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Executive Summary Report

1.1 Introduction

The principles and rationale of the project are due to the increasing traffic congestion in Bangkok and vicinity areas especially during rush hours from the average speed survey during the rush hours of inner Bangkok at 15 km / h, the central Bangkok at 26 km / h and the outer Bangkok at 31 km / hr. One of the causes is from the increasing use of personal every year and people do not popularly use public transportation. It is found that the proportion of people traveling in Bangkok and vicinity areas by personal cars is 67.77% and only 32.23% use public transportation. One of the important problems that people do not use public transport is because they do not know the information of travel routes and public transport services in the areas including the accuracy of the route information of each public transport system.

The Thailand's 3-year digital government development plan (2016-2018) has the vision in bringing the Thai government to a digital government with the integration among the agencies and the intelligent operations to provide services centered by people and truly driven to the real changes.

The draft of digital development plan for the economy and society of the Ministry of Transport (2017-2021) having the vision to elevate Thai transportation to the digital transportation era aims to develop the innovation on a digital basis to enhance the missions of transportation to be driven effectively with good management of the government sector sustainably. Moreover, the draft of strategic framework for the development of the Thai transport system for 20 years (2017-2036), Strategy 1: Integrated Transport Systems, defines the development of infrastructure for transportation and services with the integration of all relevant agencies in the planning and development of infrastructure in order to create a transportation network that covers transportation in the city and between cities with the link (connection between various modes of transportation in Bangkok, vicinity areas and regional main cities). The plan to develop public transport systems in Bangkok, vicinity areas and regional cities is set to promote agility in travel and transportation by promoting the use of technology and innovation in transportation and in the draft of master. In addition, the plan of development on intelligent traffic and transportation systems in Bangkok and vicinity areas also determines the adaptation of intelligent technology systems to help solving traffic and transportation problems in order to increase travel efficiency focusing on the vision of Thailand Smart Transport.

From the above policy, Office of Transport and Traffic Policy and Planning, Ministry of Transport, as the agency recommending the transportation and traffic policies realizes the importance of travel data integration and the necessity to publicize the relevant public transport information systems by roads, rails and waterways for accurate travel and the travel planning correctly and appropriately. This can help reducing time and costs including supporting travel in a manner that is linked to a more efficient public transport network system. Therefore, the idea is created in applying the information and communication technology (ICT) to facilitate public travel by public transport. The traveling navigation system by public transport in Bangkok and vicinity areas is then studied and created.

The purposes of the project are to prepare the database of public transport routes and public transport services of various agencies under the Ministry of Transport into the same system and to create the web applications and mobile applications to publicize the routes and services of public transport as the information used for planning and decision making in choosing the route and public transport that is accurate, reasonable, convenient and fast.

The scope of study and operations consists of 4 parts as follows:

Part 1 is to study, review the study results or the operational performance with relevant agencies both domestically and internationally, to explore and analyze the linkage of public transport networks by roads, rails and waterways that provides services in Bangkok and vicinity areas (Nonthaburi, Pathum Thani, Samut Prakan, Samut Sakhon and Nakhon Pathom).

Part 2 is to design and develop the database from the collection and analysis of public transport networks by roads, rails and waterways in Bangkok and vicinity areas.

Part 3 is to design and develop the Web Application and Mobile Application to be used in traveling navigation with public transportation services provided in Bangkok and vicinity areas including the design and development the information linking systems with public transport between the Office of Transport and Traffic Policy and Planning and related agencies.

Part 4 is to arrange the seminar for listening to the opinions and promoting the project along with academic training.

1.2 Study, review the study results or the operational performance with relevant agencies both domestically and internationally, explore, and analyze the linkage of public transport networks via roads, rails and waterways that are serviced in Bangkok and vicinity areas

1.2.1 Study, review the study results or the operational performance with relevant agencies both domestically and internationally, and explore the routes and public transport systems via roads, rails and waterways that are serviced in Bangkok and vicinity areas

From the revision on related operations including the integration of database creation, dissemination of travel and public transport information with relevant agencies both in the country and abroad especially in Thailand, the study will be in the issue of providing information to the public, accuracy, and up-to-date information, plans for the improvement, dissemination, or integration of data.

In addition to this and for the development of public transportation system in Bangkok and vicinity areas to be efficient and to support the use well including being user friendly, the consultant has reviewed the effective information system in Thailand and abroad with the summarized details as shown from Table 1 to Table 2.

Table 1 Summary of details of applications served for the use in Thailand

Domestic	Application	Support of systems			Road transportation systems			Rail transportation systems				Waterway transportation systems				GPS Tracking	GPS Location	Support the updates from the users
		Web	Android	iOS	BMTA	BRT	Vans	BTS	MRT	Airport Rail Link	SRT	Chao Phraya Express Boat	Klong Saen Saeb Boat	Klong Phasi Charoen Boat	Ferries			
Only in Thailand	Viabus		50,000+	3 navigations	✓			✓	✓							✓	✓	✓
	BMTA	✓	50,000+	17 navigations	✓												✓	
	Bangkok MRT		100,000+	62 travels					✓									
	Cityglide	✓			✓													
Support Thailand	Google Maps	✓	1,000 million +	1 navigation	✓	✓		✓	✓	✓	✓	✓	✓				✓	✓
	moovit	✓	10 million +	2 navigations	✓	✓		✓	✓	✓	✓	✓	✓		✓		✓	✓
	HERE WeGo	✓	10 million +	21 navigations	✓	✓		✓	✓	✓		✓	✓				✓	✓
	City Rail Map			69 travels		✓		✓	✓	✓							✓	

Remarks: ✓ = Applicable and N/A = Applicable but not support the navigation

Source: Consultant (2018)

 Information as on 8th May, 2018

Table 2 Summary of details of foreign applications

Abroad	Application	Support of systems			Road transportation systems		Rail transportation systems			Waterway transportation systems	GPS Tracking	GPS Location	Support the updates from the users
		Web	Android	iOS	Bus	Taxi	MTR	Light Rail	TRAM	Ferries			
Hong Kong	MTR Mobile		1 million +	15 travels	✓		✓	✓				✓	✓
	HKeTransport		500,000+	60 travels	✓							✓	
	Citybus NWFB		1 million +	3 travels	✓							✓	✓
Switzerland (Zurich)	SBB Mobile	✓	1 million +	2 navigations			✓					✓	✓
	Post bus	✓			✓		✓		✓	✓		✓	
	ZVV		100,000+	16 travels		✓	✓					✓	✓
France (Paris)	Paris Metro Map and Routes		500,000+	34 navigations		✓	✓					✓	✓
	RATP : Subway Paris		5 million +	46 travels	✓		✓		✓			✓	✓
Singapore	Singapore MRT and LRT		100,000+	23 travels			✓	✓					✓
	bus@sg		100,000+	7 travels	N/A							✓	✓
	MyTransport Singapore		1 million +	13 travels	N/A		N/A	N/A				✓	✓
	Gothere		100,000+	5 travels	✓	✓	✓	✓				✓	✓

Remarks: ✓ = Applicable and N/A = Applicable but not support the navigation

Source: Consultant (2018)

Information as on 8th May, 2018

When analyzing the advantages and limitations of the reviewed information system, it can be summarized as shown in Table 3.

Table 3 Summary of the advantages and limitations of the reviewed information system

Advantages	Limitations
- The applications are easy to be used. - Support many types of public transportation systems - Be able to estimate the time spent on travel - Be able to plan the travel - Be able to tell the estimated travel cost - Support navigation from position - position - Support searching and showing how to walk to the nearest sign - Support the updates from users - GPS tracking is used to indicate the location of the bus - Tickets can be brought through the applications - The details in the stations are described.	- Not cover all public transportation systems - Not be able to estimate the arrival time of the bus - Not be able to specify the source and destination from selecting a map or position - Support the web page operation only - Navigation is not possible to cross the road.

Remarks: Source: Consultant (2018)

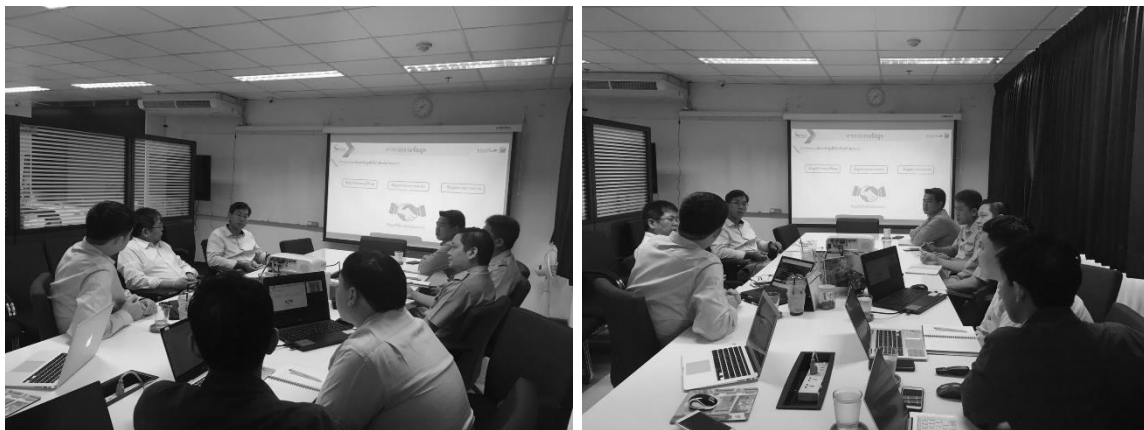
1.2.2 Collect the route information, starting points, destinations, stations, stops, and information related to public transportation via roads, rails and waterways that provide service routes in Bangkok and vicinity areas.

From the operation of collection on the route information, starting points, destinations, stations, stops, and information related to public transportation via roads, rails and waterways that provide service routes in Bangkok and vicinity areas and from the revision on related operational performance with detailed information including route information, starting points, destinations, stations, stops, and related information, for example, opening and closing times of service provision, fare prices, facilities to the disability, etc., cover the fixed route transportation system as shown in Table 4.

Table 4 Summary of the details for the collection of route information of the public transportation system available in Bangkok and vicinity areas

Mode	System	Routes	Stops
Roads	Category 1 Bangkok vehicles (Buses)	212	5047
	Category 1 Bangkok vehicles (Express buses)	1	12
	Category 1 Bangkok vehicles (public vans)	150	Using the stops together with buses category 1 and virtual stop
	Category 1 regional vehicles	10	164
	Category 2 vehicles	2	15
	Category 3 vehicles	14	156
	Category 4 Bangkok vehicles	124	Using the stops together with buses category 1 and virtual stop
	Category 4 regional vehicles	203	Using the virtual stop
Rails	BTS	2	36
	MRT	2	34
	Airport Rail Link	1	8
	State Railway of Thailand	7	161
Waterways	Chao Phraya Express Boat	4	34
	Khlong Saen Saeb Boat	1	29
	Khlong Phasi Charoen Boat	1	15
	Ferries	28	55

