province

Traffic conditions	Existing Scenario		Develop an elevated road		Percentage change (%)	
	AM	PM	AM	PM	AM	PM
Level of Service (LOS)	F	F	B	B	-93.2	-92.0
Average delay (seconds per PCU)	182.5	193.3	12.4	15.5		

Source: Consultants, 2025

Table 3.3.2-14 Maximum Queue Length (Average) – Existing Scenario vs. Development of an Elevated Road at The Don Hua Lo Intersection, Chonburi Province

Direction	Existing Scenario (meters)		Develop an elevated road (meters)		Percentage change (%)	
	AM	PM	AM	PM	AM	PM
Maximum Queue Length (Average)						
Northbound (NB)	141	162	125	94	⬇ -11.3	⬇ -42.0
Southbound (SB)	179	281	106	148	⬇ -40.8	⬇ -47.3
Eastbound (EB)	491	415	13	48	⬇ -97.4	⬇ -88.4
Westbound (WB)	270	313	36	72	⬇ -86.7	⬇ -77.0

Source: Consultants, 2025

Table 3.3.2-15 Traffic Condition Analysis – Existing Scenario vs. Development of an Elevated Road at The On-Off ramps of Motorway No. 7 Intersection, Chonburi Province

Traffic conditions	Existing Scenario		Develop an elevated road		Percentage change (%)	
	AM	PM	AM	PM	AM	PM
Level of Service (LOS)	E	E	B	A	**-86.6**	**-86.4**
Average delay (seconds per PCU)	78.6	71.9	10.5	9.8		

Source: Consultants, 2025

Table 3.3.2-16 Maximum Queue Length (Average) – Existing Scenario vs. Development of an Elevated Road at The On-Off ramps of Motorway No. 7 Intersection, Chonburi Province

Direction	Existing Scenario (meters)		Develop an elevated road (meters)		Percentage change (%)	
	เช้า	**เย็น**	**เช้า**	**เย็น**	**เช้า**	**เย็น**
Maximum Queue Length (Average)						
Southbound (SB)	62	54	30	43	⬇ -51.6	⬇ -20.4
Eastbound (EB)	177	162	164	107	⬇ -7.3	⬇ -34.0
Westbound (WB)	155	220	48	57	⬇ -69.0	⬇ -74.1

Source: Consultants, 2025

From the performance evaluation analysis of the project, considering the overall road network of Sukprayun Road (Highway No. 315) in Chonburi Province**,** specifically between the Don Hua Lo intersection and the On-Off Ramps of Motorway No. 7, a comparison was made between the existing conditions and the scenario with the development of an elevated intersection at Don Hua Lo and the On-Off Ramps of Motorway No. 7**.** This development led to improvements in the overall network efficiency, resulting in measurable economic benefits in terms of travel time savings. The estimated economic impact and cost savings are presented as follows.

Table 3.3.2-17 Project Performance Evaluation Analysis at Sukprayun Road (Highway No. 315) between the Don Hua Lo intersection and the On-Off Ramps of Motorway No. 7 intersection, Chonburi Province

Traffic Variables	Existing Scenario		Optimized Traffic Signal Cycle and Green Light Adjustment		Percentage change (%)		Value of Travel Time Savings (THB/Hr.)	
	AM	PM	AM	PM	AM	PM	AM	PM
Total Travel Time (PCU-Hr.)	1,014.9	1,048.2	690.1	621.0	-32.0	-40.8	74,408	97,867

Note: The Value of Travel Time (VOT) is calculated based on data from the project report on the development of container freight stations supporting the EEC. The base year travel time value for Thailand (2019) is specified as 213.77 THB/PCU, which is further adjusted using the Consumer Price Index (CPI) for each province as of January 2025.

Source: Consultants, 2025

- **Rayong Province, The Map Ta Phut intersection**

  It is recommended to adjust the traffic signal cycle and green light duration to align with traffic volumes at the Map Ta Phut Intersection during the morning and evening peak hours. This adjustment will improve traffic flow and reduce queue lengths, as follows:

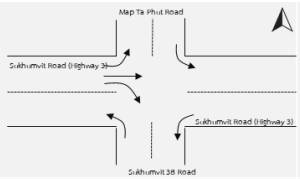
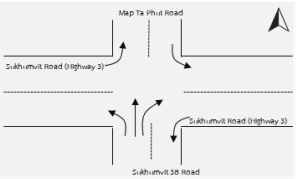
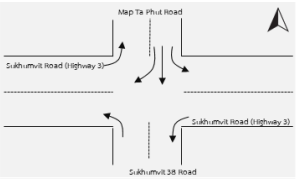
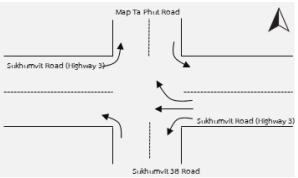
The Map Ta Phut intersection, Rayong Province (AM Peak)

Phase 1		Phase 2		Phase 3		Phase 4	
Green	37 s	Green	38 s	Green	40 s	Green	47 s
Amber	2 s	Amber	2 s	Amber	2 s	Amber	2 s
All Red	3 s	All Red	3 s	All Red	3 s	All Red	3 s

Cycle Length = 182 s

Source: Consultants, 2025

Figure 3.3.2-11 Proposed Traffic Signal Cycle Adjustment at The Map Ta Phut intersection, Rayong Province, (AM Peak)

The Map Ta Phut intersection, Rayong Province (PM Peak)			
			
Phase 1	Phase 2	Phase 3	Phase 4
Green 83 s	Green 51 s	Green 60 s	Green 33 s
Amber 2 s	Amber 2 s	Amber 2 s	Amber 2 s
All Red 3 s	All Red 3 s	All Red 3 s	All Red 3 s
Cycle Length = 227 s			

Source: Consultants, 2025

Figure 3.3.2-12 Proposed Traffic Signal Cycle Adjustment at The Map Ta Phut intersection, Rayong Province, (PM Peak)

Table 3.3.2-18 Traffic Condition Analysis – Existing Scenario vs. Optimized Traffic Signal Cycle and Green Light Adjustment at The Map Ta Phut intersection, Rayong Province

Traffic conditions	Existing Scenario		Optimized Traffic Signal Cycle and Green Light Adjustment		Percentage change (%)	
	AM	PM	AM	PM	AM	PM
Level of Service (LOS)	F	F	E	E	**-49.4**	**-51.5**
Average delay (seconds per PCU)	116.9	128.1	59.1	62.2		

Source: Consultants, 2025

Table 3.3.2-19 Maximum Queue Length (Average) – Existing Scenario vs. Optimized Traffic Signal Cycle and Green Light Adjustment at The Map Ta Phut intersection, Rayong Province

Direction	Existing Scenario (meters)		Optimized Traffic Signal Cycle and Green Light Adjustment (meters)		Percentage change (%)	
	AM	PM	AM	PM	AM	PM
Maximum Queue Length (Average)						
Northbound (NB)	109	189	80	162	↓ -37.7	↓ -36.8
Southbound (SB)	90	94	56	60	↓ -31.3	↓ -49.9
Eastbound (EB)	143	412	98	207	↓ -65.0	↓ -3.7
Westbound (WB)	340	109	119	105	↓ -37.7	↓ -36.8

Source: Consultants, 2025

Table 3.3.2-20 Project Performance Evaluation Analysis at The Map Ta Phut intersection, Rayong Province

Traffic Variables	Existing Scenario		Optimized Traffic Signal Cycle and Green Light Adjustment		Percentage change (%)		Value of Travel Time Savings (THB/Hr.)	
	AM	PM	AM	PM	AM	PM	AM	PM
Total Travel Time (PCU-Hr.)	233.3	274.8	37.2	235.7	-84.1	-14.2	45,766	9,125

Note: The Value of Travel Time (VOT) is calculated based on data from the project report on the development of container freight stations supporting the EEC. The base year travel time value for Thailand (2019) is specified as 213.77 THB/PCU, which is further adjusted using the Consumer Price Index (CPI) for each province as of January 2025.

Source: Consultants, 2025

3.4 Recommendations for Legal, Regulatory, Structural, and Management Plan Improvements, and Implementation Agencies to Respond and Drive Implementation

3.4.1 Recommendations for Improving Laws and Regulations

The implementation of the development plan and the Intelligent Transport System (ITS) action plan to enhance the efficiency of traffic and transportation management in the Chachoengsao, Chonburi, Rayong, and Bangkok regions requires the following necessary improvements to the relevant laws and regulations:

1) Laws on Cybersecurity

The Intelligent Transport System (ITS) collects a large amount of data from the public. While this data is beneficial for the government and citizens in providing efficient transportation services, there is a risk that such data could be leaked or accessed by malicious actors for inappropriate purposes. If data is tampered with, falsified, or incorrect information is entered into the system, it could cause significant damage to the ITS. Therefore, cybersecurity laws are crucial tools to help those responsible for data collection prevent potential harm from cyber threats and ensure the safety and integrity of the system.

The current announcement of the National Cybersecurity Committee, titled "Criteria for Defining the Characteristics of Organizations with Critical Information Infrastructure and Assigning Control and Supervision" (Announcement B.E. 2564), aims to establish criteria for identifying organizations that are considered to be critical information infrastructure (CII). The objective is to outline the characteristics and services of organizations that fall under the CII category, as well as the assignment of supervisory responsibilities to relevant authorities.

This announcement specifies that organizations involved in various sectors, as outlined in the annex to the announcement, must comply with these criteria to be classified as critical information infrastructure organizations. These entities play a crucial role in maintaining the security and reliability of critical systems, such as those in transportation, healthcare, and public services, which is directly relevant to the implementation of Intelligent Transport Systems (ITS).

In the transportation and logistics sector, the criteria for designating entities with missions or services as critical information infrastructure and the assignment of control and supervision are specified in the Notification on the Criteria for Designating Entities with Missions or Services as Critical Information Infrastructure and the Assignment of Control and Supervision, B.E. 2564. The notification specifies that entities providing land transportation services and involved in traffic control within the Bangkok metropolitan area shall be under the control or supervision of the Royal Thai Police.

Therefore, to ensure that the intelligent transportation system in the Chachoengsao, Chonburi, and Rayong provinces, including Bangkok, is recognized as critical information infrastructure, it is deemed necessary to amend the National Cybersecurity Committee's notification on the Criteria for Designating Entities with Missions or Services as Critical Information Infrastructure and the Assignment of Control and Supervision, B.E. 2564. This is based on Section 5 of the aforementioned notification, which allows for a review of the criteria and the assignment of control or supervision to be updated in line with evolving circumstances. The Committee may consider revising the missions or services and the assignment of control or supervision as deemed appropriate.

Additionally, it is proposed to include the intelligent transportation system in the Eastern Economic Corridor as part of the critical information infrastructure and designate the Office of Transport and Traffic Policy and Planning (OTP) or the Eastern Economic Corridor Policy Committee as the overseeing authority.

2) Personal Data Protection Law

The protection of personal data is of significant importance in today's society, as evidenced by various countries, including the European Union, the People's Republic of China, and Thailand, which have enacted specific laws for personal data protection. These laws are based on similar principles, such as the lawful basis for data collection, the necessity of data collection, and the implementation of security measures to safeguard the data.

Regarding personal data protection within the context of intelligent transportation systems, the consultant believes that the collection of personal data in such systems is necessary for the performance of duties related to public interests, as stipulated by the data controller. Under Section 24(4) of the Personal Data Protection Act, B.E. 2562, an exemption is provided allowing the collection of personal data without the need for the data subject's consent. However, the responsible entity is still required to comply with the provisions set forth by the law, such as issuing a privacy notice and a privacy policy (Section 32), appointing a data protection officer (Sections 41-42), and implementing appropriate security measures (Section 37).

3) Laws Concerning Driverless Vehicles

In Thailand, there are three main laws that govern the use of vehicles: the Land Traffic Act, B.E. 2522, the Motor Vehicle Act, B.E. 2522, and the Department of Land Transport Notification on the Criteria, Procedures, and Conditions for Obtaining Permission, Authorization, and the Duration of Vehicle Use, and the Mark of Vehicle Use for Testing, B.E. 2560. Upon reviewing the provisions of these three laws, it is clear that none specifically addresses autonomous vehicles.

As a result, the Motor Vehicle Act, B.E. 2522, which is a general law regarding the use of vehicles and different types of vehicles on public roads in Thailand, must be applied to autonomous vehicles as well. The Land Traffic Act, B.E. 2522, although primarily aimed at regulating road usage for drivers and pedestrians to ensure the safety of life, body, and property during travel, applies only to vehicles that have a human operator. Therefore, autonomous vehicles are not explicitly covered by the provisions of this law.

In conclusion, while Thailand does not yet have a specific law for autonomous vehicles, existing laws related to vehicle usage are being applied, with the understanding that updates or amendments may be necessary to address the specific needs of autonomous vehicle regulation in the future.

However, although the Motor Vehicle Act, B.E. 2522 can be applied to autonomous vehicles as a general law, the Act was established in 1979, long before the development of autonomous driving technology. Therefore, applying this law to autonomous vehicles may lead to inappropriate provisions and pose challenges in interpreting the law. As a result, it is recommended that a specific law for autonomous vehicles be introduced, based on the authority granted under the Motor Vehicle Act, B.E. 2522, which empowers the Minister of Transport to issue ministerial regulations related to various measures. These could include definitions, testing of autonomous vehicles, the qualifications of autonomous vehicle operators (requiring a certain level of knowledge in

software), issuing licenses for autonomous vehicles (similar to a driver's license), establishing specific areas for the operation of autonomous vehicles, vehicle inspection standards, and determining the liability of manufacturers or designers of the autonomous driving software in case of damage caused by defects in the autonomous vehicle. This approach would allow for more effective governance of autonomous vehicles and ensure that the legal framework keeps pace with current developments and the rapid advancement of vehicle technologies.

In the context of the laws related to liability arising from autonomous vehicles in Thailand, the relevant civil liability laws are outlined in the Civil and Commercial Code. Section 420 states: "Any person who intentionally or negligently commits an act that causes harm to another, whether it be to life, body, health, liberty, property, or any other right, is considered to have committed a tort and is required to compensate for the damage caused." Additionally, Section 437 stipulates: "Any person who owns or controls any vehicle powered by mechanical means shall be liable for damages arising from the use of that vehicle, unless it is proven that the damage was caused by an unforeseeable event or by the fault of the person suffering the damage."

When considering liability arising from autonomous vehicles, it can be aligned with the provisions of Section 437, which pertains to liability for damages caused by property. This is a form of strict liability, meaning that even if the person who owns or controls a vehicle powered by mechanical means does not act intentionally or negligently, they are still liable for any damage that occurs. The only exception is if it can be proven that the damage resulted from an unforeseeable event or from the fault of the injured party alone. The aim is to protect the public from the dangers posed by property and to define the liable parties, as well as to reduce the burden of proof on the injured party. The following are the issues that need to be considered when applying Section 437 to liability arising from autonomous vehicles:

- The issue of the owner or controller of an autonomous vehicle

  The term "owner" refers to the person who uses the vehicle in a manner that indicates they have control over it at the time the damage occurs, or in other words, the person who possesses the vehicle during the incident (Supreme Court Judgment No. 2659/1978). Therefore, the issue here is to determine the specific characteristics that define "possession" of a vehicle. When applying this to autonomous vehicles, it can be argued that even though the person inside the autonomous vehicle may not be driving it themselves, as the vehicle's system can handle all aspects of driving, there must still be a human inside the vehicle who functions as an observer.

This person can be considered as the "owner" or controller of the autonomous vehicle in this context. Therefore, if liability arises, the owner or controller of the autonomous vehicle would also be liable.

- The issue of damage must be caused by a vehicle powered by mechanical means

  According to Section 437, the damage must be caused by a vehicle powered by mechanical means. Therefore, Section 437 cannot be applied in cases where the damage is caused by a stationary vehicle that the injured party accidentally comes into contact with, or where the damage occurs between two vehicles powered by mechanical means. In such cases, the provisions of Section 420, which is a general provision, should apply, and the legal presumption provided by Section 437 cannot be utilized.

  Therefore, when damage occurs between autonomous vehicles or between an autonomous vehicle and another vehicle powered by mechanical means, Section 437 is not applicable. It can only be applied in cases where the damage is caused by an autonomous vehicle on one side and a non-mechanical vehicle on the other.

3.4.2 Structure and Management Plan, and Operational Agencies for Implementation and Execution

The development of the intelligent traffic and transportation system in the Chachoengsao, Chonburi, and Rayong provinces, as well as in Bangkok, is a large-scale initiative with a broad scope. It involves several agencies that operate according to their legal authority and responsibilities. To ensure the unity of operation in terms of policy, coordination, and execution, it is important to first assess which agency is most suitable to take on the role of the central agency responsible for the development of the intelligent traffic and transportation system in the specified areas. The key agencies involved in the policy development of this project are two main entities: the Office of Transport and Traffic Policy and Planning (OTP) and the Eastern Economic Corridor Policy Committee (EEC).

1) Eastern Economic Corridor

According to the objectives of the Eastern Economic Corridor (EEC) as outlined in the Eastern Economic Corridor Act of 2018, and the structure of the Eastern Economic Corridor Policy Committee, it is evident that the EEC is a policy-oriented agency with the primary responsibility of proposing development plans and pushing forward policies related to the Eastern Economic Corridor. The goal is to enable the development of the Eastern region to reach its full potential, integrating the construction of infrastructure and utilities both within and outside the EEC area.

The key role of the Eastern Economic Corridor Policy Committee in the development of the intelligent transportation system is therefore a policy-making role specific to the area. The committee will be the agency involved in presenting policies and development plans for the intelligent transportation system within the EEC. This will involve coordination with other government agencies such as the Department of Highways, the Department of Rural Roads, the Expressway Authority of Thailand, and the Provincial Police of Region 2 , who will be responsible for supporting and implementing the policies or plans in accordance with their respective authorities to ensure cohesion in the implementation process.

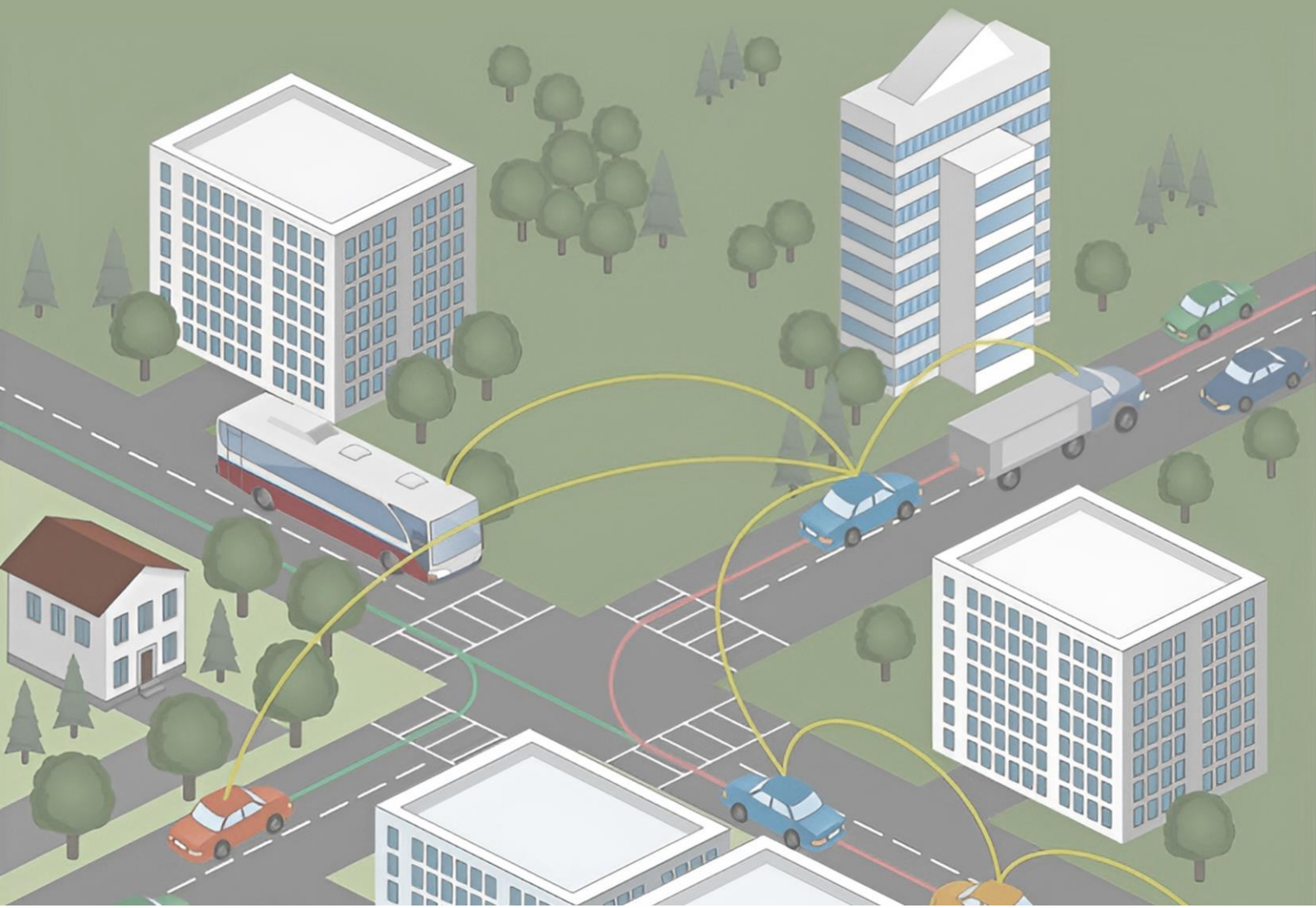
2) The Office of Transport and Traffic Policy and Planning (OTP)

The legal authority of the Office of Transport and Traffic Policy and Planning (OTP) includes responsibilities related to transportation and logistics directly. This also encompasses the internal governmental units within the office, which are tasked with duties related to transportation and traffic management.

The Eastern Economic Corridor Policy Committee (EEPC) is the agency responsible for the geographical area of the Eastern region. It shares similarities with the Office of Transport and Traffic Policy and Planning (OTP) in terms of being an organization with authority and duties related to policy and planning. Additionally, it holds responsibilities concerning infrastructure policies, which include transportation and logistics.

Chapter 4

Design and Development of a Data Integration System Using CCTV, GPS or Other Technologies from Relevant Agencies within the pilot area/route



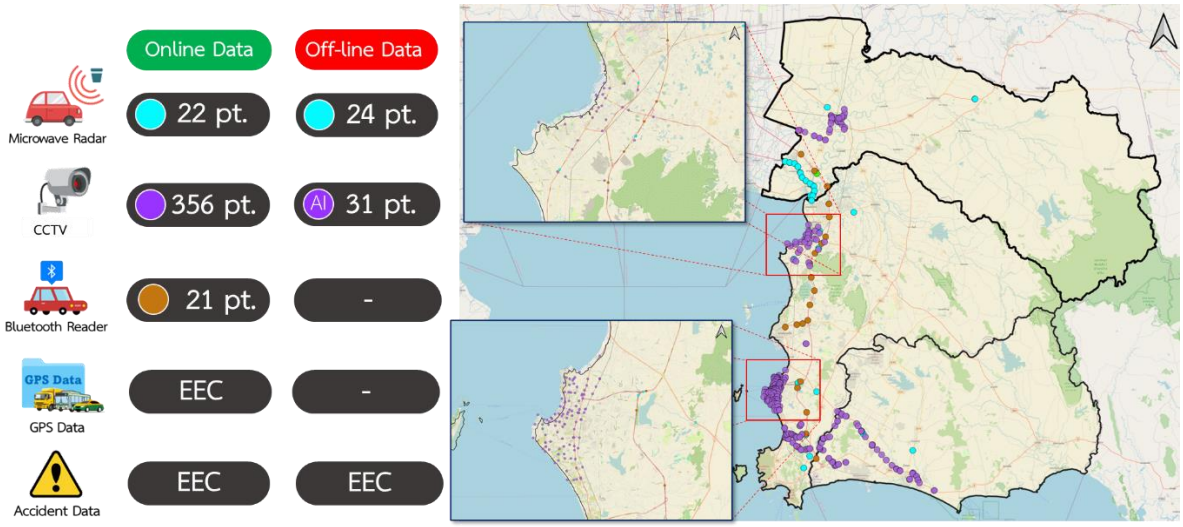
Chapter 4
Design and Development of a Data Integration System Using CCTV, GPS or Other Technologies from Relevant Agencies within the pilot area/route.

4.1 Connectivity with Systems of Relevant Agencies from CCTV Systems, GPS Systems or Other Technologies.

Summary of Coordination and Consultation Meetings with Various Agencies Revealed Agencies with Data Readiness for Traffic Analysis Within the Project are including: Bureau of Highway Safety Department of Highways (BRS-DOH), Inter - City Motorway Division Department of Highways (IMD-DOH), Department of Rural Road (DRR), Expressway Authority of Thailand (EXAT), Provincial Police Region 2 (PPR2), Pattaya City, Office of the Permanent Secretary, Ministry of Transport (OPS-MOT) and Department of Land Transport (DLT). The equipment used for data transmission includes:

1) **Microwave Radar Sensors** – for traffic volume and average speed.
2) **Bluetooth Reader** – for average speed and travel time.
3) **CCTV Cameras** – for traffic conditions.
4) **GPS Data** – for average speed, delays at intersections, origin-destination points of travel and legal violations.
5) **Accident Database** – for the location of accident occurrences.

Locations Connected to Data from Various Devices as shown in **Figure 4.1-1.**



Source: Consultant, 2024

Figure 4.1-1 Locations of Data Input Devices

4.2 Development of Applications and Central Database Systems for Automatic Data Connection from CCTV, GPS or Other Technologies from Relevant Agencies

The development of applications and a central database system for automatic connection of data from CCTV, GPS and other technologies from relevant agencies that agencies can access and integrate data through the application that developed in this project. The application retrieves data in two ways as follows:

1) **The data that owner agency provides a web service** that allows the project to retrieve data from the agency's database at specified intervals, such as every 1 minute, 1 hour or 1 day.
2) **The data owner agency sends data to the project's database automatically** through the web service provided by the project.

For data storage system will use Local Storage, where the data is stored on a hard disk in the form of an SQL database. That data is collected from two sources as follows:

1) **Analytics Data from the Analytics Server in the form traffic data**, that stored in SQL databases to enable fast querying.
2) **GPS Data and Traffic Condition Data from the data owner agencies**, also stored in SQL databases to allow for rapid querying and access

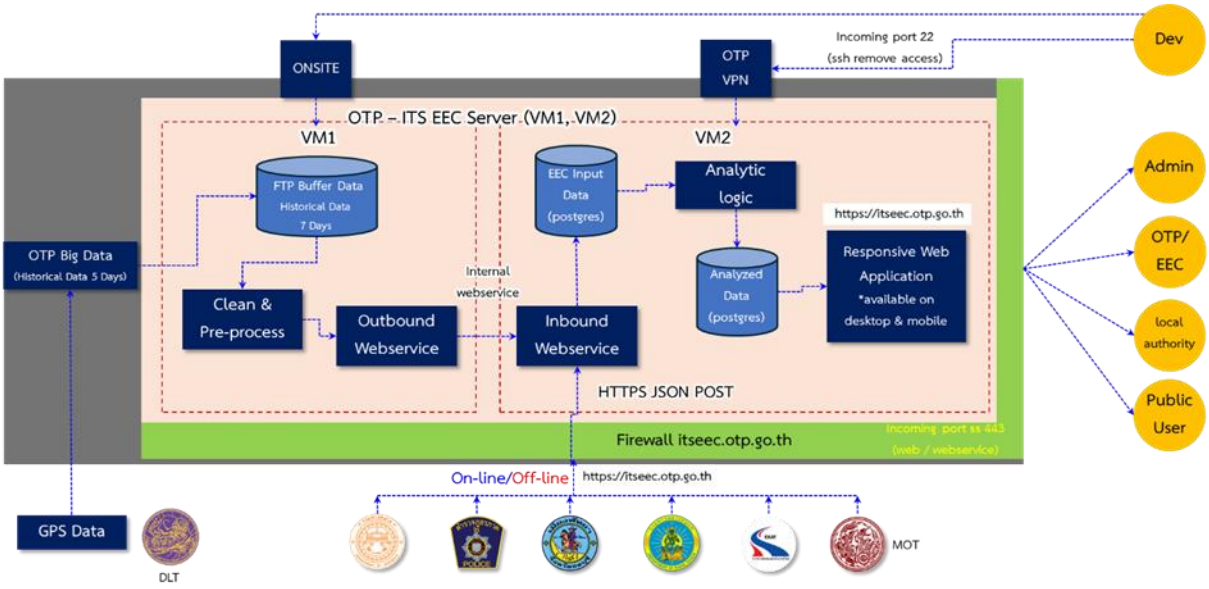
Summary of Automatic Data connection from CCTV, GPS and Other Technologies from Relevant Agencies, The successful integration of data from CCTV, GPS and other technologies into an automatic system where agencies can access and integrate the data, depends on key factors such as cooperation from the data-owning agencies and the infrastructure for data transmission. The following key issues require collaborative efforts between the agencies as follows:

1) **The raw data available from the data-owning agencies** must be converted into a mutually agreed-upon format.
2) **The network connecting the data-owning agencies and the project's network** must be secure (e.g., Intranet or VPN). Additionally, the network speed must be adequate to handle the various data types being transferred.
3) **The data-owning agencies must have personnel responsible for developing the web service** to allow the project to receive data or to develop a system to send data to the project's web service.