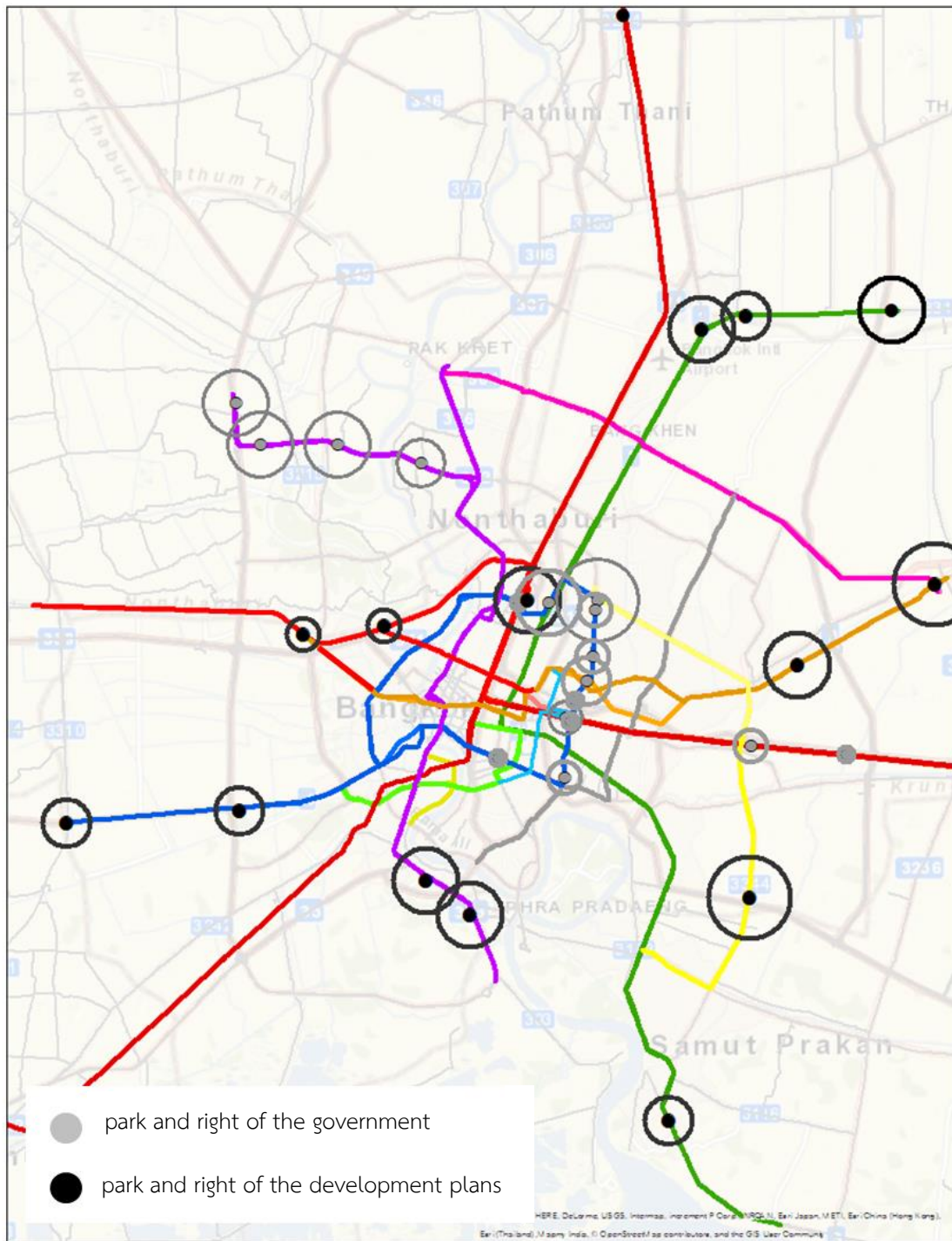
In addition, there is an accident data linkage to the information and traffic conditions by coordinating with the Office of Transport and Traffic Policy and Planning (OTP) for information assistance to traffic radio stations (JorSor. 100) and the Intelligent Traffic Information Center Foundation (iTIC) to discuss the connection and request of detailed information about accident data, information, and traffic conditions to be used for designing and developing application databases to be more efficient. The coordination is given from the Intelligent Traffic Information Center Foundation (iTIC) to meet, receive the information, and to answer the questions on various issues on 24th September, 2018, as shown in Picture 1.



Picture 1 Make the arrangement to see the chief of Intelligent Traffic Information Center Foundation (iTIC) to ask for the information (consultant, 2018)

The information is collected about park and ride spots that are currently open for services. At present, there is the parking where mass transit passengers in Bangkok and vicinity areas can use the service as the park and ride spots provided by the following sectors:

- The government agencies provide for park and ride are such as the park and ride building of MRTA for the MRT project of Chaloem Ratchamongkhon Line (Blue Line) and Purple Line MRT Project of Tao Poon-Bang Yai, parking area of the Suvarnabhumi Airport Rail Link Station, and parking area at BTS Mo Chit Station, etc. There are 22 park and ride spots with a total of 9,805 parking spaces.
- The private sectors provide the park and ride spots such as the park and ride spots at the Krung Thon Buri BTS station and APT parking lots of Bearing BTS Station, etc. There are 11 park and ride spots with a total of 1,798 parking spaces.



Picture 2 Current park and ride spots of the government and plans of development
 Source: Study project for park and ride system development

From the details collecting of roads, rails and waterways public transport, that are serviced in Bangkok and vicinity area. These data include route information, origin and destination, station, parking lot, and relevant information such as opening and closing time, fare, facilitation disability. All of these are analyze the connection of all public transport include designing and developing database and application as receiving good cooperation from the departments in the Ministry of Transport and the related external agencies. Details of information shown in table5.

Table 5 Public transportation data which is supported by relevant departments

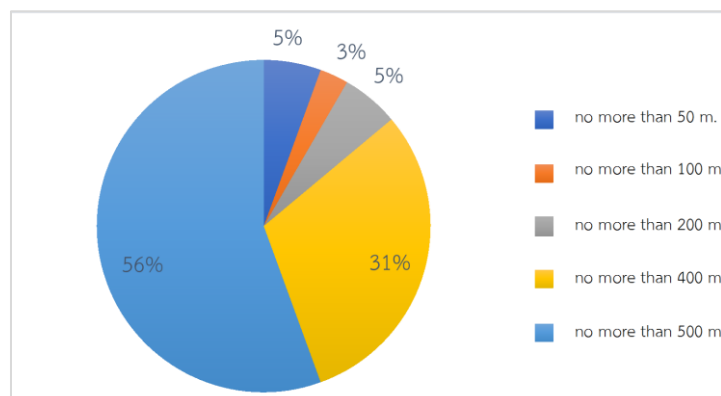
Department		Station name Thai-English	Stop	Route	Timetable	Frequency	Fare table	Station layout	Facilitating disability	GPS	AED information
Bangkok	BRT	/	/	/	/	/	/	/	/		
	BTS	/	/	/	/	/	/				/
	Phasi Charoen boat	/	/	/	/	/	/				
Bangkok Mass Transit Authority (BMTA)		/	/	/	/	/	/				
Mass Rapid Transit Authority of Thailand (MRTA)					/	/	/	/	/		
State Railway of Thailand	Airport Link		/	/				/	/		
	Railway	/	/	/	/	/	/	/			/
	Mae Klong Railway	/	/	/	/	/	/				
Marine Department	Chao Phraya Express Boat	/	/	/	/	/	/				
	Khlong Saen Saeb Boat	/	/	/	/		/				
	Chao Phraya Ferry Boat	/	/	/	/		/				
Department of Land Transport		/	/	/	/	/	/			/	
Thai Intelligent Traffic Information Center Foundation		Connect traffic information									

- 1.2.3 Analyze all public transport network connections and create map data showing public transport routes and modes based on the collected data supplementary for the development of public transport systems to be able to support the future urban expansion

The consultant has made the summary on the basic public transport network chart and conducted the analysis on public transport network connection. According to the study on relevant researches, it is found that the public transport network connection will divide the analysis into 3 areas; physical connectivity, schedule connectivity, and fare connectivity.

For the appropriate connectivity model to be analyzed in the project, the consultant has selected to use the physical connectivity by studying relevant foreign researches. It is found that the distance that people generally accept to walk to the access point or travel station is at the distance of 400 meters.

From such information, the consultant then proceeds to analyze the physical connectivity from rail transportation systems and waterway transportation systems whether there is a position that is highly effective in connectivity based on the opportunity to change the routes of travel or not. From the analysis on data from the studied database, it is found that the rail transport systems are connected to road transport systems. There are a total of 760 positions. Besides, the water transport system that is linked to the road transport system is in the amount of 699 positions showing the sample stations and ports for 10% first from the total number of positions that can go on foot to change the travel mode at a distance of 500 meters from the base station as shown in Table 6.



Picture 3 Proportion of questionnaire respondents per maximum distance that users of public transport will travel to change the travel pattern or connect the travel distance

Table 6 Example of stations that can go on foot to change the travel mode at a distance of 500 meters

No.	Names of stations	Types	Name of stops	Bus lines	Number of bus lines
1	Mo Chit Station	BTS	Jatujak Market	104, 108, 134, 136, 138, 145, 26, 27, 28, 29, 3, 34, 38, 39, 44, 502, 503, 510, 517, 52, 524, 59, 63, 77, 8, 96, A1, A2	28
2	MRT Jatujak	MRT Blue Line	Jatujak Market	104, 108, 134, 136, 138, 145, 26, 27, 28, 29, 3, 34, 38, 39, 44, 502, 503, 510, 517, 52, 524, 59, 63, 77, 8, 96, A1, A2	28
3	Victory Monument Station	BTS	Victory Monument (Phahonyothin island)	108, 157, 166, 204, 26, 27, 28, 29, 34, 38, 39, 502, 503, 509, 510, 522, 54, 59, 63, 74, 77, 8, 97, A2	24
4	Mo Chit Station	BTS	Opposite to Jatujak Market	104, 108, 157, 26, 27, 28, 29, 3, 34, 38, 39, 44, 502, 503, 509, 510, 52, 524, 59, 63, 77, 8, A2	23
5	Victory Monument Station	BTS	Victory Monument (Phayathai island)	139, 14, 140, 17, 172, 177, 183, 187, 204, 29, 34, 36, 38, 503, 536, 538, 539, 54, 542, 59, 62, 74, 77	23
6	MRT Jatujak	MRT Blue Line	Opposite to Jatujak Market	104, 108, 157, 26, 27, 28, 29, 3, 34, 38, 39, 44, 502, 503, 509, 510, 52, 524, 59, 63, 77, 8, A2	23
7	Phayathai Station	BTS	Wannasorn Building	139, 14, 140, 17, 172, 177, 183, 187, 204, 29, 34, 36, 38, 536, 538, 539, 54, 542, 59, 62, 74, 77	22
8	Mo Chit Station	BTS	Department of Land Transport	108, 157, 26, 27, 28, 29, 3, 34, 38, 39, 44, 502, 503, 509, 510, 52, 524, 59, 63, 77, 8, A2	22
9	Aree Station	BTS	Soi Ratchakru, Opposite to Soi Phahonyothin 5	108, 157, 204, 26, 27, 28, 29, 34, 38, 39, 502, 503, 509, 510, 54, 59, 63, 74, 77, 8, 97, A2	22
10	Aree Station	BTS	Soi Phahonyothin 5, Soi Ratchakru	108, 157, 204, 26, 27, 28, 29, 34, 38, 39, 502, 503, 509, 510, 54, 59, 63, 74, 77, 8, 97, A2	22

1.3 Design and development of database from the collection and analysis of public transport networks of road, rails, and waterways provided in Bangkok and vicinity areas

1.3.1 Collect and analyze the information of public transport networks of road, rails, and waterways provided in Bangkok and vicinity areas

The consultant concludes the entire public transport network map and analyzes the connectivity of the public transport network that provides services in Bangkok and vicinity areas by showing in 3 forms including station map / stops, route map, and network map including all public transportation systems. In this regard, the consultant has prepared the Intermodal Transit Data and Model (ITDM) to be used in the development of map showing the routes and public transport patterns from the collected data to be the supplementary information for the development of public transport systems in order to support the future urban expansion.

The Intermodal Transit Data and Model (ITDM) is gained from the design, data collection, analysis, and examination from the Cloud Sourcing Info such as Google, iTic, Land Scan, Heat Map, etc. The results of data synthesis and model of transportation and traffic in Thailand lead to the complete information reflecting the reality necessary for policy formulation, service action plan, provision of travel information to the fast growing public transport users with complexity and constant changing in the service model. Therefore, ITDM is needed for the application in various fields for the public sector, the private sector, and general users.

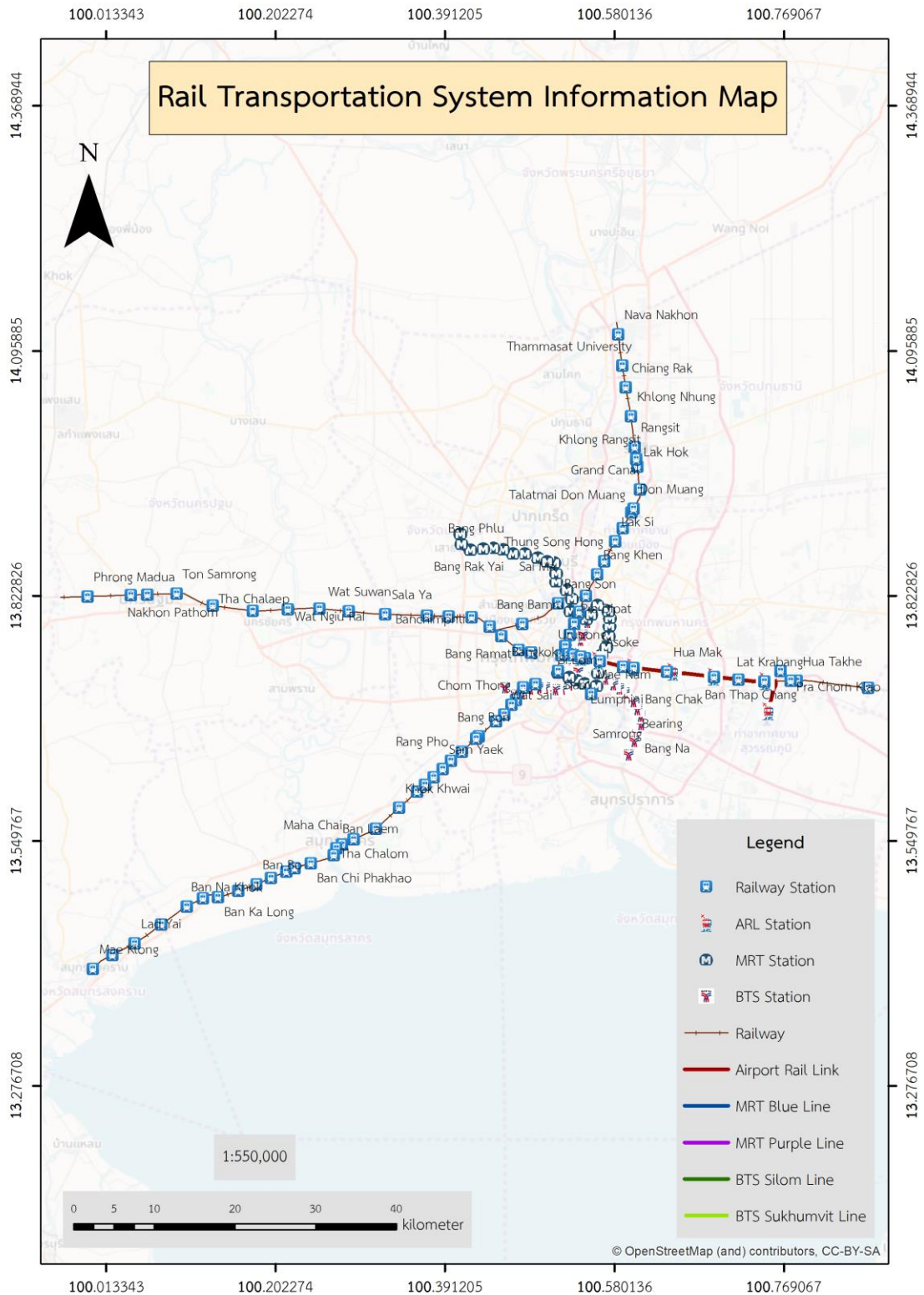
The Intermodal Transit Data and Model (ITDM) consists of 4 groups of data as follows:

- Transit Network
- Transit Route
- Transit Stop
- Transit Facilities

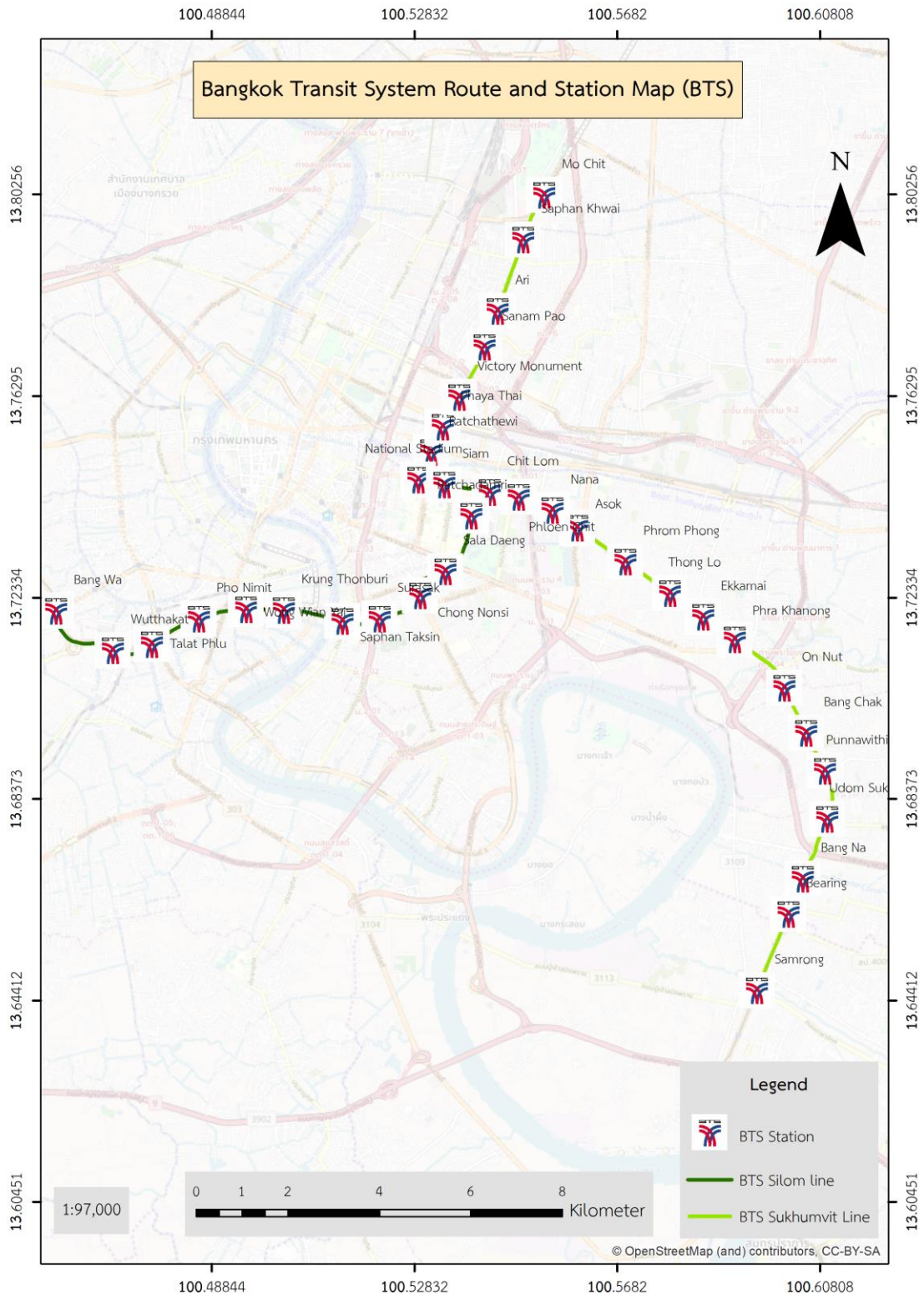
Arrangement of data obtained from the survey

(1) Rail system

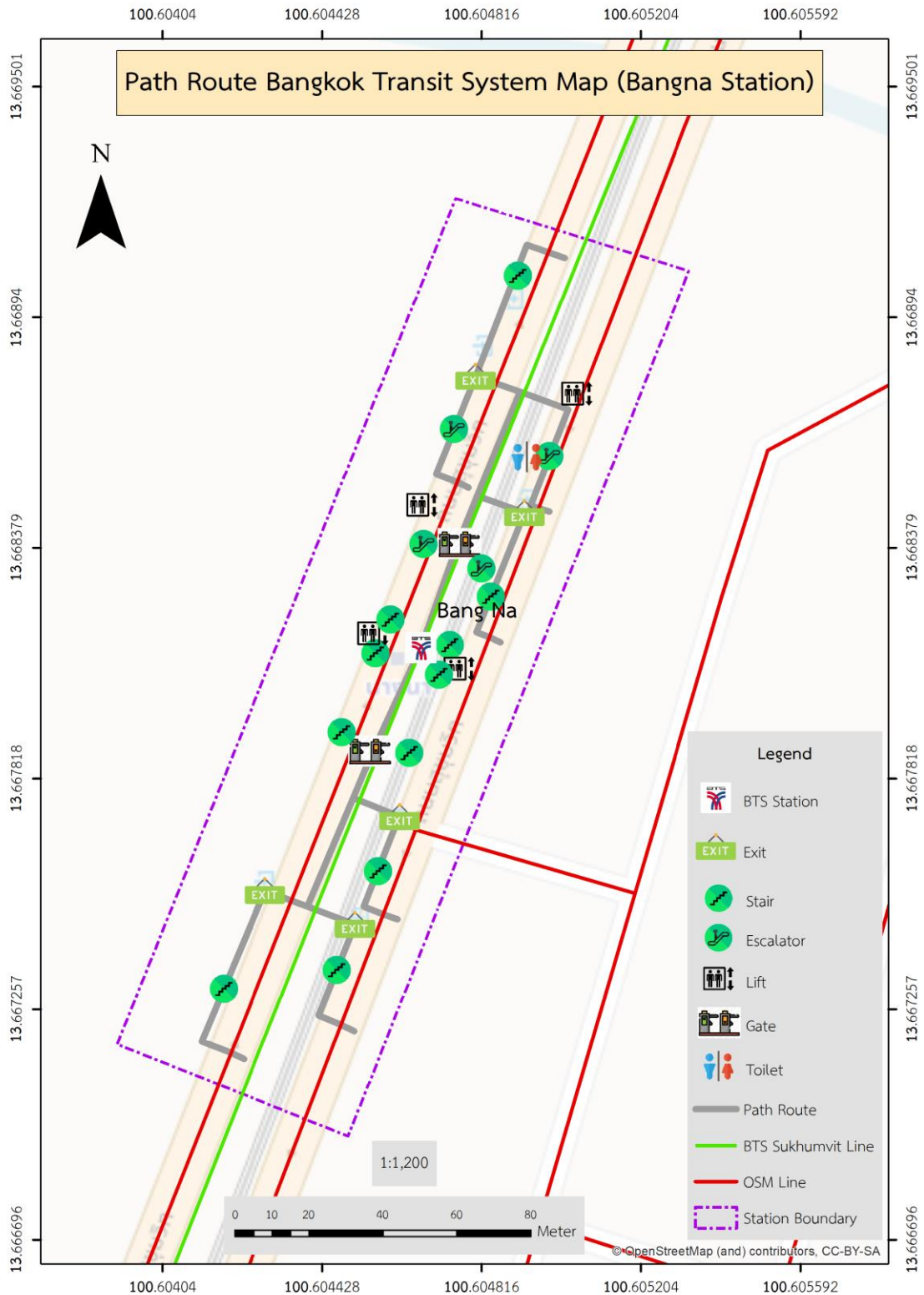
When the survey has been completed, the consultant uses the information obtained in the form of a Shape file with descriptive information using geo-informatics program for the data collection. The obtained data is the spatial data which is in the form of point to show the station locations, in the form of Polygon to show the boundary area of the station, in the form of Line data to show Bangkok Mass Transit System (BTS) routes and station route information, etc. In addition, the station's location information is checked using the geographic program in the Bangkok Mass Transit System (BTS) which will use the Google Map satellite to check the location of the station in the top. Google Street view is used in checking the position of the station on the side. If the station's location does not match, it will be corrected by moving the station's location. The examples of the road network of public transportation are the examples as shown from Picture 4 to Picture 6.