From the data compilation above, it was found that currently, the internet networks (Bandwidth) of each agency are insufficient to continuously connect data in a Real-time format. The consultants therefore recommend procuring internet networks for the source agencies to ensure adequate internet for automatic (Real-time) data transmission and to enhance the data interconnection system's readiness.

4.3 Summary of Intelligent Traffic and Transport System Architecture

Development of Data Analysis and Processing Systems for Traffic and Transport Management in Pilot Areas/Routes, the architecture of the Intelligent Traffic and Transport System can be summarized as shown in Figure 4.3-1 that are including: 1) Traffic and Transport Data (Inputs), 2） Data Storage System (Storage), 3） Data Processing System (Data Processing) and 4) Data Display System (Outputs).



Source: Consultant, 2024

Figure 4.3-1 System Architecture for Data Integration from Relevant Agencies

1) **Traffic and Transport Data (Inputs),** can be categorized into 3 main types:

    1. Vehicle Tracking Data (Global Positioning System, GPS) from the Department of Land Transport.
    2. Closed Circuit Television (CCTV) Data, consisting of video footage from CCTV cameras operated by various agencies.
    3. Automated Traffic Measurement Sensor Data, including information that reflects traffic conditions such as speed, traffic volume, density, travel time etc.

2) **Data Storage System (Storage),** The data storage system consists of a Data Exchange Gateway which receives traffic and transport data from various agencies before it enters the subsequent data processing in next phase.

3) **Data Processing System,** Traffic and transport data from the Inputs are analyzed and processed. The data that be processing in the project can be divided into 3 categories:

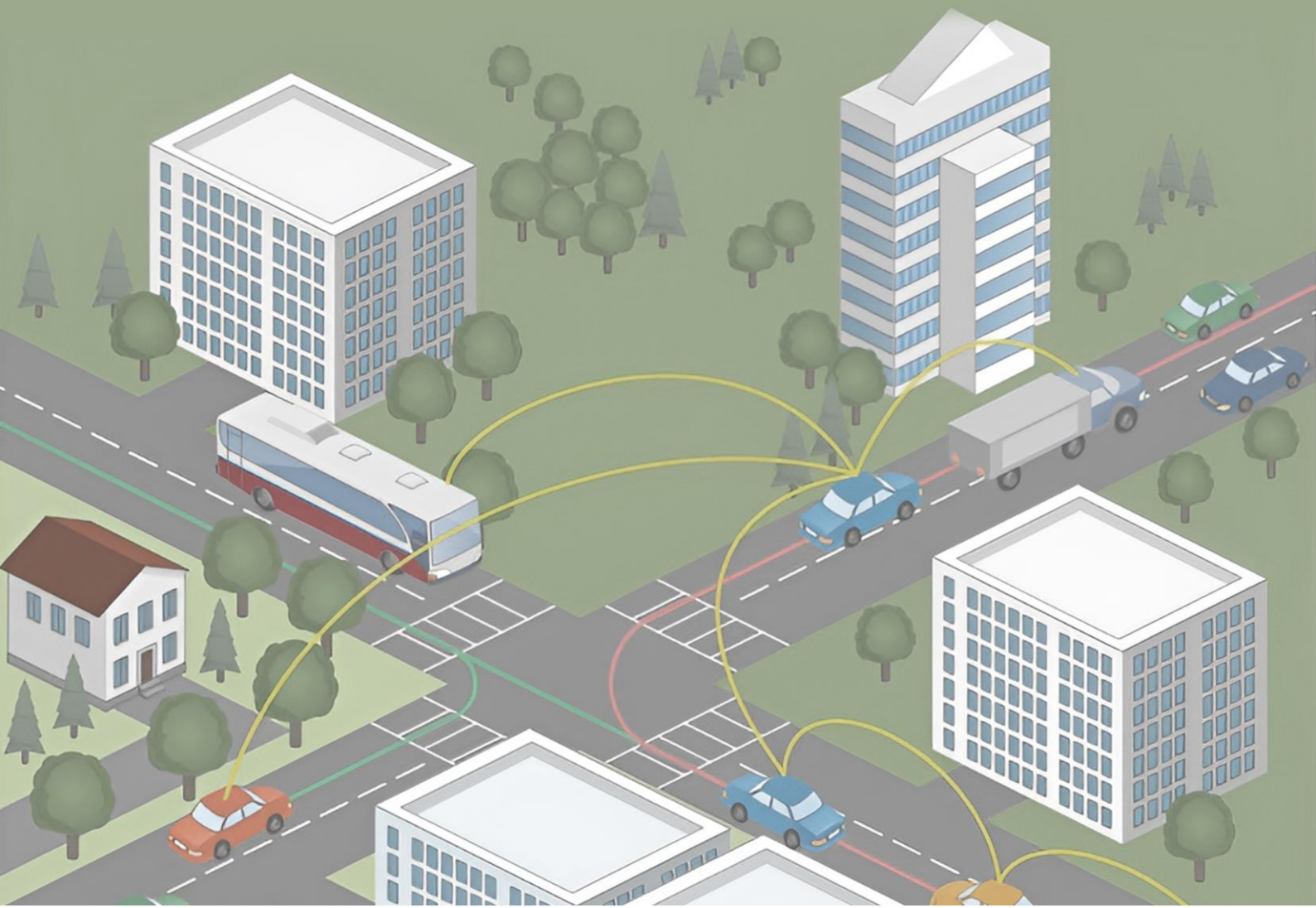
   1. Traffic Condition Data Processing, such as average speed, traffic volume and intersection delay.
   2. Road Safety Data Processing, such as accidents data and hazardous locations/dangerous road segments (Black Spots).
   3. Logistics Data Processing, such as the origin-destination of freight transport, the number of trucks over 10 wheels on certain routes and the number of trips in and out or passing through the EEC area.

4) **Data Display System (Outputs),** The results of the data processing can be displayed in 4 categories:

   1. Traffic Condition Data, such as average speed, traffic volume on road segments and delays intersections.
   2. Road Safety Data, such as accidents data and hazardous locations/dangerous road segments (Black Spots).
   3. Logistics Data, such as the origin-destination of freight transport, the number of trucks over 10 wheels on certain routes, the number of trips in and out or passing through the EEC and truck routes between ports and industrial zone.
   4. Violation Detection Data, such as the number of trucks exceeding the speed limit, the number of trucks traveling on restricted routes and parking violations within the specified time period.

Chapter 5

Design and development of a system for analyzing, processing and displaying data for traffic and transportation management in the pilot areas/routes



Chapter 5

Design and development of a system for analyzing, processing and displaying data for traffic and transportation management in the pilot areas/routes.

5.1 Development of Application Programs for Analyzing, Processing and Displaying Traffic Data

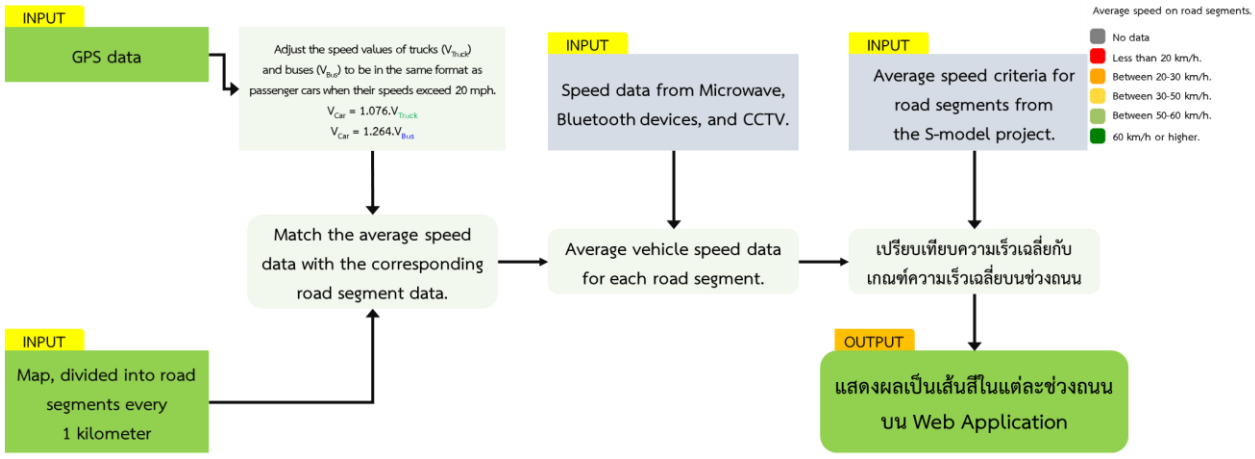
The development of application programs for analyzing and processing data for traffic and transportation management in the pilot areas/routes includes traffic volume, average speed, density, freight transportation routes for trucks with 10 or more wheels and the origin-destination points for transportation. The data is processed through an artificial intelligence (AI) system and displayed through an application system, with the following details:

5.1.1 Data Analysis Process from Traffic Devices for Display on Web Application

The analysis of data from the GPS of the Department of Land Transport, Microwave Radar, Bluetooth Reader and CCTV cameras before displaying it on the Web Application is divided into 7 processes as follows: 1) Analysis of average speed data on midblock sections of the road, 2) Analysis of delay data at signalized intersections, 3) System for detecting trucks exceeding the legally allowed speed limit, 4) System for detecting trucks driving on restricted routes or parking areas, 5) Analysis of hazardous locations/road sections (Black Spot), 6) Analysis of origin-destination points for freight transportation and 7) Analysis of areas with regular traffic congestion. The details are as follows:

5.1.1.1 Analysis of Average Speed Data on Midblock Sections of the Road

The analysis of average speed on road sections uses two types of data for analysis: 1) GPS data from the Department of Land Transport, Microwave Radar, Bluetooth Reader and CCTV cameras and 2) road network map data (Base map), with road sections divided every 1,000 meters in length. The details of the data analysis are shown in **Figure 5.1.1-1**.

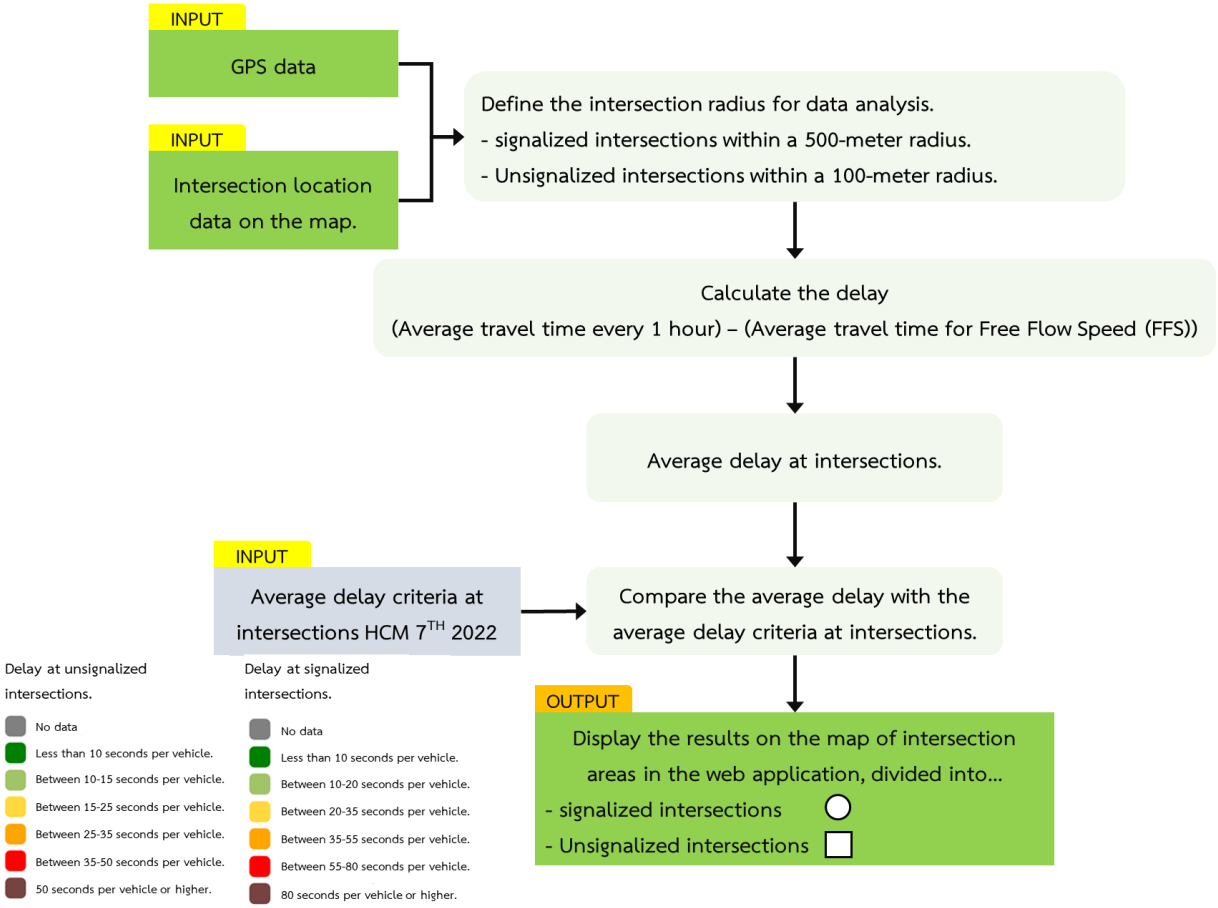


Source: Consultant, 2024

Figure 5.1.1-1 Analysis of Average Speed Data on Midblock Sections of the Road

5.1.1.2 Analysis of Delay Data at Signalized Intersections

The analysis of delay at intersections uses two types of data for analysis: 1) GPS data from the Department of Land Transport and 2) intersection location data, categorized into intersections with no traffic signals and intersections with traffic signals. The details of the data analysis are shown in **Figure 5.1.1-2**.