Picture 4 Diagram of the public transport system by rails



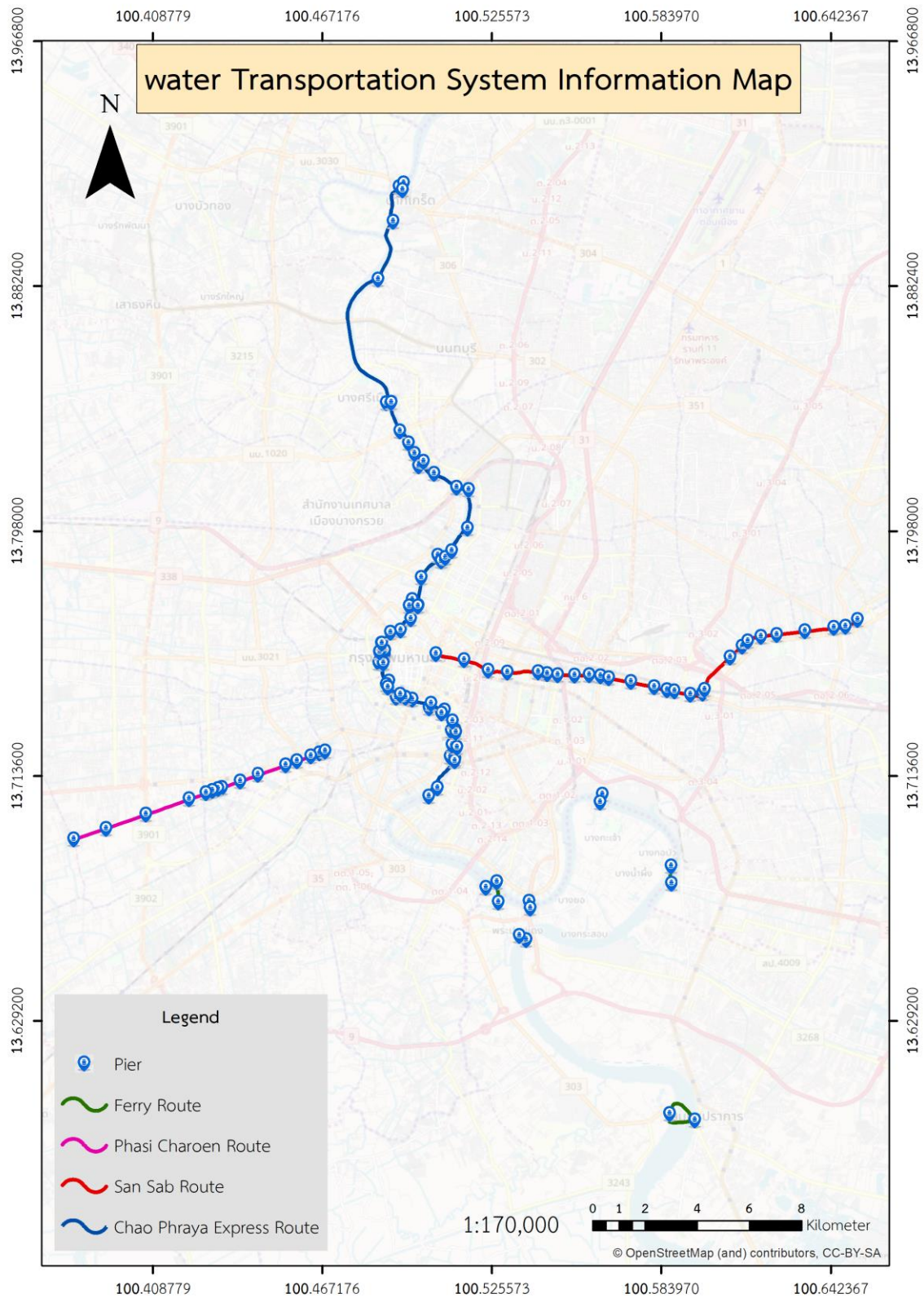
Picture 5 Map showing BTS routes



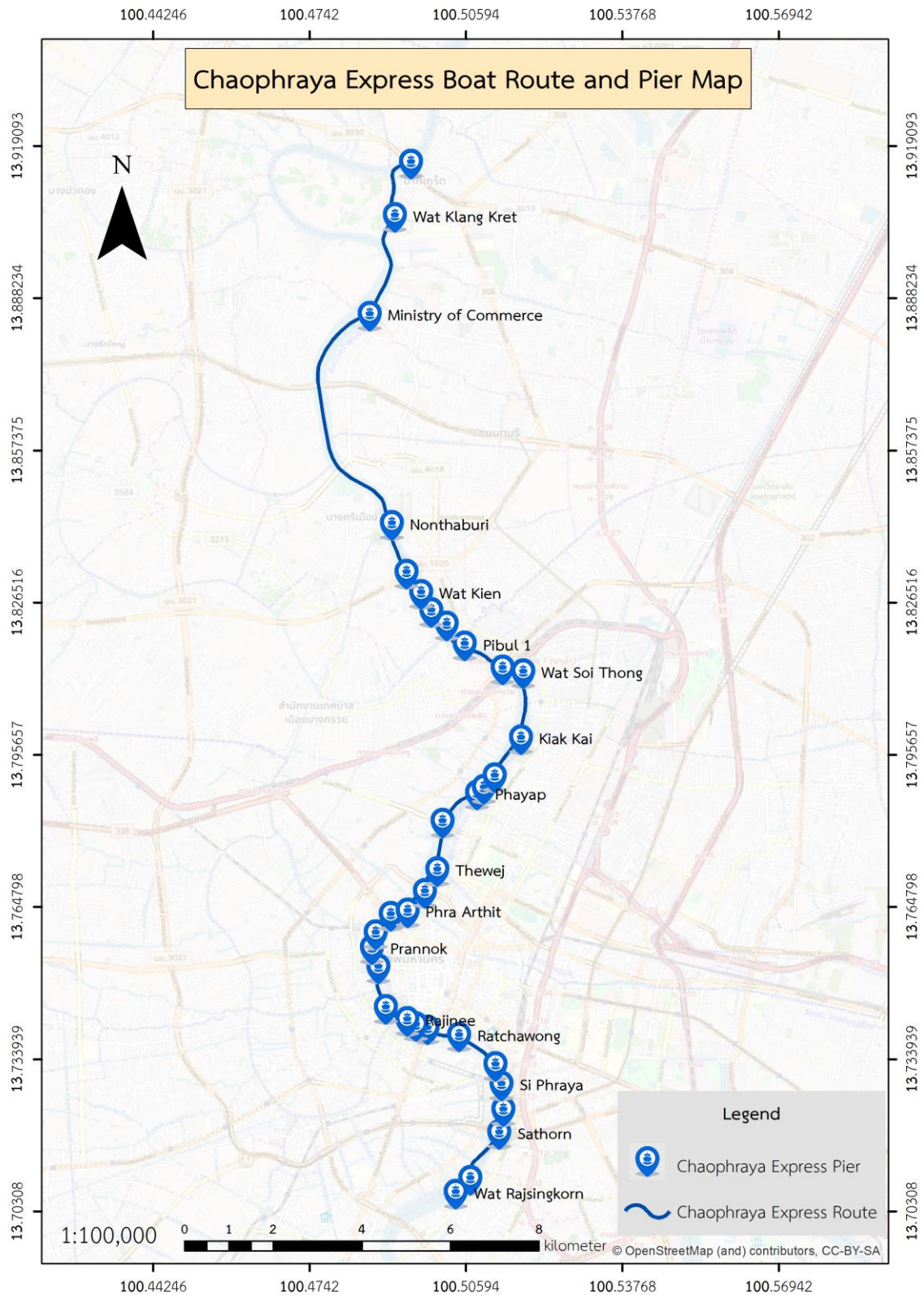
Picture 6 Map showing BTS Sukhumvit Line (Bang Na Station)

(2) Waterway system

From the field surveys on the maritime route information, pier location of Chao Phraya Express Boat, Ferries, Saen Saep Boat, and Khlong Phasi Charoen boat including updating the information to the present in case of changing and taking pictures of various piers when the survey is completed, the consultant will bring the data obtained from the survey to be arranged in the form of spatial data together with descriptive information. The geo-informatics program is used for collecting the data. The obtained data is the spatial data which is in the form of point showing the pier location, Line data showing maritime route information, etc. There is also the inspection on the location of the piers using geographic information in the management software using the Google Map satellite to check the location of the piers from the top. Google Street view is used in checking the position of the station on the side. If the pier's location does not match, it will be corrected by moving the pier's location. The examples of the waterway network of public transportation are as shown from Picture 7 to Picture 8.



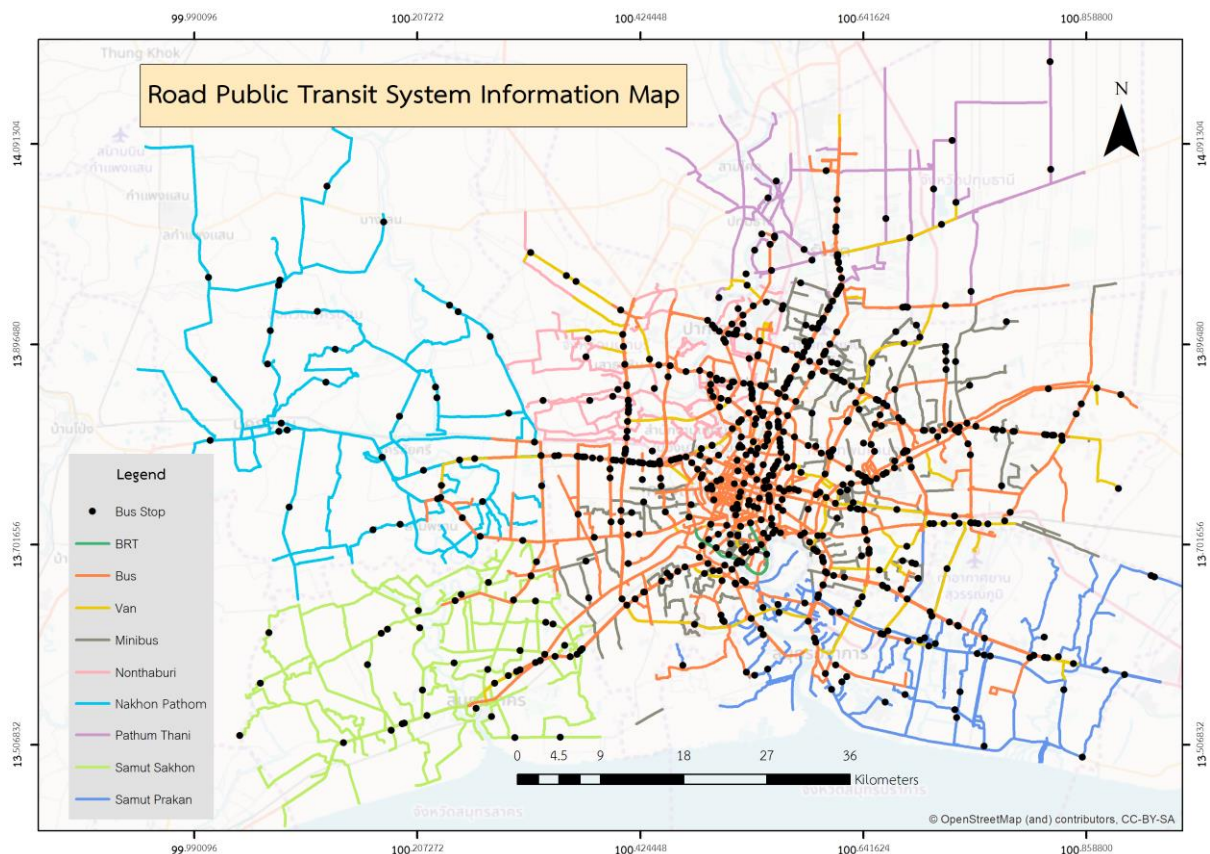
Picture 7 Diagram of the public transport system by waterways



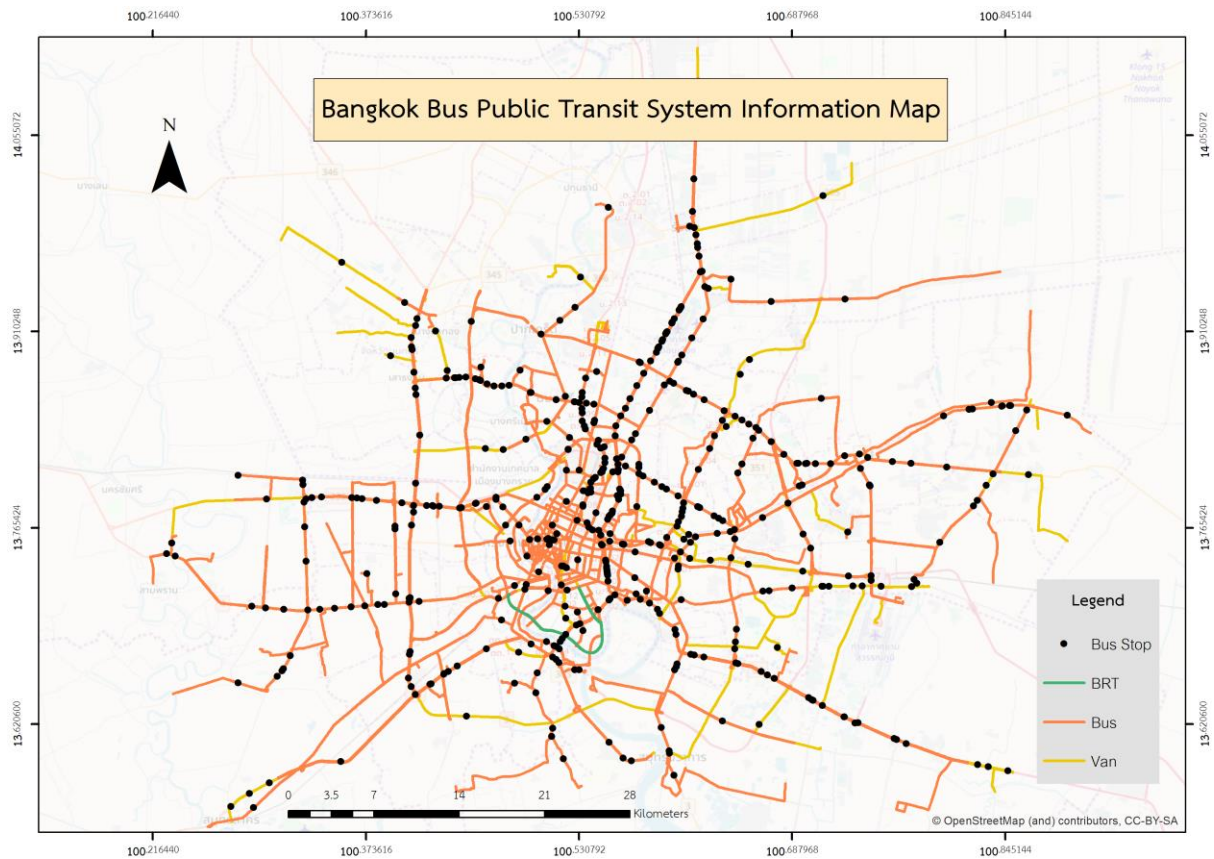
Picture 8 Map showing the Chao Phraya Express Boat route

(3) Road system

The consultant has examined the accuracy of information of bus stops using geographic information in the management software using the Google Map satellite to check the location of the information from the top. Google Street view is used in checking the position of the stops on the side. If the bus stop does not match, it will be corrected by moving the stop's location. The examples of the road network of public transportation are as shown from Picture 9 to Picture 10.

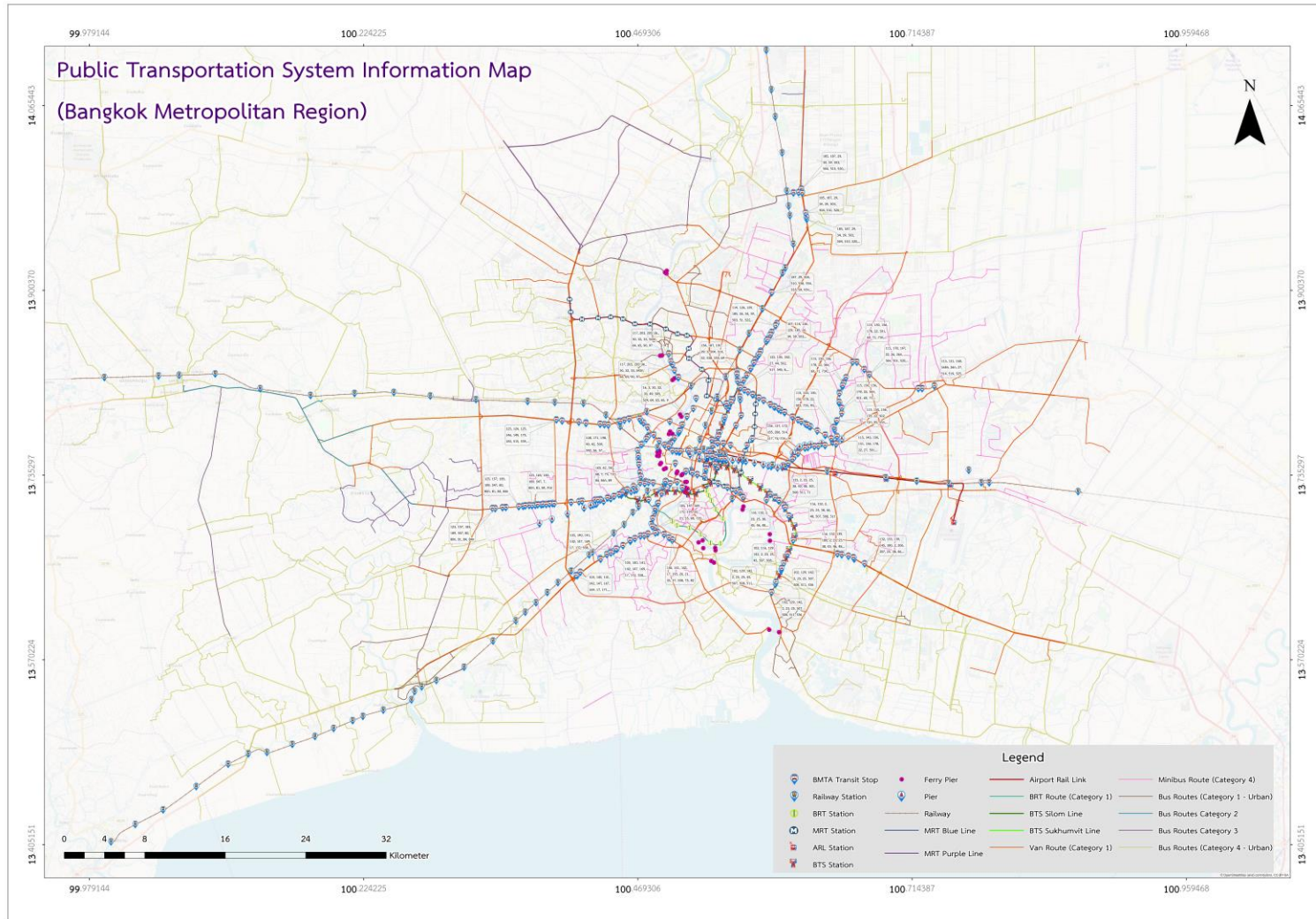


Picture 9 Map showing the integrated public road network system



Picture 10 Bus network map category 1 Bangkok

From the collection and analysis on the network information of public transport via roads, rails and waterways that are serviced in Bangkok and vicinity areas, the consultant summarizes the map of integrated public transport system as shown in Picture 11.



Picture 11 Map showing the routes of public transport systems in Bangkok and vicinity areas

1.3.2 Determining the database structure in the forms of Table and Data Dictionary together with the ER Diagram

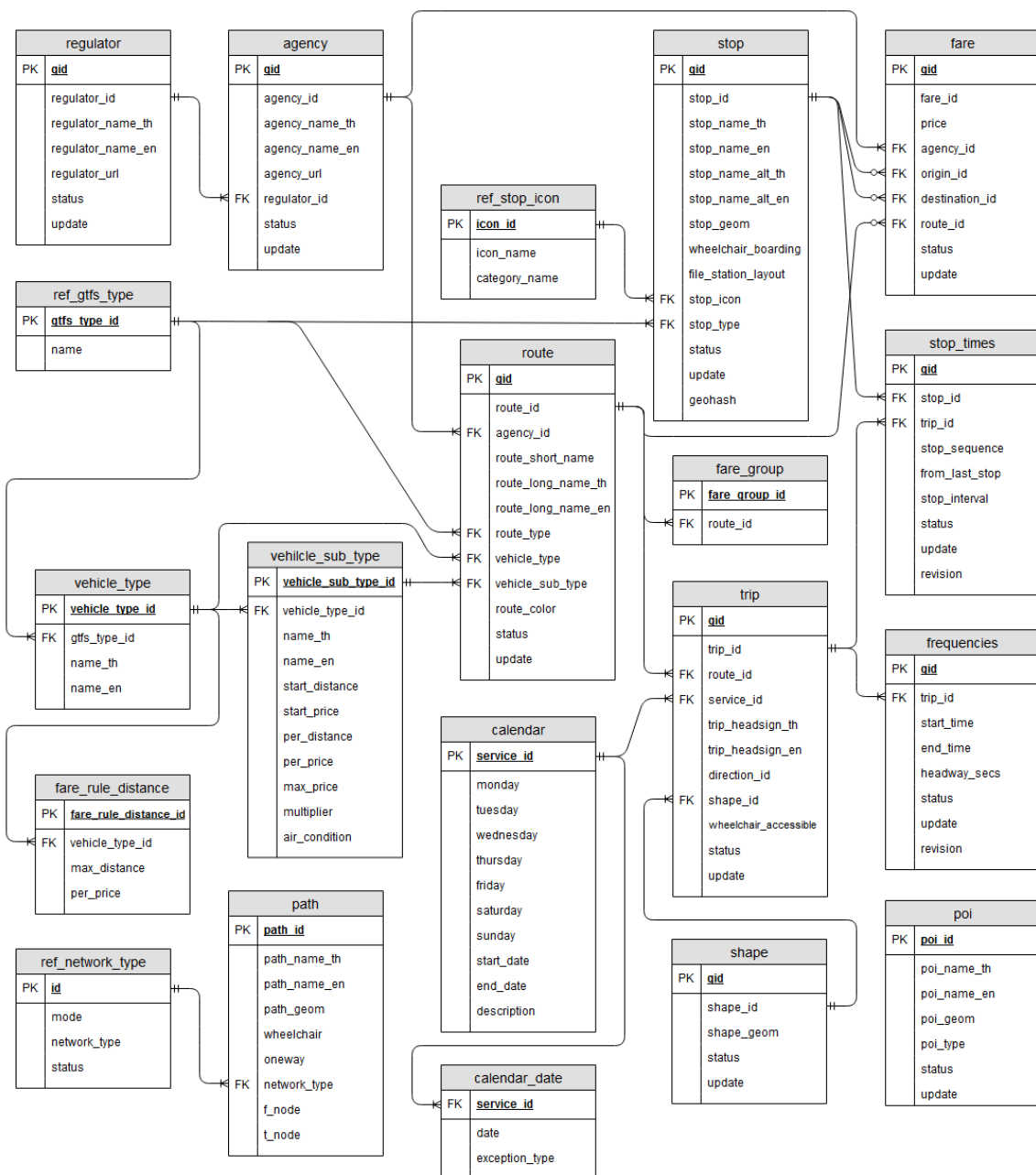
The consultant has studied the information structure and conducted the information table which can be explained in the form of Data Dictionary consisting of the table of each type of information structure and features in the database system as shown in Table 7 and the ER Diagram as shown in Picture 12, respectively.

Table 7 Data Dictionary

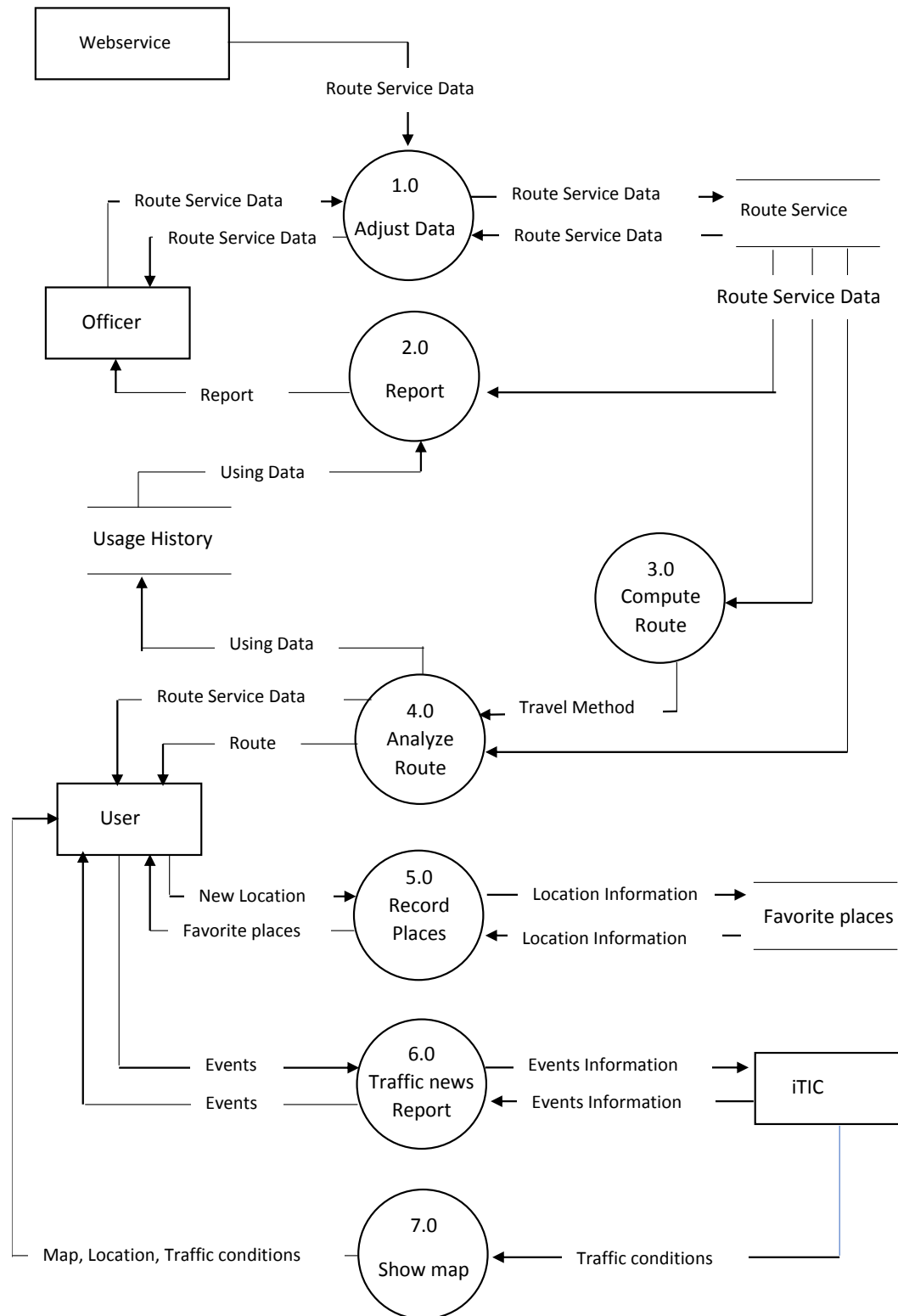
Agency		
gid	serial	Main Key
agency_id	varchar (255)	Operator Code Ex. BMTA
agency_name_th	varchar (255)	Operator Name Ex. องค์การขนส่งมวลชนกรุงเทพ (ขสมก.)
agency_name_en	varchar (255)	Operator Name Ex. Bangkok Mass Transit Authority
agency_url	varchar (255)	Operator Website Ex. http://www.bmta.co.th/?q=home
regulator_id	varchar (255)	Supervisory agency code Ex DLT
status	char (1)	Information status A = Active, D = Delete
update	timestamp	Last modified date Ex. 1552269299

Route		
gid	serial	Main key
route_id	int	Route code Ex. 1
agency_id	varchar (255)	Operator Code Ex. BMTA
route_short_name	varchar (255)	Short Route Name Ex. A1

Route		
route_long_name_th	varchar (255)	Route Name Ex. Donmueng Airport - BTS Mochit
route_long_name_en	varchar (255)	Route Name Ex. Donmueng Airport - BTS Mochit
route_type	int	Travel Type Ex. 3
vehicle_type	int	Vehicle Type Ex. 6
vehicle_sub_type	int	Subcategory of vehicles Ex. 18
route_color	char (6)	Display Color Ex. FE9A2E
status	char (1)	Information status A = Active, D = Delete
update	timestamp	Last modified date Ex. 1552269299



1.3.3 Database Design together with Data Flow Diagram



Picture 13 Data Flow Diagram of functions in the system

The elements in the development of Web Base Application and Mobile Application for the development of a public transportation system in Bangkok and vicinity areas have the important details as follows:

- (1) The navigation system with public transportation inside Bangkok and vicinity areas is classified as the web application information system and mobile applications. The users can use the system via the web browsers such as Chrome and Firefox or mobile phones by processing on the Web Server. The program with the server has details of the components used in the development as follows:
 - PostgreSQL Database and PostGIS Extension function as the database management system and the geo-information management system
 - nginx Web Server functions as the program with the server to receive the orders from the users via the web browser.
 - PHP Engine functions as the basic system to support the web operation.
 - Symfony CMF (Content Management Framework) functions as the management program and presentation of information inside the web including the user management.
 - Java Runtime Environment: functions as the basic system to support the data processing
 - Apache Tomcat: functions to receive the command for the data processing
 - JasperReports Server: functions to create the report for printing
 - Ubuntu Linux: functions as the operational system of the server
- (2) The elements will be used altogether in the system development which can be divided into 4 main parts as follows:
 - Website will use HTML5, CSS3, Ajax and Web Component as the basis in the system development
 - The database is used for the geo-information works with the copy system and regular data back-up.
 - The reports can be made in PDF, Excel, and HTML for the printing, analysis, and viewing via the web browser, respectively.