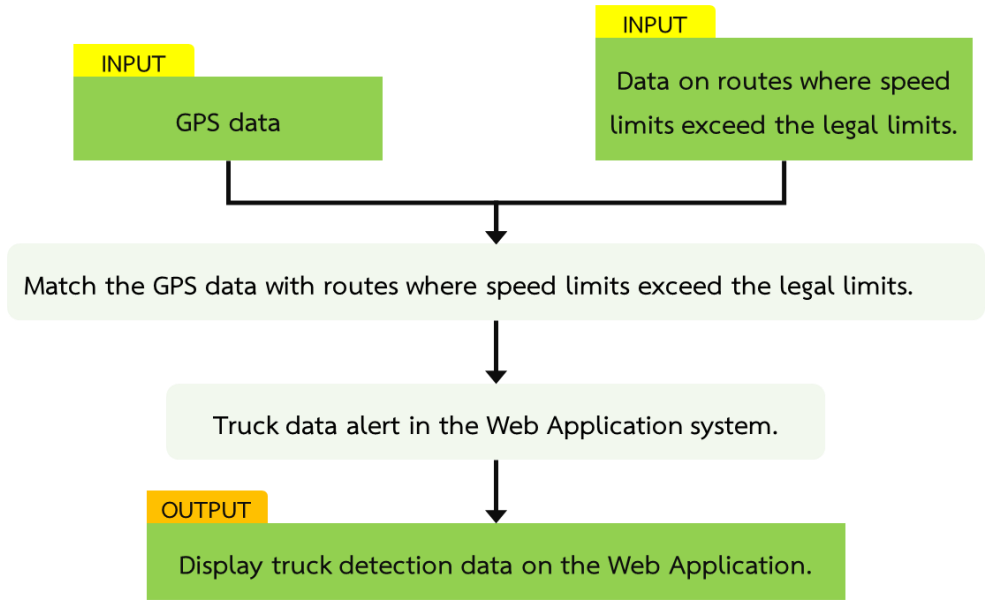


Source: Consultant, 2024

Figure 5.1.1-2 Analysis of Delay Data at Signalized Intersections

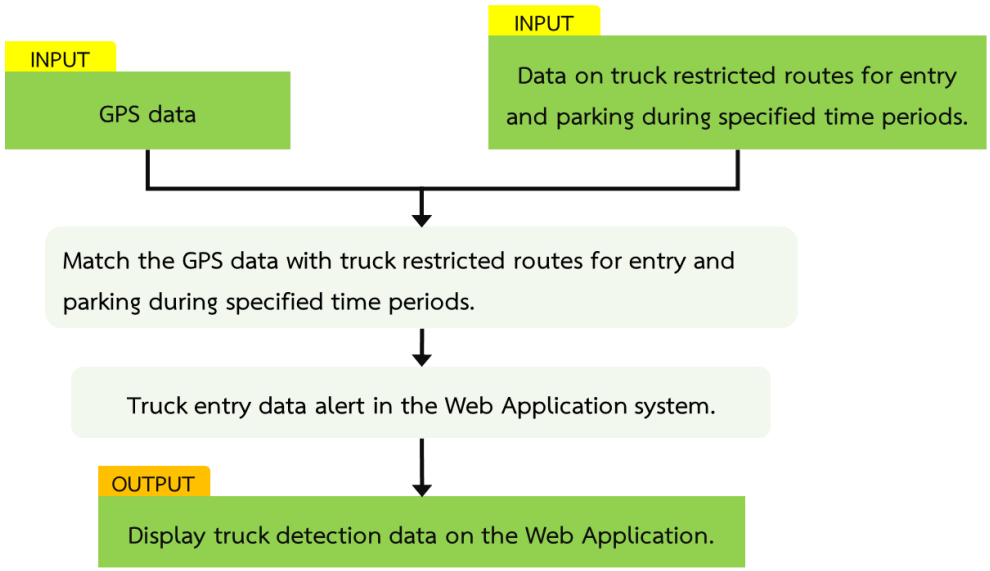
5.1.1.3 System for Detecting Trucks Exceeding the Legally Allowed Speed Limit and Trucks Operating on Restricted Routes or Parking During Designated Times

The development of a system for detecting trucks exceeding the legally allowed speed limit and trucks operating on restricted routes or parking during designated times uses three types of data for analysis: 1) GPS data from the Department of Land Transport, 2) Legal regulation data (such as routes where speed limits are exceeded or where trucks are prohibited from entering or parking during specified times) and 3) road network map data (Base map). The details of the data analysis are shown in **Figure 5.1.1-3** and **Figure 5.1.1-4**.



Source: Consultant, 2024

Figure 5.1.1-3 Development of a System for Detecting Trucks Exceeding the Legally Allowed Speed Limit

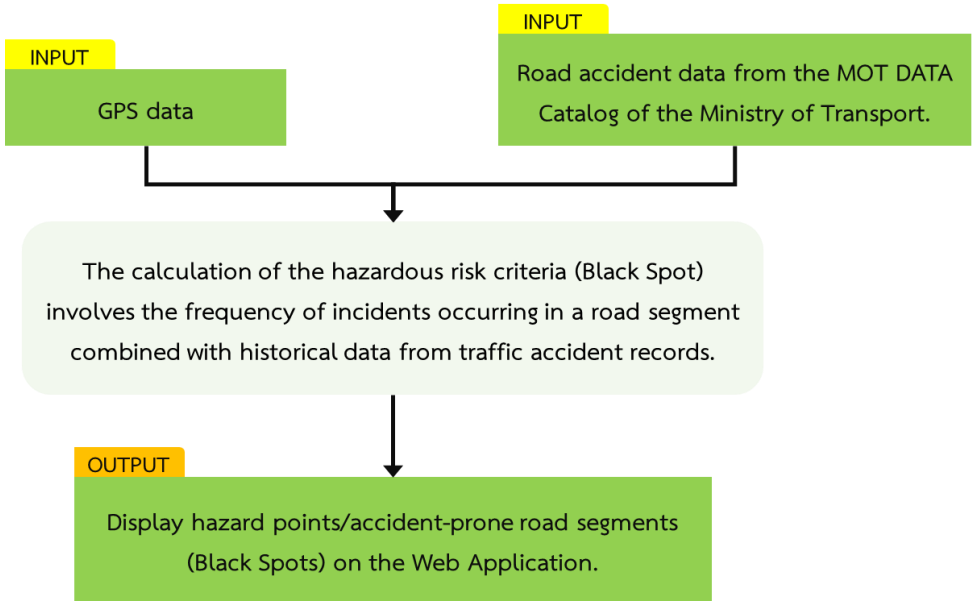


Source: Consultant, 2024

Figure 5.1.1-4 Development of a System for Detecting Trucks Operating on Restricted Routes or Parking During Designated Times

5.1.1.4 Analysis of Hazardous Locations/Road Sections (Black Spot)

The analysis of hazardous locations/road sections (Black Spot) is conducted to identify areas prone to road accidents. The details of the data analysis are shown in **Figure 5.1.1-5.**

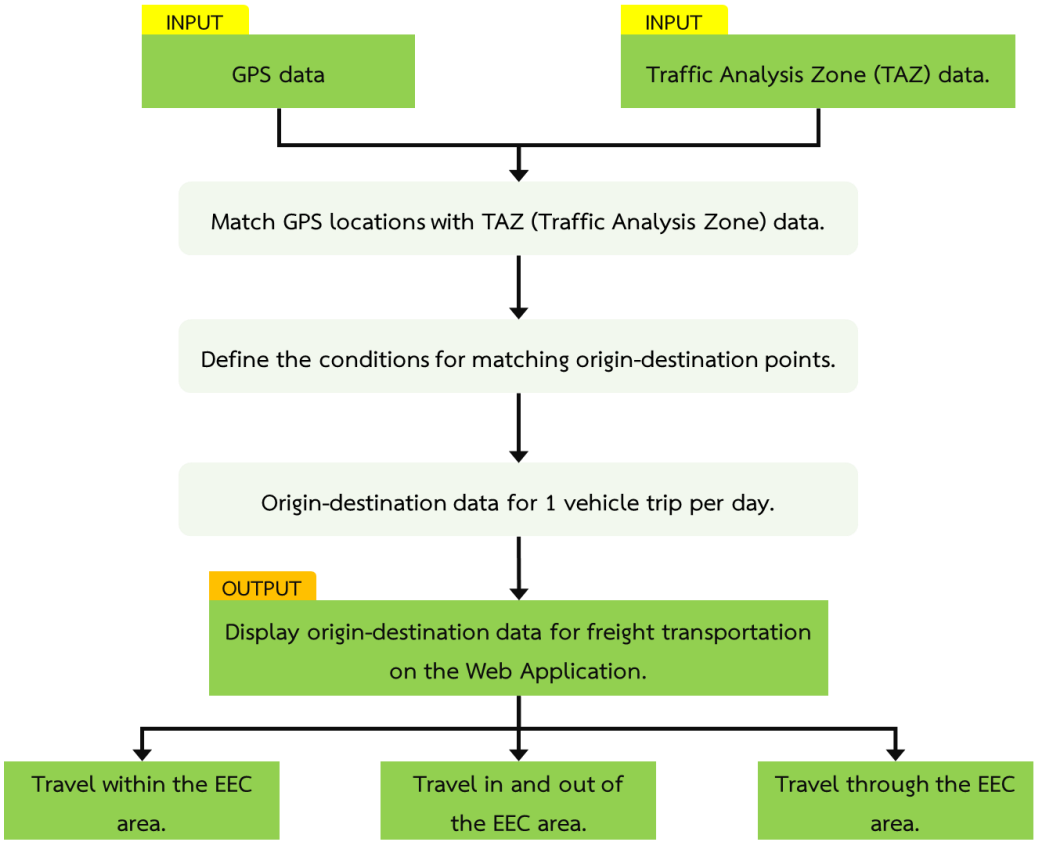


Source: Consultant, 2024

Figure 5.1.1-5 Analysis of Hazardous Locations (Black Spot)

5.1.1.5 Analysis of Origin-Destination Points for Freight Transportation

The analysis of origin-destination points for freight transportation uses two types of data for analysis: 1) GPS data from the Department of Land Transport and 2) Traffic Analysis Zone (TAZ) data for traffic analysis. The details of the data analysis are shown in **Figure 5.1.1-6.**

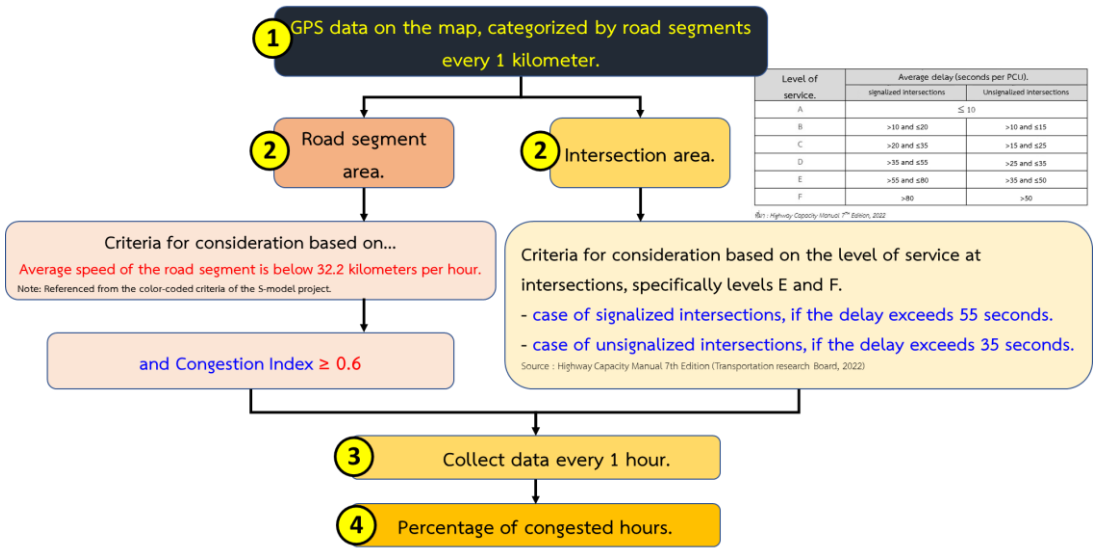


Source: Consultant, 2024

Figure 5.1.1-6 Analysis of Origin-Destination Points for Freight Transportation

5.1.1.6 Analysis of Areas with Regular Traffic Congestion

The analysis of areas with regular traffic congestion uses two types of data for analysis: regularly congested road sections and regularly congested intersections. The details of the data analysis are shown in **Figure 5.1.1-7.**