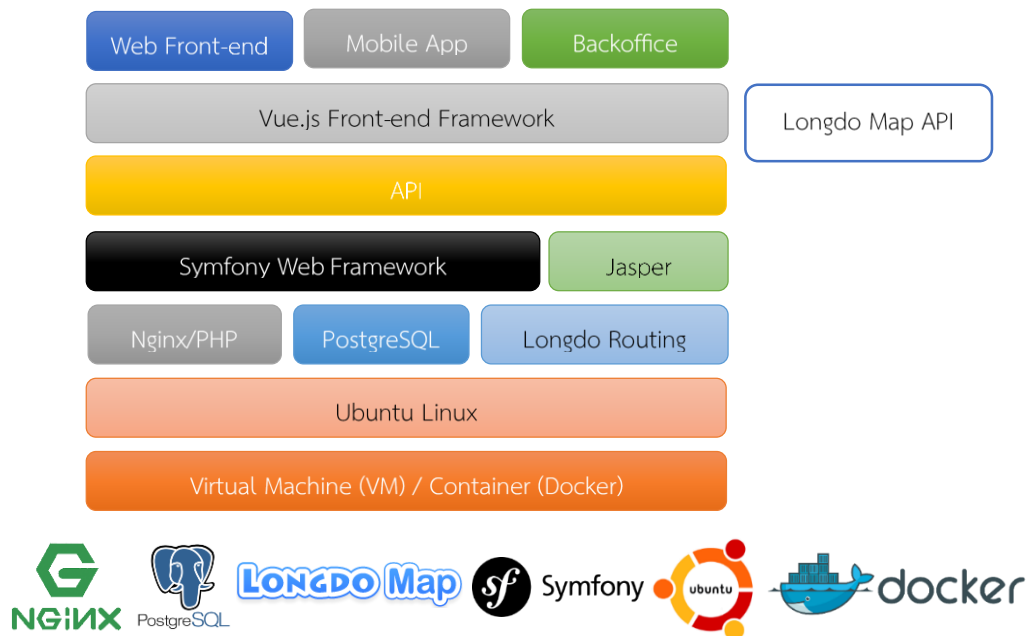
- The map uses both map data of Raster and Vector as appropriate for quick display.
- Route searching system will use both public bus information and basic map data for work to link multiple travel forms together (Multimodal Routing)

Mobile phone applications for iOS. Choose XCode and Swift.

- (3) Is a software development tool
- (4) Mobile applications for Android. Choose to use Android Studio and Java as a software development tool
- (5) Web application systems both Front-End and Back-Office work on virtual environments using Container technology such as Docker

The components of the program used in the development are as shown in

Picture 14.



Picture 14 Elements of the program used in developing the traveling navigation system

(6) Data standards of General Transport Feed Specification (GTFS)

GTFS public transport information standard is a standard data format that global public transport providers use to store data and present information for the general public, application or program developers to use. These include the use as a database for exchanging to other information systems. At present, Google Maps uses the GTFS standard as the standard for publishing various information.

The details of the data can be divided into 2 parts; Files and fields. The examples of the data files are as shown in Table 8.

Table 8 Data files in GTFS data standards

No.	Data	Files	Necessary data	Descriptions
1	Service providers	agency.txt	/	Service providers
2	Stops	stops.txt	/	Location or points for picking up the passengers
3	Routes	routes.txt	/	Service routes
4	Trips	trips.txt	/	Service trips
5	Stop time	stop_times.txt	/	Stop time at the stations / stops
6	Service dates	calendar.txt	/	Service dates or hours
7	Non-service dates	calendar_dates.txt	x	Non-service dates or hours
8	Fares	fare_attributes.txt	x	Fare rates
9	Fare rules	fare_rules.txt	x	Fare calculation criteria
10	Route shape	shape.txt	x	Route shape
11	Frequencies	frequencies.txt	x	Frequencies of service provision
12	Transfers	transfers.txt	x	Changes in modes/vehicles in traveling
13	Service information	feed_info.txt	x	Other additional information

Source: Consultant (2018)

1.4 Design and development of Web Application and Mobile Application to be used in the traveling navigation with public transport provided in Bangkok and vicinity areas including the design and development on the information link system on the public transport among the Office of Transport Policy and Planning and Traffic with related agencies

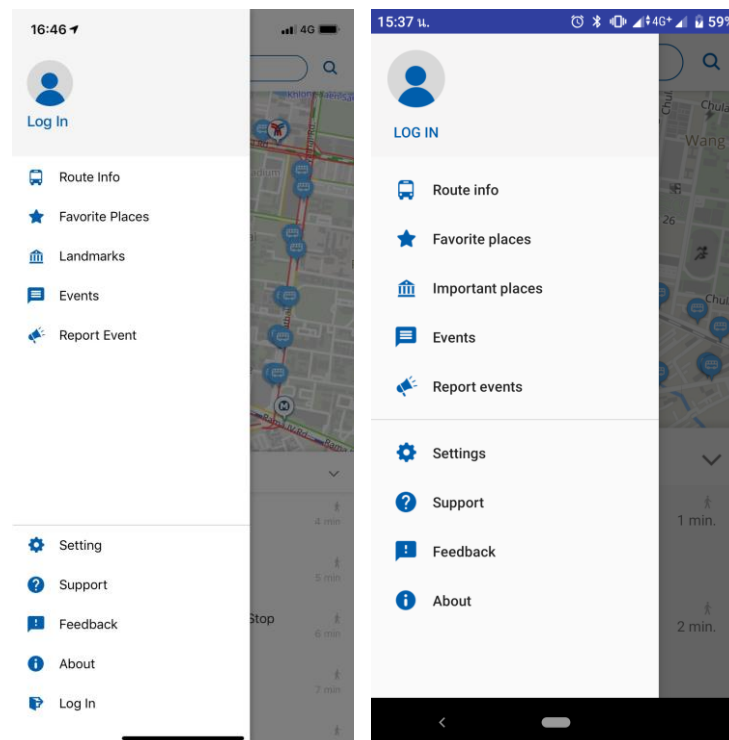
The consultant will design the system to be suitable for the use of data management and can be User Friendly. The use of such systems does not require knowledge or skills in computers. It can be used easily or if training is required, it can be learned by not taking time. It can also be learned from the quick manual.

The consultant has developed the system for traveling navigation with public transportation in Bangkok and vicinity areas according to the needs of users. The details are as shown below.

1.4.1 How to use the “Navigation” Application

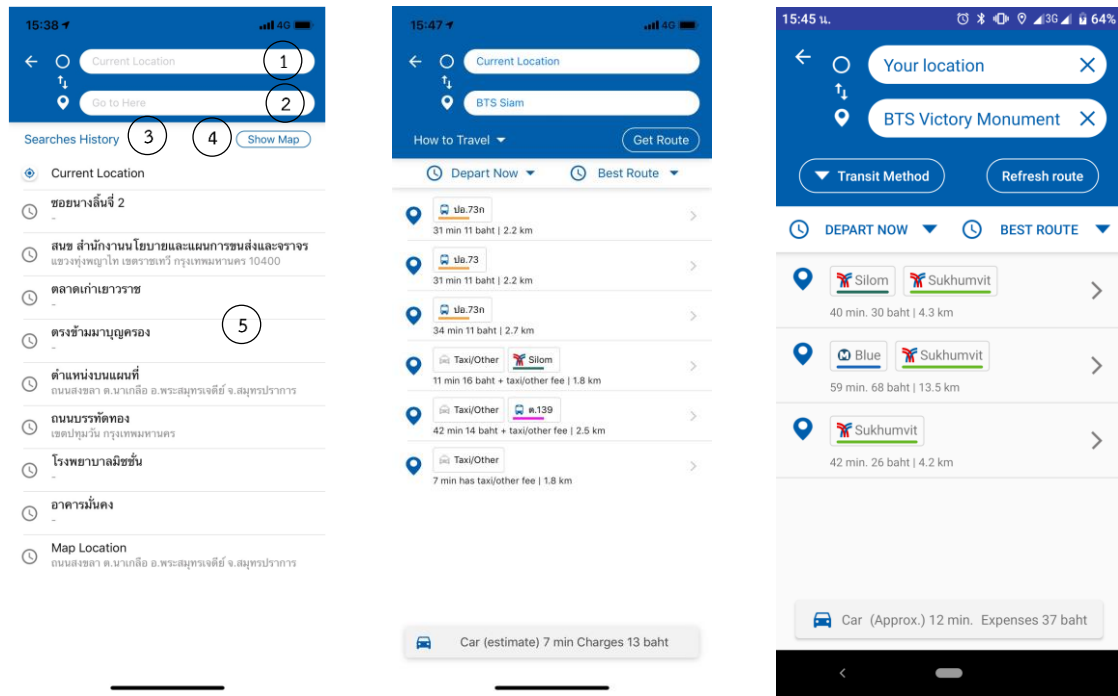
The details will cover various menu commands as follows.

- (1) The structure of “Navigation” Application mainly consists of:
 - (1.1) Menu bar button shows favorite places, important locations, traffic event reports, system settings and system access



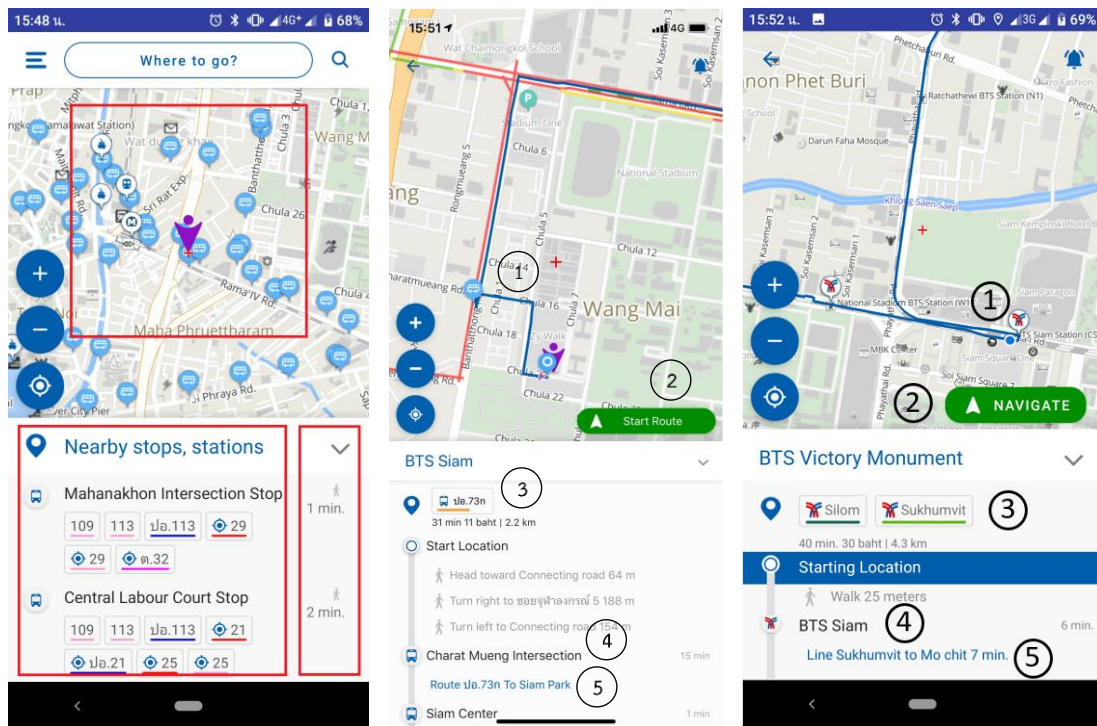
Picture 15 Menu bar

- (1.2) Searching for navigation can search for the starting points and destinations. The system will show the traveling mean choices along with calculating time, price or distance



Picture 16 Searching Window for the traveling mean choices

- (1.3) Map shows the nearest station location. The system can list the nearest stations, passing bus lines, and the time it takes to walk to that place

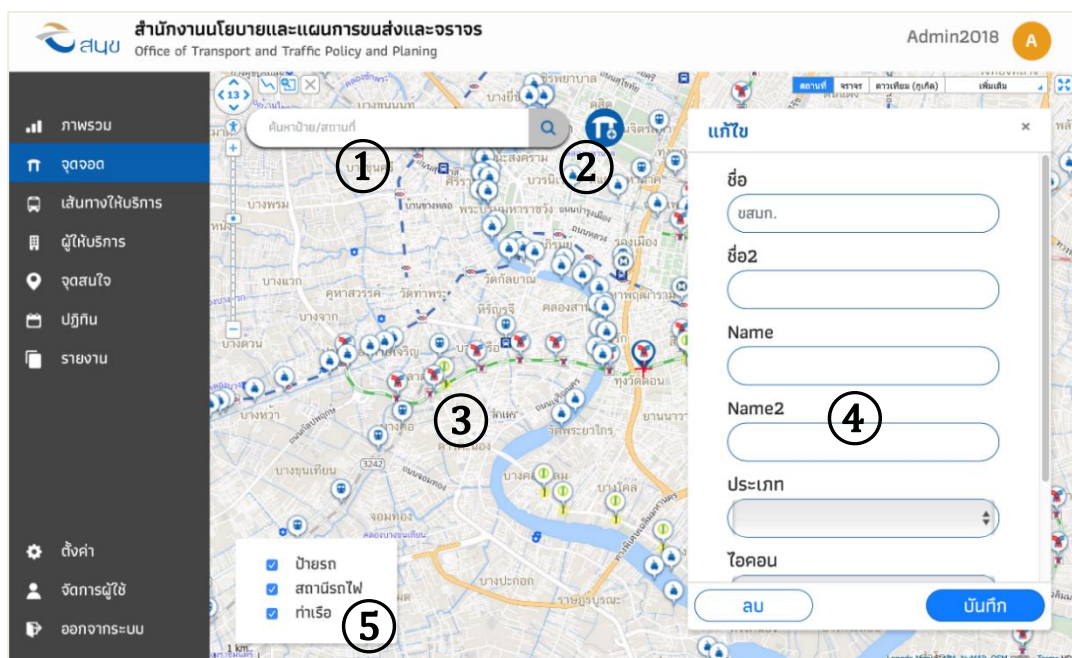


Picture 17 List of nearby stations and how to travel

(2) Admin & Back Office

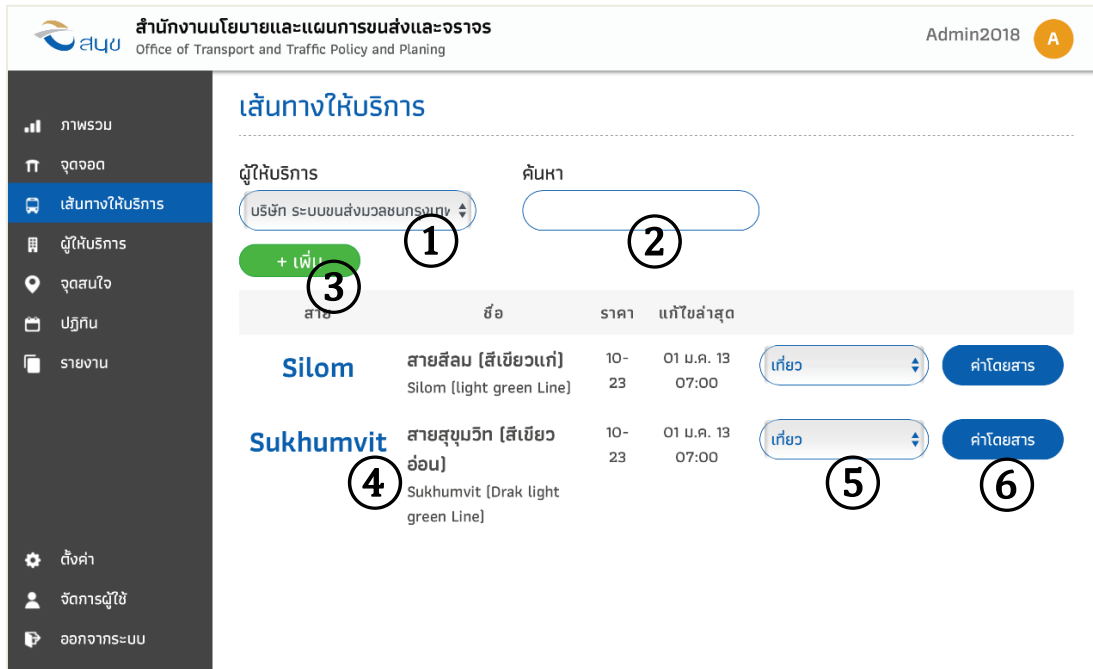
The details of the command menu and the uses are as follows.

(2.1) The window for determining the stops can be set / edit for the information of bus stops, train stations and piers.



Picture 18 Window for determining the stop information

- (2.2) The window for determining route information can set / edit the travel information, trips, service trips, and fares.



เส้นทางให้บริการ

ผู้ให้บริการ: บริษัท ระบบขนส่งมวลชนกรุงเทพ (1)

ค้นหา: (2)

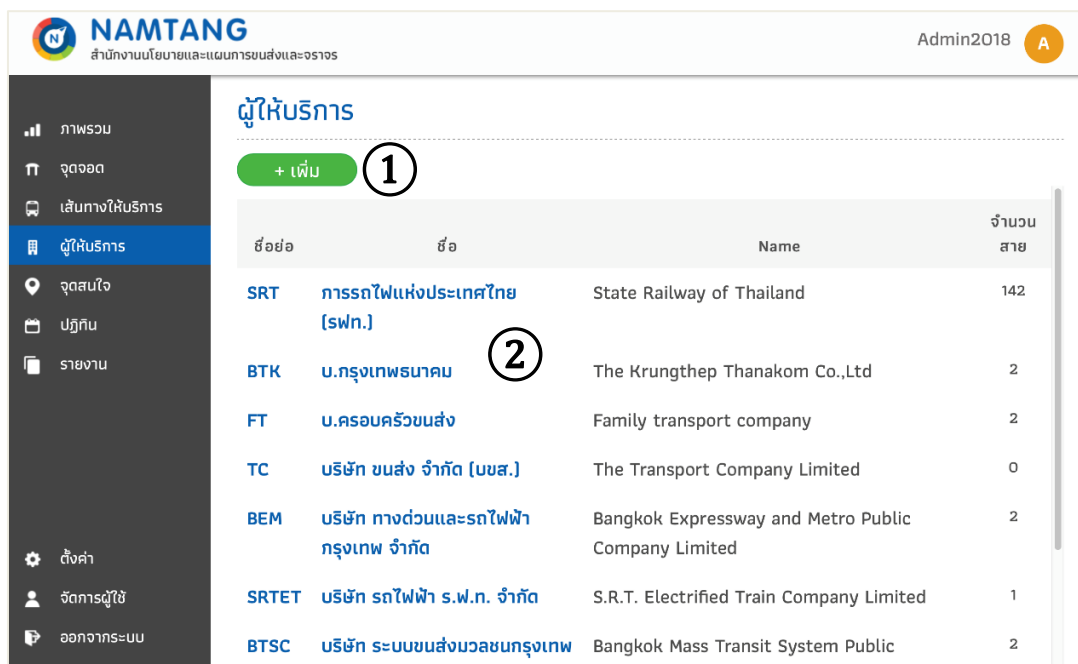
+ เพิ่ม (3)

สาย	ชื่อ	ราคา	แก้ไขล่าสุด	แก้ไข	ค่าโดยสาร
Silom	สายสีลม (สีเขียวแก่) Silom (light green Line)	10-23	01 ม.ค. 13 07:00	เที่ยว (5)	ค่าโดยสาร (6)
Sukhumvit	สายสุขุมวิท (สีเขียวอ่อน) Sukhumvit (Drak light green Line)	10-23	01 ม.ค. 13 07:00	เที่ยว (5)	ค่าโดยสาร (6)

4

Picture 19 Window for determining route service information

- (2.3) The window for determining service provider information can set / edit the public transport service provider information.



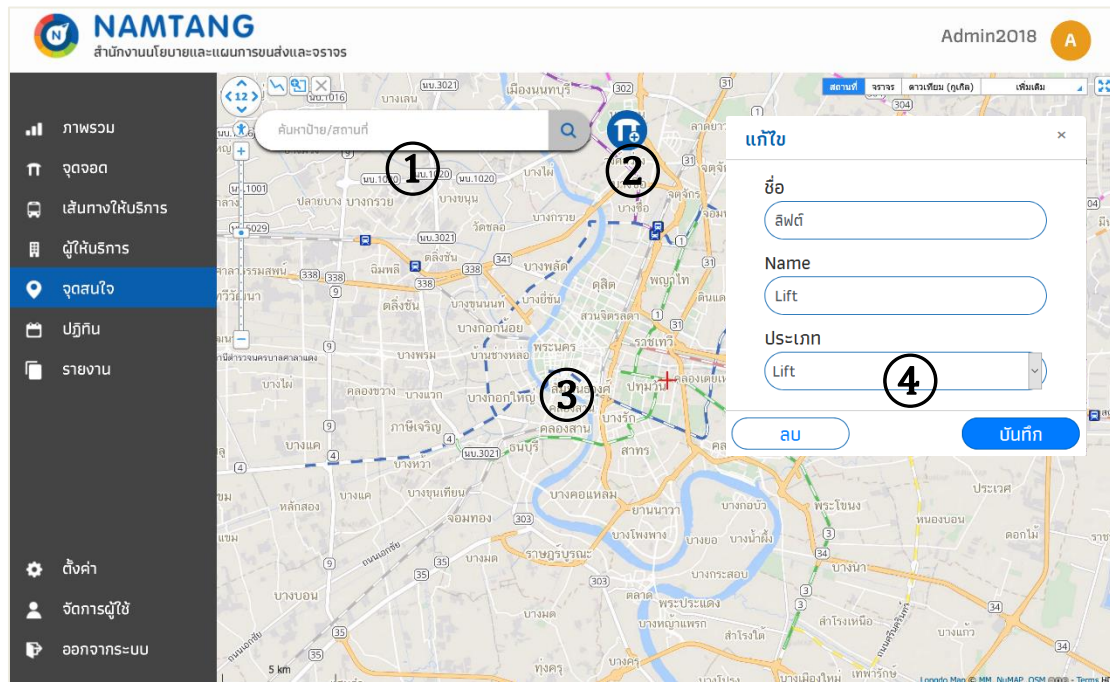
ผู้ให้บริการ

+ เพิ่ม (1)

ชื่อย่อ	ชื่อ	Name	จำนวนสาย
SRT	การรถไฟแห่งประเทศไทย (รฟท.)	State Railway of Thailand	142
BTK	บ.กรุงเทพธนาคม (2)	The Krungthep Thanakom Co.,Ltd	2
FT	บ.ครอบครัวขนส่ง	Family transport company	2
TC	บริษัท ขนส่ง จำกัด (บขส.)	The Transport Company Limited	0
BEM	บริษัท ทางด่วนและรถไฟฟ้ากรุงเทพ จำกัด	Bangkok Expressway and Metro Public Company Limited	2
SRTET	บริษัท รถไฟฟ้า ร.ฟ.ท. จำกัด	S.R.T. Electrified Train Company Limited	1
BTSC	บริษัท ระบบขนส่งมวลชนกรุงเทพ	Bangkok Mass Transit System Public	2

Picture 20 Window for determining service provider information

- (2.4) The window for determining the window's interest point information can set / edit the information of facilities in the station.



Picture 21 Window for determining the points of interest

- (2.5) The window for setting the calendar information can set / edit service date list of information.



Picture 22 Window for determining the calendar information

1.5 Arrangement of seminar to promote the project and academic training

1.5.1 Arrange at least 2 seminars to promote the project consisting of opening and closing to listen to the suggestions and publicize the project

(1) 1st activity of listening to the comments of the seminar attendants and public relations

The consultant conducted the 1st seminar of public relations and listening to the comments. The project to study the traveling navigation system with public transport in Bangkok and vicinity areas was arranged on Friday 9th November, 2018, at 08.00AM - 12.00PM at Ballroom A, 6th Floor, Amari Watergate Hotel, Bangkok. The target groups involved in both government agencies and state enterprises under the Ministry of Transport, private agencies, institutes / research units / public sector associations and mass media attending the seminar of public relations and listening to the comments.

In such seminar, 95 attendants from various agencies participated in the seminar of public relations and listening to the comments. Mr. Sarawut Songsiwilai, the Director of the Office of Transport and Traffic Policy and Planning (OTP), presided over the opening of this seminar and Miss Laksanawadee Thanamee, Director of the Transport and Traffic Information Technology Center, OTP, reported the objectives and details of operations in the project.