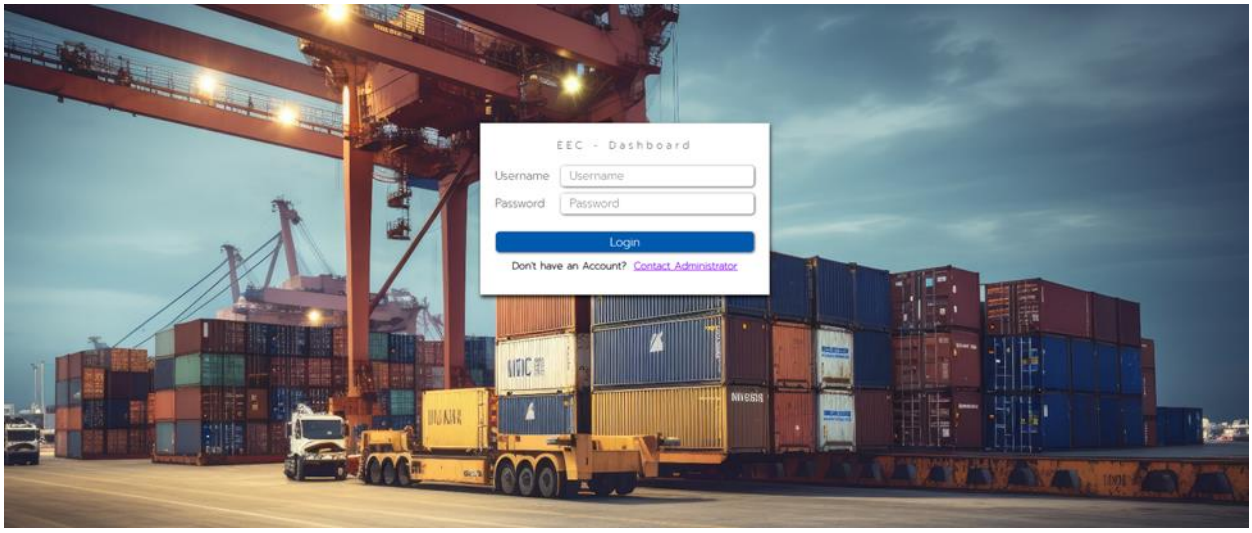
Source: Consultant, 2024

Figure 5.1.1-7 Analysis of Areas with Regular Traffic Congestion

5.2 Development of a System for Displaying Traffic and Transportation Data in Pilot Areas/Routes

The development of a system for displaying traffic and transportation data in pilot areas/routes, along with automatic traffic and transportation report statistics, includes data such as traffic volume entering and exiting the area, average speed summaries of routes, traffic density on routes, and level of service (Level of Service), etc. The data used depends on the information that can be provided by relevant agencies for analysis and recommendations on management strategies for the pilot areas/routes. These strategies may include traffic lane management, traffic signal management, and traffic management to enhance the efficiency of freight transportation, among others. The details are as follows:

The data is displayed through a Web Application, and users can access it via a computer at https://itseec.otp.go.th to reach the login page, as shown in **Figure 5.2-1.**



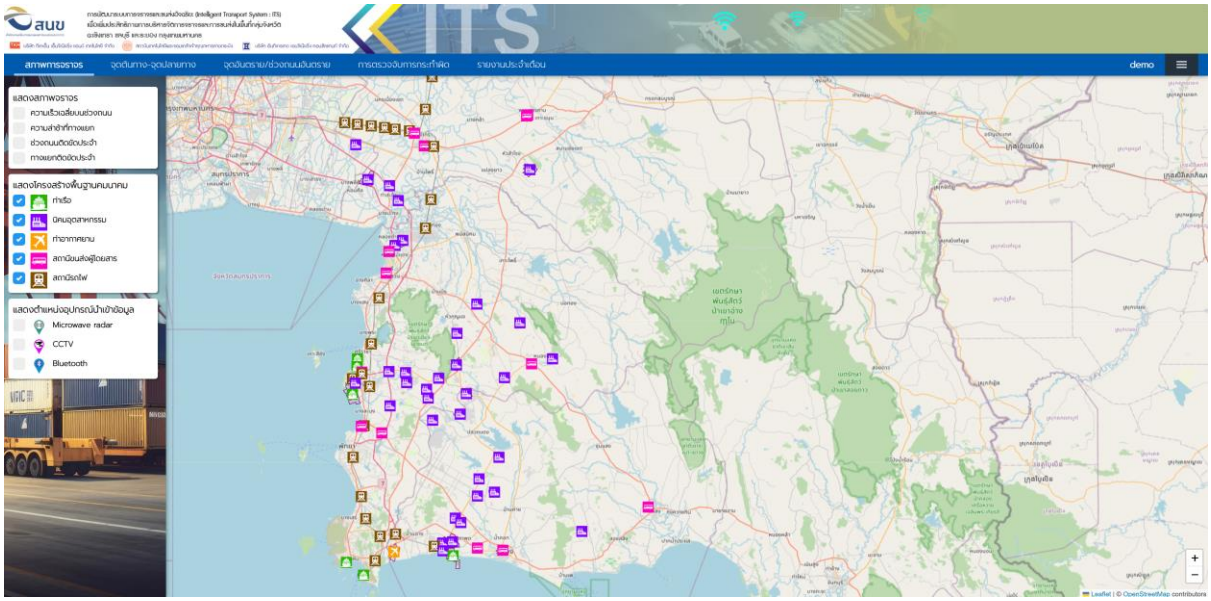
Source: Consultant, 2024

Figure 5.2-1 Example of the Login Page for Accessing Data Levels

The display through the Web Application consists of four main sections: 1) Traffic Conditions, 2) Freight Transportation, 3) Hazardous Locations/Road Sections and 4) Detection of Violations. Each section contains the following details for display:

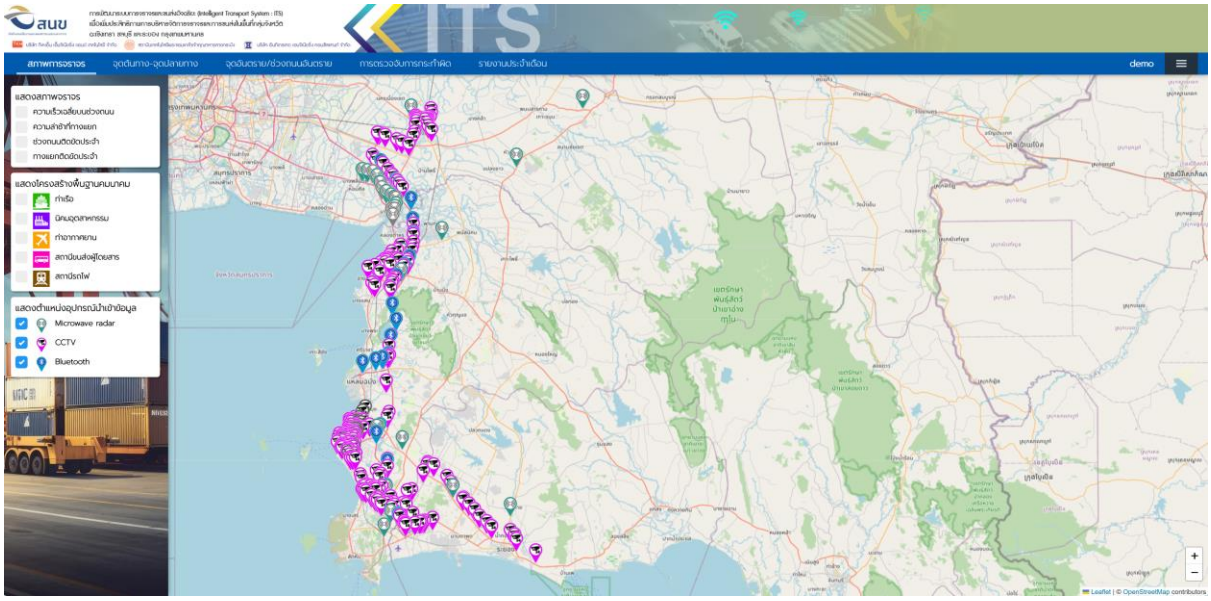
1) Traffic Conditions

The display of traffic conditions in the Chachoengsao, Chonburi, and Rayong provinces includes: (1) the location of transportation infrastructure, such as ports, industrial estates, airports, and passenger transport stations, as well as train stations and routes; (2) the location of traffic monitoring equipment, including CCTV cameras, microwave radar, and Bluetooth devices; (3) traffic conditions, such as average speed on road sections, average delay at intersections; (4) regularly congested road sections; and (5) regularly congested intersections, along with the display of service level colors, as shown in **Figures 5.2-2 to 5.2-3.**



Source: Consultant, 2024

Figure 5.2-2 Location of Transportation Infrastructure

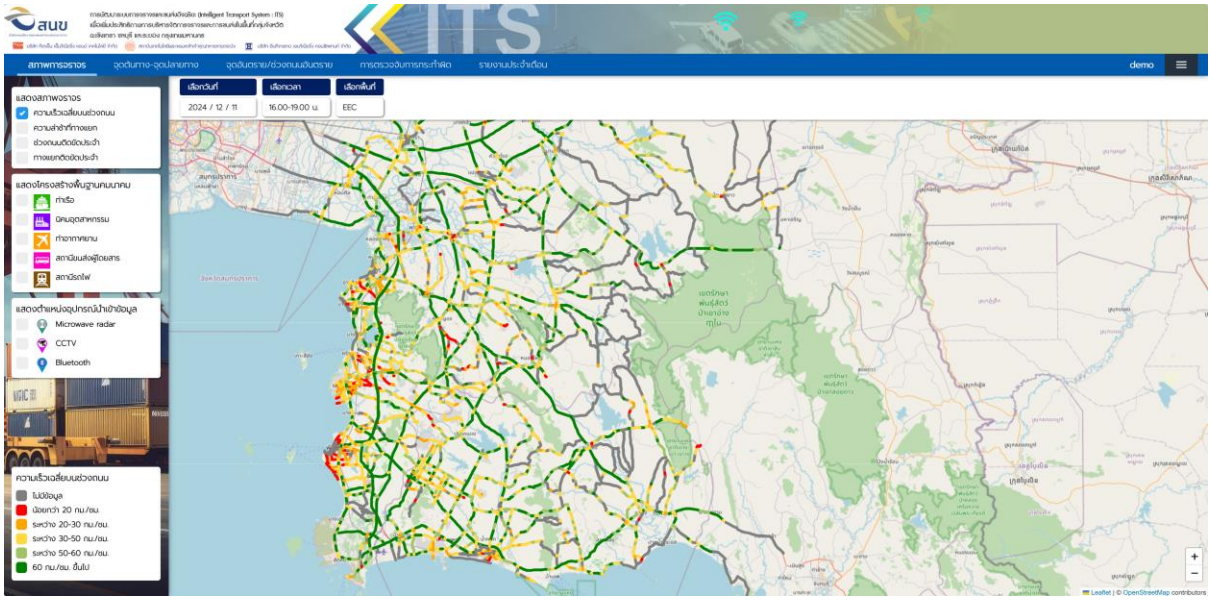


Source: Consultant, 2024

Figure 5.2-3 Location of Data from CCTV Cameras, Microwave Radar and Bluetooth Devices

1.1) Average Speed of the Route (Average Speed)

The display of average speed on the route (Average Speed) is derived from the adjusted GPS data, where the truck speed is presented in the format of passenger vehicle speed, as shown in **Figure 5.2-4.**

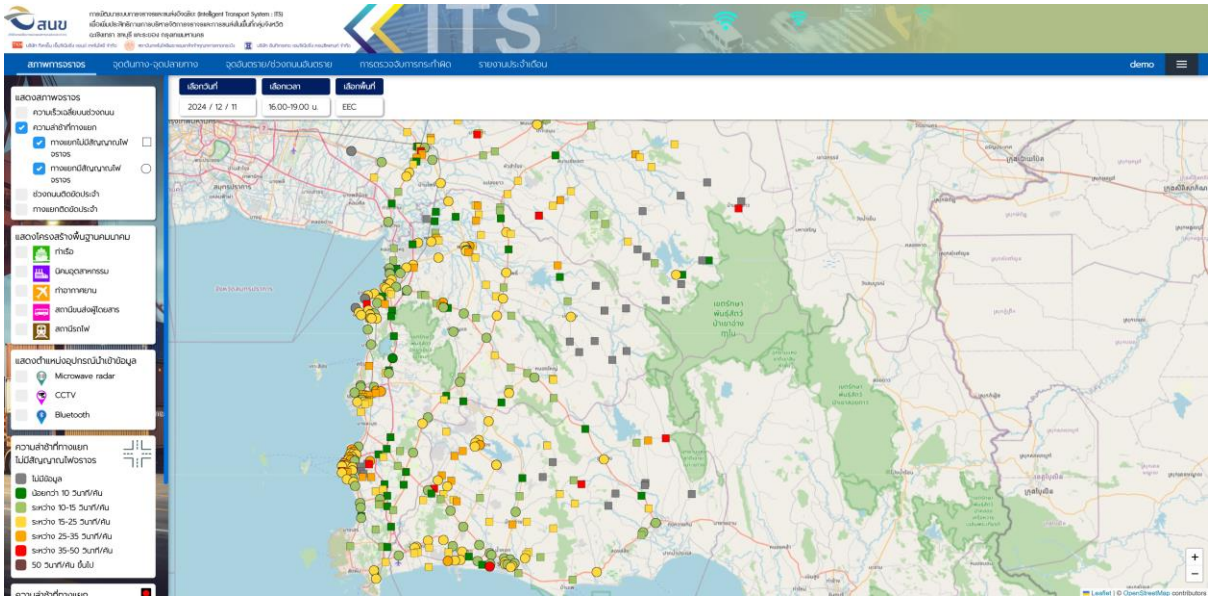


Source: Consultant, 2024

Figure 5.2-4 Average Speed on Road Sections

1.2) Delay at Intersections

The display of average delay at intersections is divided into the average delay at intersections without traffic signals, represented by a square symbol, and the average delay at intersections with traffic signals, represented by a circular symbol, as shown in **Figure 5.2-5.**

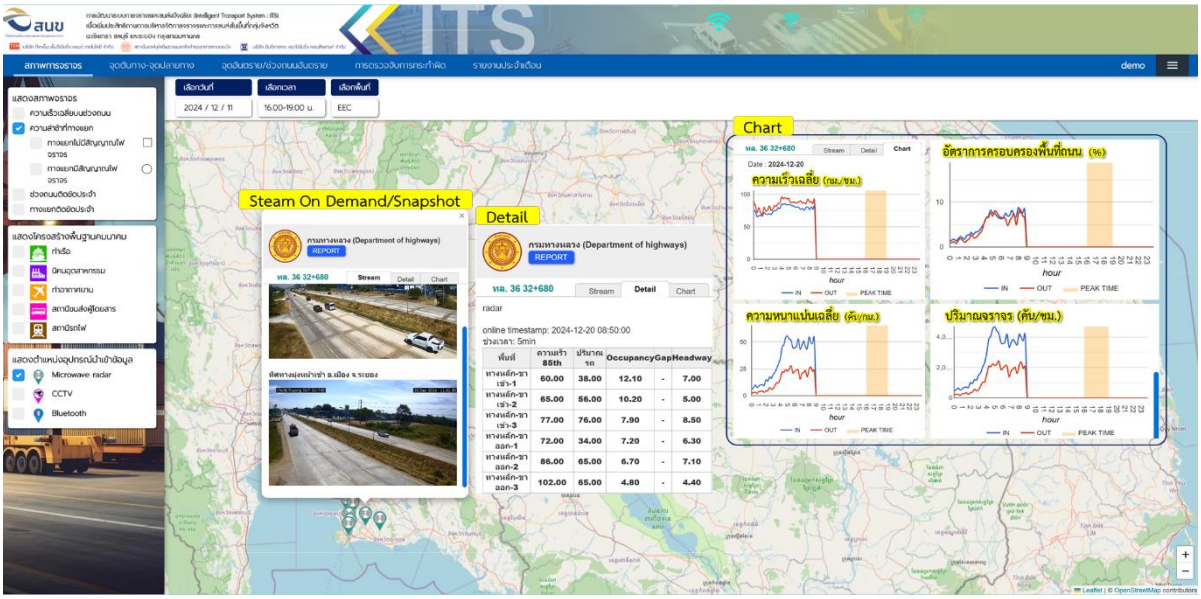


Source: Consultant, 2024

Figure 5.2-5 Average Delay at Intersections

1.3) Hourly Traffic Volume and Average Hourly Speed

Locations equipped with traffic monitoring devices, such as CCTV cameras, microwave radar, and Bluetooth, which can measure traffic indicators, will display hourly traffic volume, average speed, traffic density and road occupancy rate (% occupancy). An example is shown in **Figure 5.2-6.**

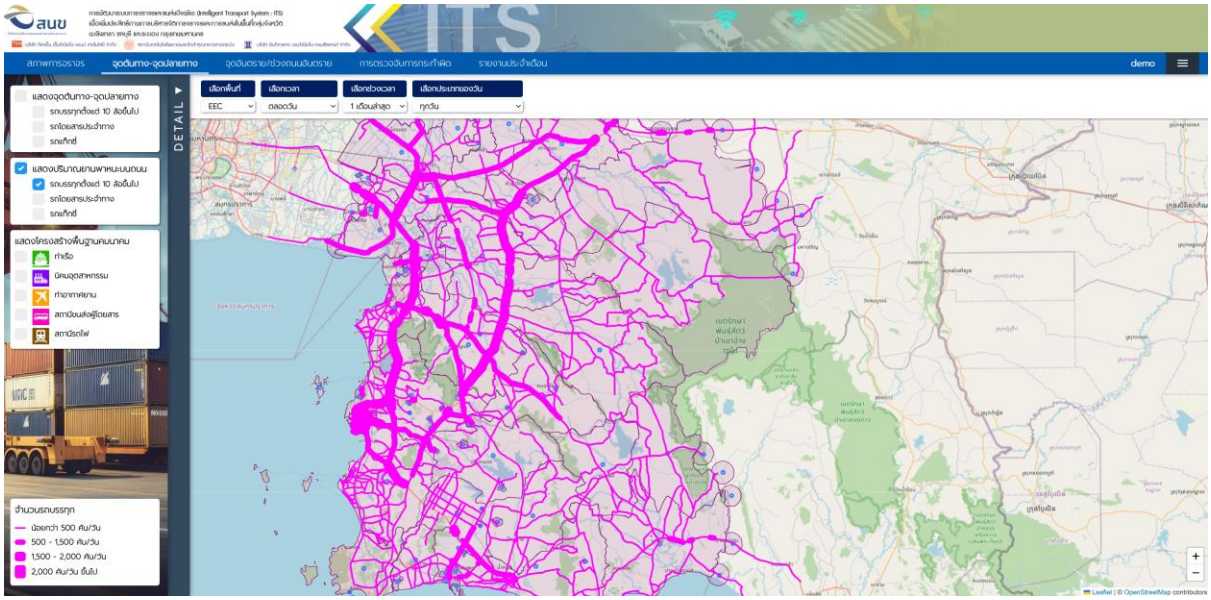


Source: Consultant, 2024

Figure 5.2-6 Example of Hourly Traffic Volume and Average Hourly Speed at Traffic Monitoring Device Locations

1.4) Traffic Density of Trucks with 10 or More Wheels on the Route

The analysis of data on the volume of trucks with 10 or more wheels on the route, using GPS data from the Department of Land Transport, shows that the main routes with high truck volumes include Highway No. 7, 3, 36, 315, 331 and 344, as shown in **Figure 5.2-7.**



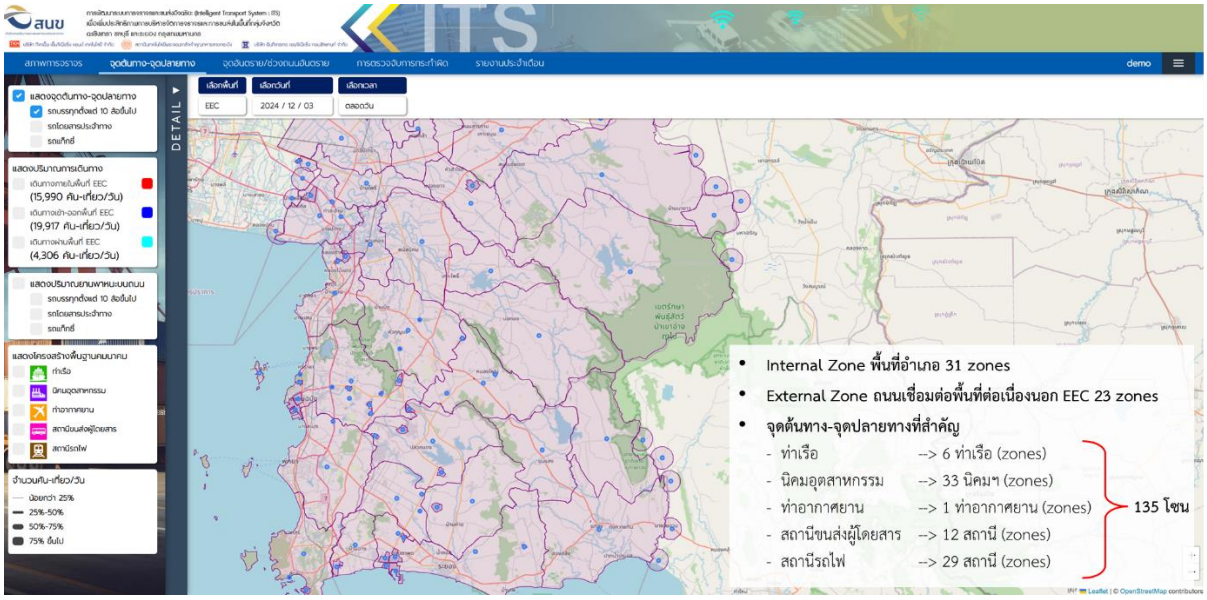
Source: Consultant, 2024

Figure 5.2-7 Traffic Density of Trucks with 10 or More Wheels on the Route

2) Freight Transportation (Logistics)

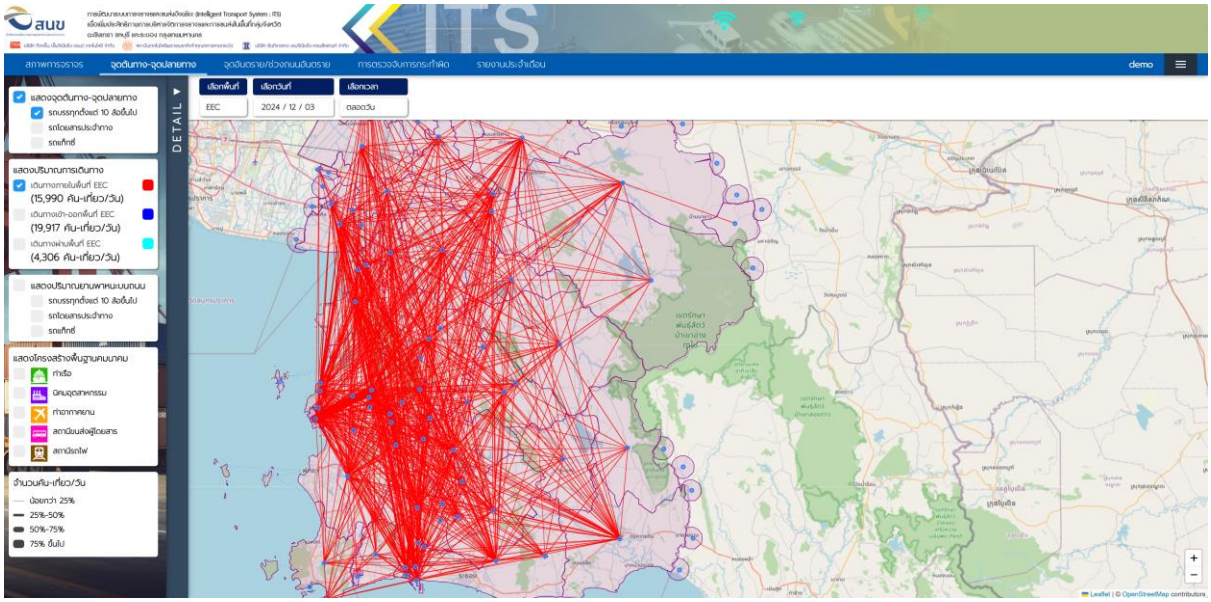
The display of logistics data for freight transportation by trucks with 10 or more wheels in the Chachoengsao, Chonburi and Rayong provinces includes origin-destination points on the TAZ (Traffic Analysis Zone). These are divided into 31 internal zones, representing areas within districts, and 23 external zones, which connect to areas outside the Eastern Economic Corridor (EEC). Key origin-destination points include ports, airports, industrial estates, and passenger transport stations, totaling 81 zones, with a grand total of 135 zones, as shown in **Figure 5.2-8.**

The analysis of transportation volume between different districts is displayed in three formats: 1) travel within the EEC area, 2) travel into and out of the EEC area and 3) travel through the EEC area, along with the traffic volume entering and exiting the area for trucks with 10 or more wheels, as shown in **Figures 5.2-9 to 5.2-11.**



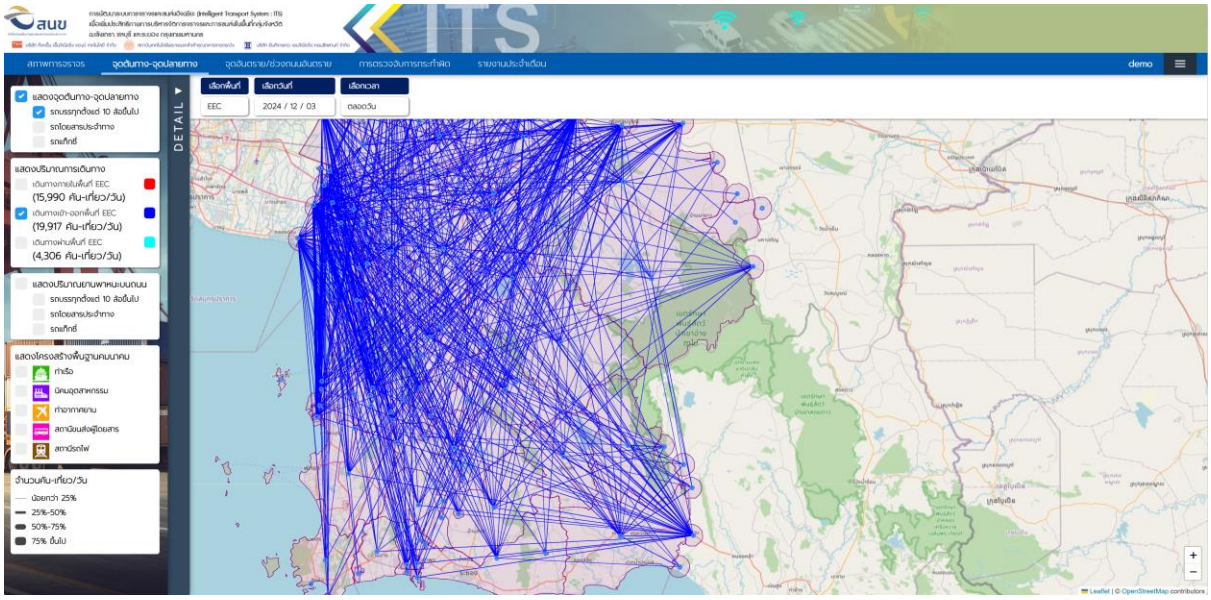
Source: Consultant, 2024

Figure 5.2-8 Traffic Analysis Zone : TAZ



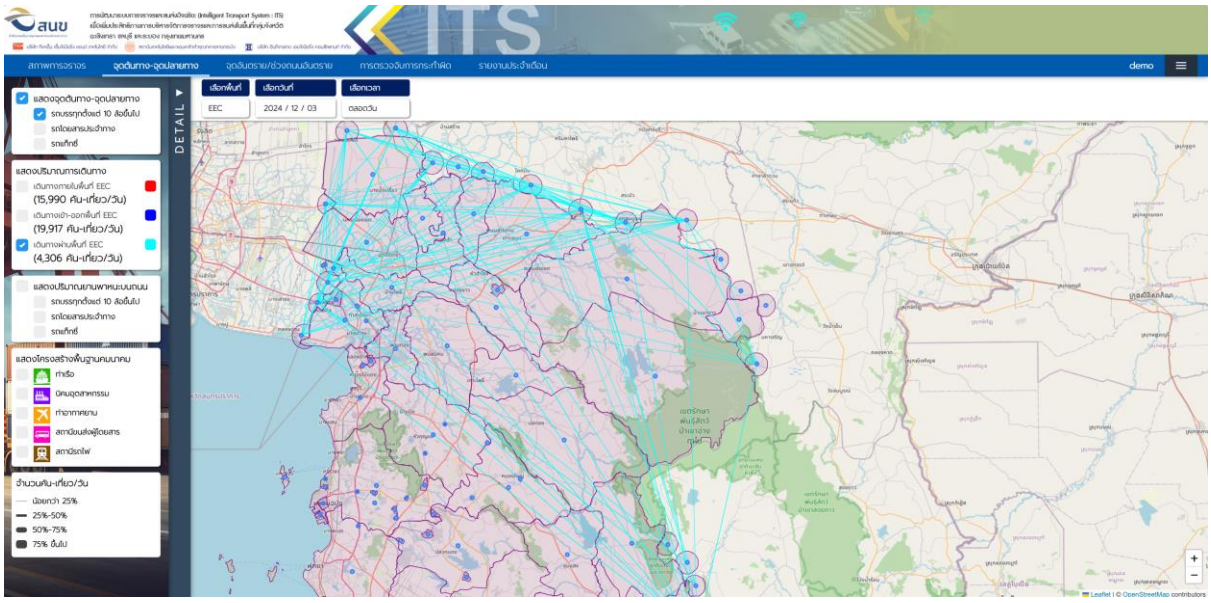
Source: Consultant, 2024

Figure 5.2-9 Travel within the EEC Area



Source: Consultant, 2024

Figure 5.2-10 Travel into and out of the EEC Area

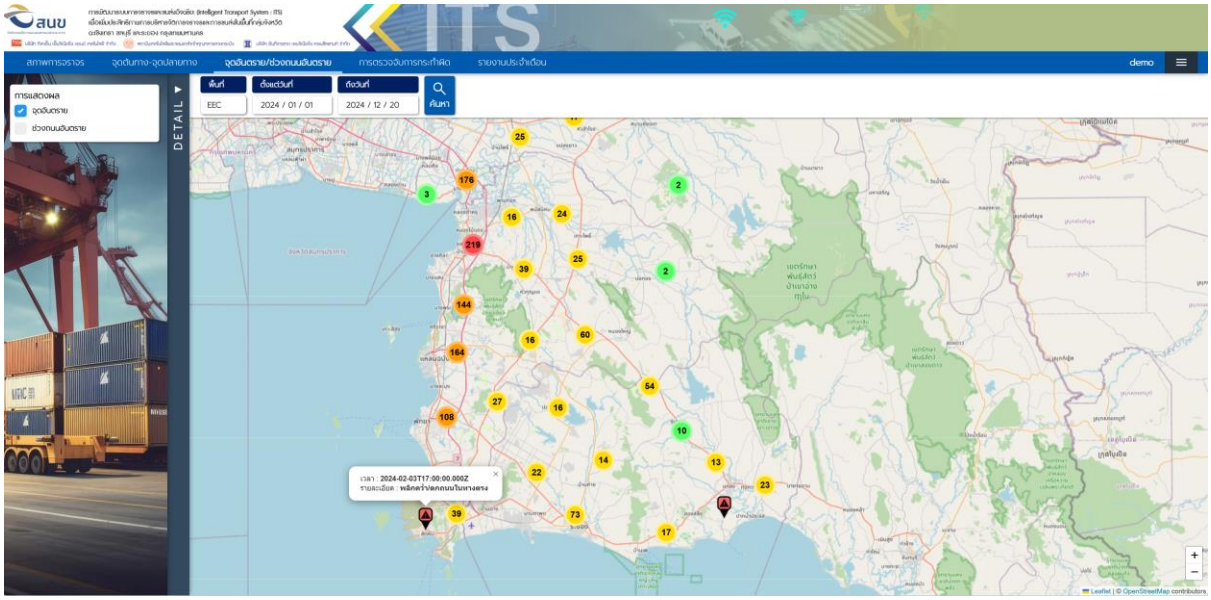


Source: Consultant, 2024

Figure 5.2-11 Travel through the EEC Area

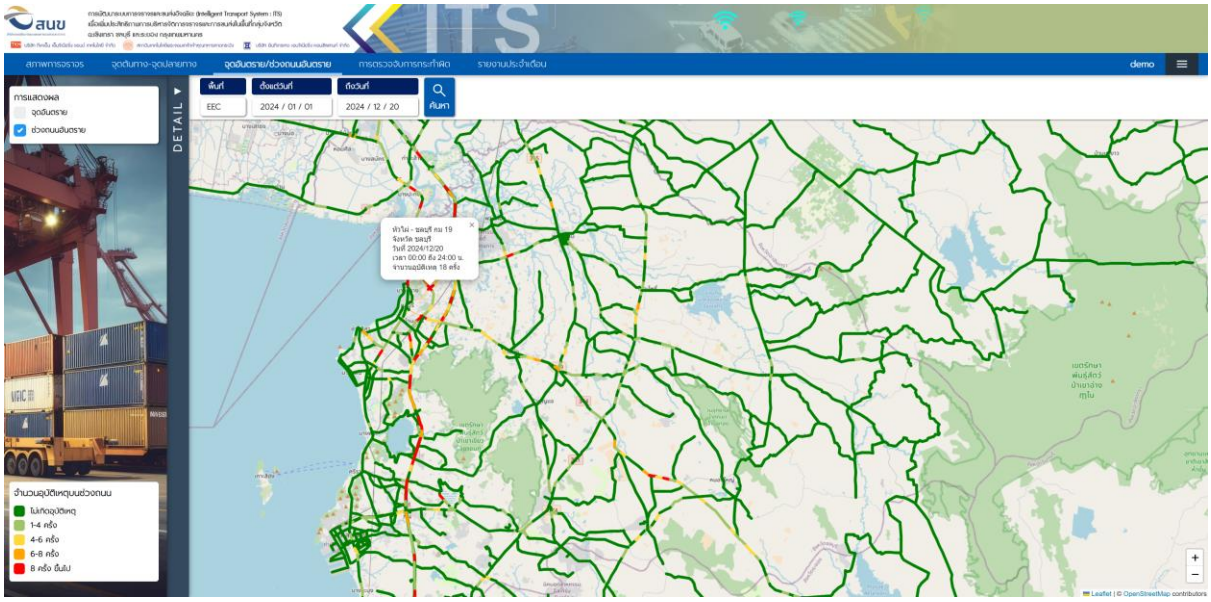
3) Hazardous Locations/Road Sections

The display of hazardous locations/road sections in the Chachoengsao, Chonburi, and Rayong provinces is based on data obtained from the Ministry of Transport's transportation database (MOT DATA Catalog) as shown in **Figure 5.2-12**. The consultant has analyzed and displayed the hazardous road sections where accidents frequently occur, highlighting areas that should be prioritized for safety improvements, as shown in **Figure 5.2-13.**



Source: Consultant, 2024

Figure 5.2-12 Hazardous Locations

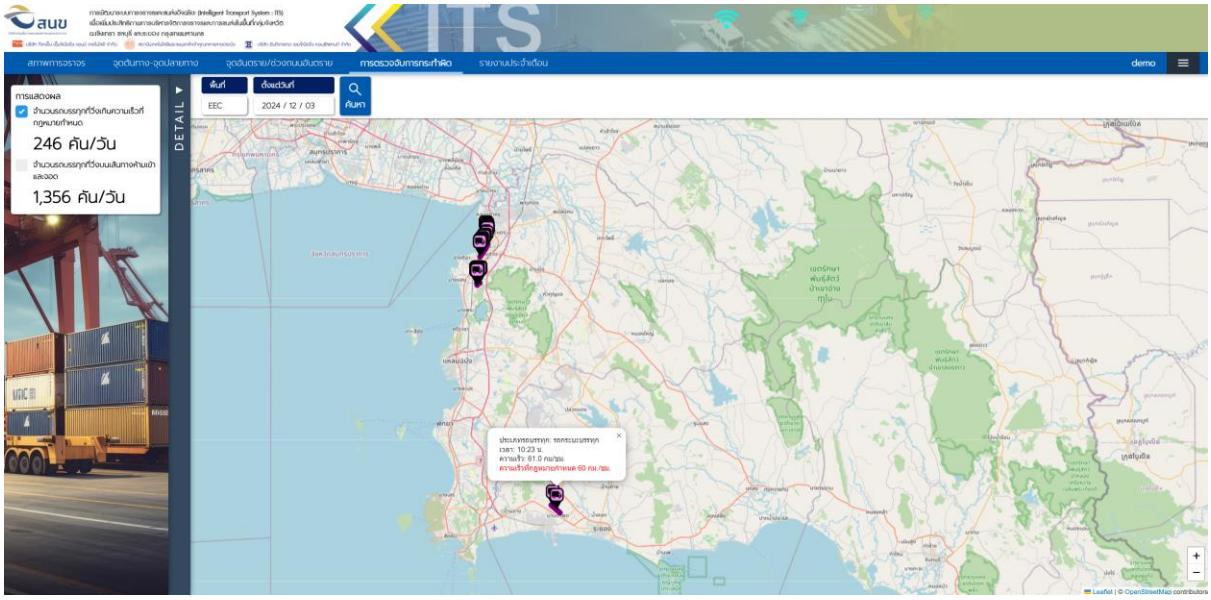


Source: Consultant, 2024

Figure 5.2-13 Hazardous Road Sections

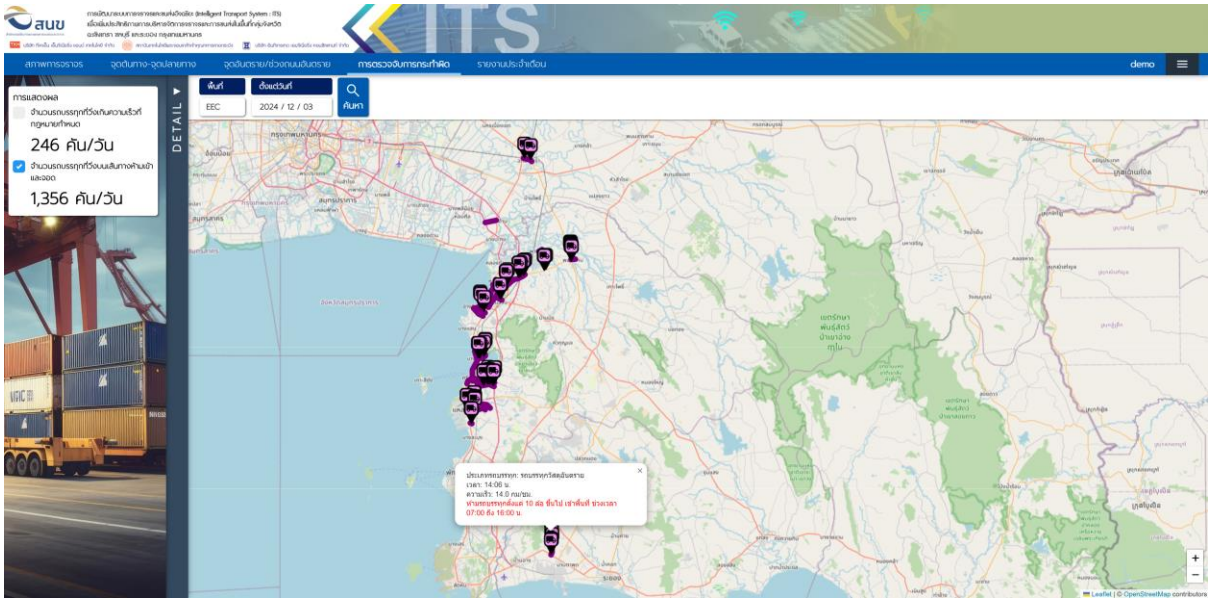
4) Violation Detection

Violation detection in the Chachoengsao, Chonburi and Rayong provinces includes: (1) Speed control zones for trucks and (2) Restricted zones for trucks, such as areas where trucks are prohibited from entering or parking during certain times. These are shown in **Figures 5.2-14 to 5.2-15.**



Source: Consultant, 2024

Figure 5.2-14 Detection of Trucks Exceeding Speed Limits in Speed Control Zones



Source: Consultant, 2024

Figure 5.2-15 Detection of Trucks Entering Restricted Routes or Parking in Prohibited Zones During Specific Times

5) Monthly Reports

The display of monthly report data will summarize the information under the following topics: (1) Regularly congested road sections, (2) Regularly congested intersections, (3) Origin-destination points, (4) Trucks exceeding legal speed limits and (5) Trucks operating on restricted routes or parking in prohibited areas. This will be reported by the EEC area, including Chachoengsao, Chonburi, and Rayong provinces, with detailed information as follows:

1. **Regularly Congested Road Sections**
    - **Time:** Divided into two periods: morning rush hour (06:00-09:00) and evening rush hour (16:00-19:00).
    - **Timeframe:** The most recent 1-month period.
    - **Day Type:** Workdays.
    - **Percentile of Congestion:** 80th percentile.
2. **Regularly Congested Intersections**
    - **Time:** Divided into two periods: morning rush hour (06:00-09:00) and evening rush hour (16:00-19:00).
    - **Timeframe:** The most recent 1-month period.
    - **Day Type:** Workdays.
    - **Percentile of Congestion:** 80th percentile.
3. **Origin-Destination Points**
    - **Vehicle Types:** Divided into three categories 1) Trucks with 10 or more wheels, 2) Public buses and 3) Taxis.
    - **Travel Volume per Day:** Divided into three sections 1) Travel within the EEC area, 2) Travel into and out of the EEC area and 3) Travel passing through the EEC area.
4. **Trucks Exceeding Legal Speed Limits**
    - **Data:** Volume of trucks with 10 or more wheels exceeding the legal speed limit (vehicles/day).
5. **Trucks Operating on Restricted Routes or Parking in Prohibited Areas**
    - **Data:** Volume of trucks with 10 or more wheels operating on restricted routes or parking in prohibited areas (vehicles/day).

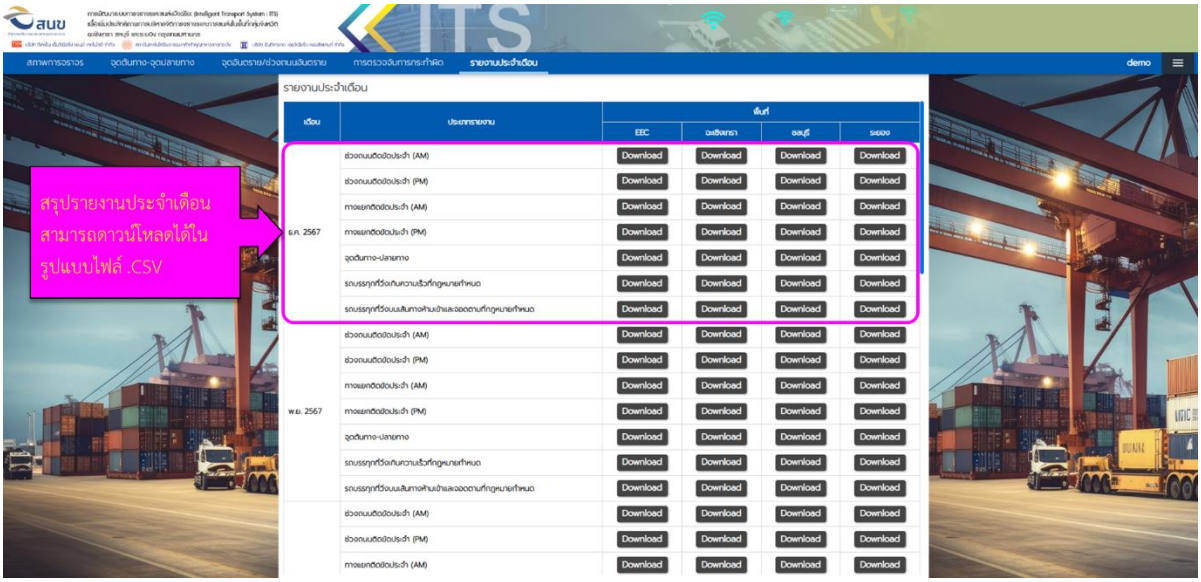
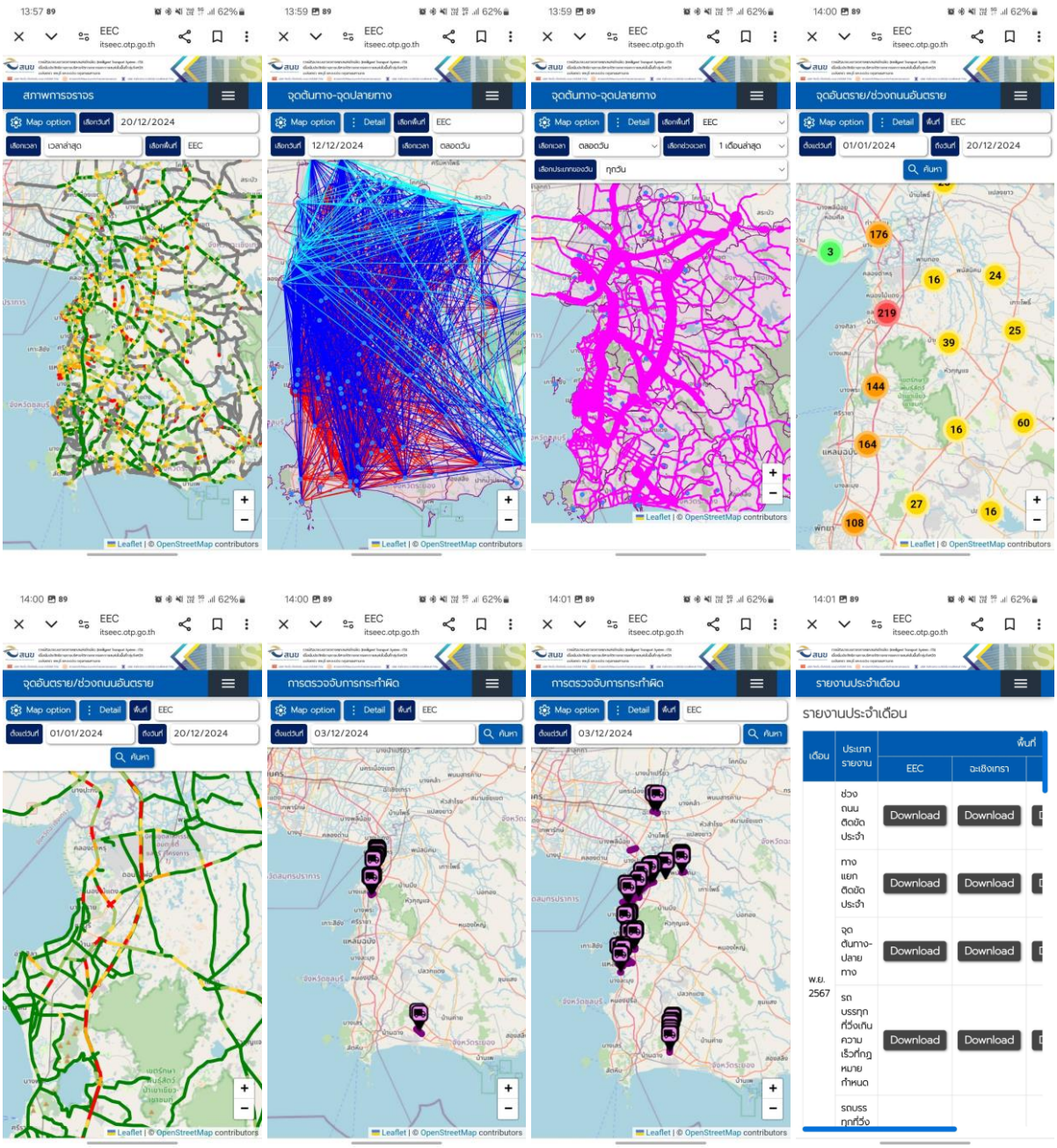


Figure 5.2-16 Monthly Report

5.3 Displaying Application Data via Mobile Phones

Traffic conditions, logistics, hazardous locations/dangerous road segments and traffic violations in Chachoengsao, Chonburi, and Rayong provinces are displayed through a dashboard interface on smartphones. These displays are accessible via a web browser on the smartphone and offer the same analytical structure, data visualization and access levels as the desktop version. An example is shown in **Figure 5.3-1.**

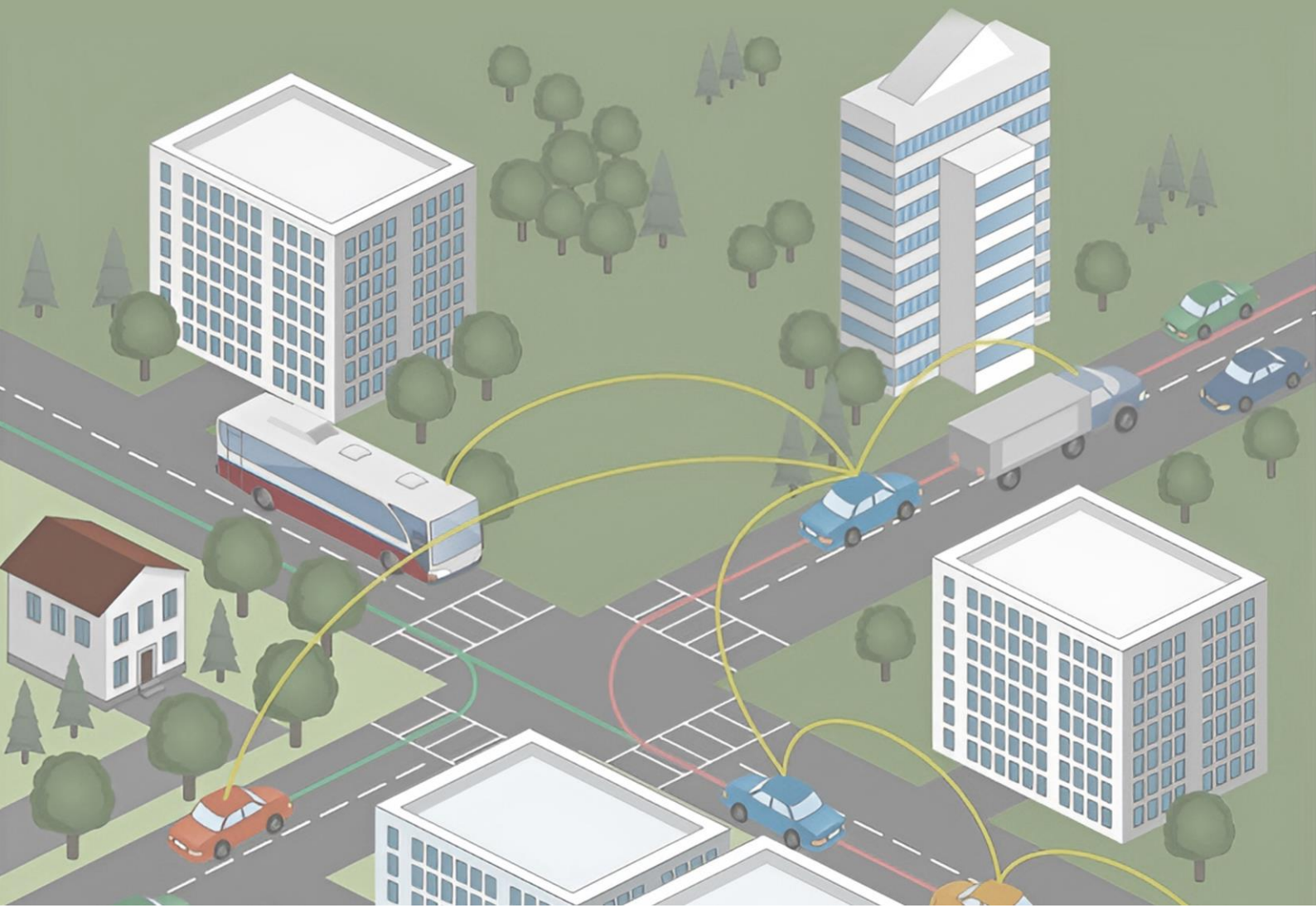


Source: Consultant, 2024

Figure 5.3-1 Displaying Analytical Data on Smartphone Screens

Chapter 6

Meetings, Training, Seminars and Public Relations



Chapter 6
Meetings, Training, Seminars and Public Relations.

6.1 The first project seminar

The first project seminar invited target groups, including relevant government agencies, private sector organizations, and the general public, to gather feedback and suggestions. The seminar was conducted in Chachoengsao, Chonburi and Rayong, with one session held in each province, totaling three sessions. Each session had at least 50 participants. The key points of feedback and suggestions gathered from the seminars focused on three main object: 1) Current traffic issues in routes/areas 2) Information on traffic management technology systems in the areas and 3) Opinions on the study of traffic management technology development in the areas, including other related issues.

The seminar discussions and significant feedback and suggestions from each province are summarized as follows:

1) Chachoengsao

Held on Wednesday, September 27, 2023, at the Chonlathit 1 Room, Sunthara Wellness Resort, Chachoengsao.

Figure 6.1-1 The First Seminar in Chachoengsao Province.

2) Chonburi

Held on Thursday, September 28, 2023, at the Grand Ballroom 1, Amari Pattaya Hotel, Chonburi.

Figure 6.1-2 The First Seminar in Chonburi Province.

3) Rayong

Held on Friday, September 29, 2023, at the Soithong 3 and 4 Rooms, Golden City Hotel, Rayong.

Figure 6.1-3 The First Seminar in Rayong Province.

6.2 The Second Seminar

The second project seminar invited target groups, including relevant government agencies, private sector entities, and members of the public, to share their opinions and suggestions. The seminar was conducted in three provinces: Chachoengsao, Chonburi, and Rayong, with one session held in each province, totaling three sessions. Each seminar was attended by no fewer than 80 participants. The key topics of opinions and suggestions gathered during the seminars were categorized into two main issues: (1) The integration of data and the development of application programs for analyzing, processing, and visualizing traffic data within the EEC area. (2) Pilot projects and a draft plan for developing intelligent traffic and transportation systems in the EEC area. The summary of the seminars, along with the critical opinions and suggestions gathered from each province, is as follows:

1) Chachoengsao Province

The second seminar in Chachoengsao Province was held on Monday, January 20, 2025, at the Royal Inn Room, Sunthara Wellness Resort and Hotel, Chachoengsao Province.

The seminar was officially opened by Mr. Prasit Intachot, Deputy Governor of Chachoengsao Province.

Seminar Sessions and Presentations

Seminar in Chachoengsao Province

Figure 6.2-1 The Second Seminar in Chachoengsao Province

2) Chonburi Province

The second seminar in Chonburi Province was held on Tuesday, January 21, 2025, at the Daowadung Room, 7th Floor, The Siamese Pattaya Hotel, Chonburi Province.

The seminar was officially opened by Mr. Adirek Unosot, Deputy Governor of Chonburi Province.

Seminar Sessions and Presentations

Second Seminar in Chonburi Province

Figure 6.2-2 The Second Seminar in Chonburi Province

3) Rayong Province

The second seminar in Rayong Province was held on Wednesday, January 22, 2025, at the Soi Petch 1 Room, Golden City Hotel, Rayong Province.

The seminar was officially opened by Mr. Kalachai Thepwarachai, Deputy Governor of Rayong Province.

Seminar Sessions and Presentations

The second seminar in Rayong Province

Figure 6.2-3 The second seminar in Rayong Province

6.3 Academic Training

The academic training sessions were held three times (3 session):

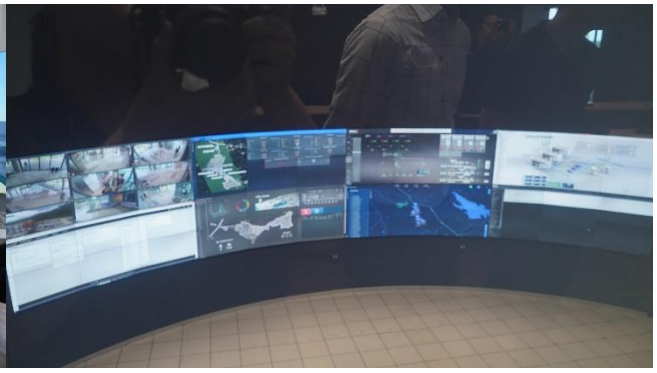
- **The first session** was held on July 4-5, 2024, at the Test Meeting Room, 1st Floor, T Pattaya Hotel, Bang Lamung District, Chonburi.
- **The second session** took place on July 10-11, 2024, at the Saengphet 3 Room, 2nd Floor, Golden City Hotel, Rayong City, Rayong.
- **The third session** was held on July 15-16, 2024, at the Daow Dueng Room, 7th Floor, The Siamese Hotel, Pattaya City, Chonburi.

These sessions aimed to transfer knowledge and technology related to the development of Intelligent Transport Systems (ITS) to the Office of Transport and Traffic Policy and Planning (OTP) or other relevant agencies.

Listening to a lecture on system architecture and data integration.

Human Resources and Innovation Development Center.

ATC Simulator Room, U-Tapao Airport.



Operations Room, IOC Building.

CAV Proving Ground Vehicle Testing Center.

Figure 6.3-1 Illustration of the Academic Training Session.