The seminar proceedings were presented with 3 main parts:

The first part is the presentation of the strategic plan for communication and transportation of Thailand by Assoc. Prof. Dr. Jittichai Rujjanakanoknart, the specialist in transport engineering. The details of lecture include:

- Strategies for the development of transportation systems for 20 years in 5 strategies. The implementation of this project linked to Strategy 5 Technology and Innovation.
- Digital communication plan of 2021, Ministry of Transport
- Strategic plans of OTP in 3 strategies. The implementation of this project linked to Strategy 1 Inclusive Transport (IT), Strategy 2 Network Cognition (NC), and Strategy 3 Technology and Innovation (TI).

The second part is the presentation on the entire pictures of operation and details of the project by Assoc. Prof. Dr. Phaisan Santithammanon, the Project Manager. The details of lecture include:

- Study and review the results of the study results or the operational performance with related agencies both domestic and abroad
- Survey and collect the data from related agencies for analysis in the linkage of public transport network via roads, rails and waterways serviced in Bangkok and vicinity areas (Nonthaburi, Pathum Thani, Samut Prakan, Samut Sakhon and Nakhon Pathom)
- Create the database of public transport routes and public transport services of various agencies under the Ministry of Transport into the same system
- Create the Web Application and Mobile Application to publicize routes and public transport services to be used as information in planning and decision making in choosing the right route and public transportation that is accurate, convenient and fast.

The third part is the discussion in the topic of "Extending the way of thinking: adding value to public transport information" conducted by Assoc. Prof. Dr. Jittichai Rudjanakanoknad, the specialist in transport engineering. The discussion is attended by Dr. Patthara Kiatsevee, General Manager of Meta Media Technology Co., Ltd. and Mr. Intouch Maswongpakorn, CEO and co-founder of Viabus. The photo of seminar atmosphere is as shown in Picture 23.

	
Mr. Sarawut Songsiwilai Director of the Office of Transport and Traffic Policy and Planning (presided over the opening of the seminar)	Miss Laksanawadee Thanamee Director of the Transport and Traffic Information Technology Center, OTP (reported)
	
Director of the Office of Transport and Traffic Policy and Planning is interviewed by press.	The representatives for the seminar answer the questions in various issues.
	
The attendants of the seminar express the comments on the project.	Atmosphere in the seminar room

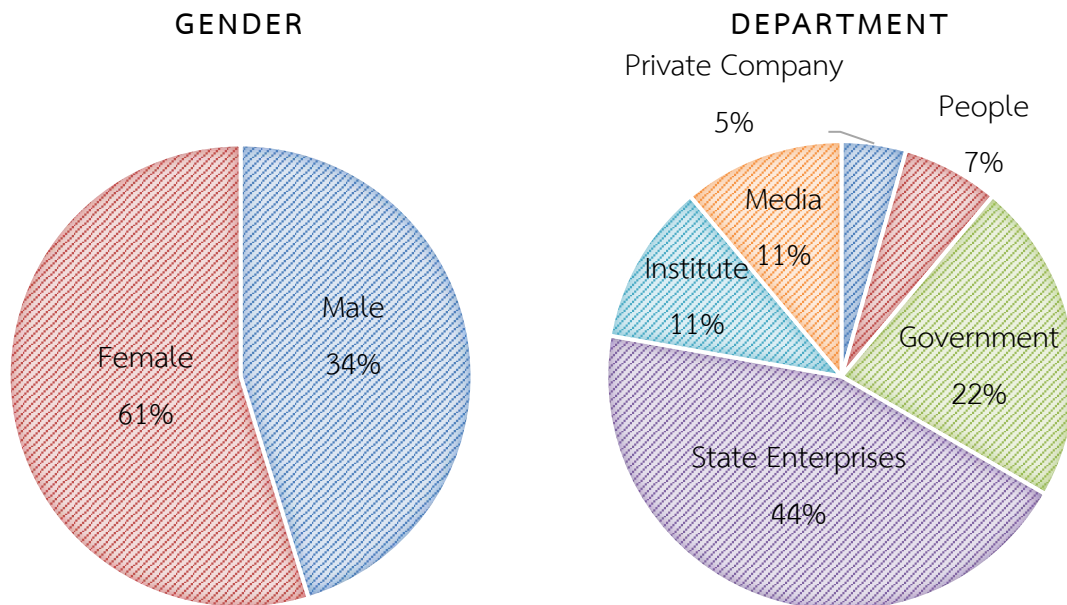
Picture 23 Photo of the atmosphere of the 1st seminar, public relations and listen to the comments

(1.1) Summary of comments and suggestion to the project

From the first public relations and receiving opinion seminar, the seminar gained a lot of interesting from attendants and include opinions and suggestions to the project. The consultants had collected details of opinions and suggestions which is shown below this

(1.1.1) General characteristics of the seminar attendants

There was 61% of female attendants and 34% of male attendants. Furthermore, there was 44% of attendants from state enterprises and 22% of attendants from the government as shown in Picture 24.



Picture 24 The ratio of seminar attendants.

(1.1.2) Suggestions and opinions to the Operations

From the seminar, the consultant collected the interesting opinions and suggestions from each department for 12 topics as shows in table 9 include the answers by the consultant.

Table 9 Summary of suggestions and comments

No.	Suggestions and comments	Answer comments/suggestions by consultants
1	How much is possible in application to input van and motorcycle data into the database of Application.	Vans and minibuses that are legally authorized to be established will be in the application but are not covered by motorcycle, including taxi cars as well.
2	Application should be included in the promotion, travel, tickets and discounts.	For payment within the application, it is necessary to tell us about evolution. The payment starts from cash. Followed by the latest smart card and next is the QR code from our mobile phone is not required to use the card at all. But Thailand, in the middle is disappeared. Because it stuck in many problems as well as having a variety of operators Causing no deductions between the way to the train to the bus and with the limitations related to the concession system. Which each contract is separated from each other. In the current application, there will be a calculation of travel expenses and can compare with traveling by personal car.
3	Will this project include public transportation in other regions, such as Chiang Mai, Khon Kaen, Phuket etc., as well as whether to support the future electric trains?	This project covers only 5 provinces in Bangkok and suburb was include Nonthaburi, Pathum Thani, Samut Prakan, Nakhon Pathom and Samut Sakhon. For the increased mass transit system, the information system has been developed to support additional operations in the future when being activated.

Table 9 Summary of suggestions and comments (con.)

No.	Suggestions and comments	Answer comments/suggestions by consultants
4	The issue of open data consists of 2 parts, one is the technique and another linking the system is the government policy. In the past, the government sector tried to disclose information to ensure transparency in operations. In addition, various information All of which create a tremendous amount of added value both in terms of economic promotion want to know how the Open Data approach and economic promotion will work?	After this application is completely activated. It has been verified and accept that it works well. So, should be used to track public transportation points, airports, Mo Chit or Big Port. Which will bring maximum benefits. Other than that, there should be other promotion such as linking the shopping center. Connecting other public transport systems Collaboration with the private sector, eating, drinking, traveling or private property development for use in the case of open data. For example, the new generation thinks that it is very unconventional. Which sometimes requires information to be used in the extension of ideas or try and be wrong with what has been thought.
5	Can pplication developed for online payment?	Online payment considerations must begin with the government's policies, including the OTP as well. Technically, development can be carried out. With safety, acceptance and standardization for example, payment via QR Code, which can be operated easily and quickly. Finally, what to consider is after accepting payment How to proceed. Because at present, there are many entrepreneurs in both the public and private sectors.
6	Did Viabus collect data about time between parking spots? And how can the information be used?	Currently, Viabus refers to information from government agencies that request cooperation. And are trying to make the information more accurate by using real travel information

Table 9 Summary of suggestions and comments (con.)

No.	Suggestions and comments	Answer comments/suggestions by consultants
7	In the project, there will be a link to tracking information with other agencies or not, such as buses, boats or electric trains.	The project supports connection with GPS Tracking system, but at present the system still has some limitations, such as buses that access garages or buses that change the route. But the system is still the same route
8	We would like to propose suggestions that the developed application should be used as a model to be able to expand in order to support the guidance and navigation of the transportation system. The next regional public events, such as Chiang Mai, Khon Kaen, Phuket, Korat, Phitsanulok and Udon Thani, which are under study.	This application is designed to support travel to various regions of Thailand. Just need to have the management of importing data, routes and related information and updating the application to be consistent with the database.
9	Application should support additional routes of minibus or motorcycle by the general public	Technically and application development can be carried out. But the agency needs to have a system administrator to monitor and approve such information. But due to other route information in the system is a path that is allowed by law. Therefore, adding various routes Should reference the license primarily
10	Application developed must support fast and easy data updates, such as closing ports. To improve or construct to facilitate the people.	The developed system has a back office system which administrators can easily access the route information or parking spots.
11	Can the developed application be able to suggest routes across travel modes?	Application supports Multi Modal navigation. It can suggest routes across travel modes.
12	Application developed with the extension to be able to track accident data or suggest routes to avoid? To be able to plan travel	Within the application, there is an accident data link and road construction information from iTIC and can display various information which users can plan the operation by public transport.

The participants of the seminar conducted the evaluation form seminars have a total of 73 sets of opinions. The consultant conducted a compilation of the summary of the evaluation form as shown in Table 10, including details of the recommendations as follows:

Table 10 Summary of assessment results

Details	Max score	Min Score	Avg. score	Deviation
1. Staffs				
1.1 Coordination and clarification of information during the seminar	5.00	1.00	4.23	0.70
1.2 Roles and responsibilities of staff	5.00	1.00	4.27	0.67
1.3 Facilitation for participants	5.00	1.00	4.47	0.69
1.4 Interpersonal relationships with seminars	5.00	1.00	4.42	0.69
1.5 Appropriate dress	5.00	2.00	4.45	0.62
1.6 Caring for neatness during the seminar	5.00	2.00	4.44	0.67
2. Speakers				
2.1 Content knowledge	5.00	3.00	4.33	0.62
2.2 Techniques or methods used to transfer knowledge	5.00	3.00	4.26	0.71
2.3 Answer	5.00	3.00	4.14	0.63
2.4 Timing	5.00	3.00	4.26	0.60
3. facilities				
3.1 Banquet and seminar facilities.	5.00	2.00	4.37	0.70
3.2 Food and drink	5.00	1.00	4.12	1.01
3.3 Audiovisual equipment for seminars	5.00	3.00	4.32	0.66
4. Content				
4.1 Consistent with the objectives of the project	5.00	3.00	4.36	0.56
4.2 Complete content	5.00	3.00	4.14	0.67
4.3 Benefits in applying to work	5.00	3.00	4.21	0.67
5. Documents				
5.1 Documentation helps to understand the content	5.00	1.00	3.95	0.86
5.2 The documentation is clear and accurate	5.00	1.00	3.99	0.81
5.3 The supporting documents are enough for the participants.	5.00	2.00	4.25	0.74
Summary of overall assessment results			4.24	0.72

(1.1.3) Suggestions and comments to publicize the project / seminar

- Agreed with the concept of this application which saw the convenience of future use of the people.
- Want to be outstanding and more useful than the application navigation. (currently the application guides public relations in buses)
- Agree with the concept of U Go We Guide. (Where do you want to go? We will take you)
- If successful, should give publicity to invite people to join the application.
- Would like to show the number of passengers on the train station (Should be counted from the ticket collection channel) to show the density on various stations. Which will help to decide when to use the service at that station.
- The project brochure should be updated to be a color document.

(2) 2nd activity of listening to the comments of the seminar attendants and public relations

The consultant held the 2nd seminar for public relations and opinion hearing of the study project on navigation system by public transportation in Bangkok and the vicinity areas on Friday 8th March, 2019, at 08.00AM - 12.00 PM at the Mandarin C Room, 1st floor, Mandarin Hotel, Bangkok. The target groups involved government agencies and state enterprises under the Ministry of Transport, private agencies, institutes / research units / associations, people sector, and press to attend the 2nd seminar for public relations and opinion hearing.

In such seminar, totaling 116 participants attended the seminar for public relations and opinion hearing from relevant agencies. Mr. Chaiwat Thongkamkoon, Permanent Secretary of the Ministry of Transport, presided over the opening of this seminar. Mrs. Wilairat Sirisoponsin, Deputy Director of the Office of Transport and Traffic Policy and Planning, was the person who reported the objectives and details of the project operations.

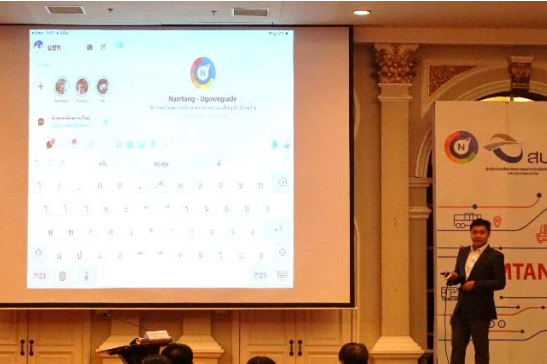
The seminar proceedings were presented with 3 main parts:

The first part is an overview of the operations and details of the project presented by Assoc. Prof. Dr. Phaisan Santithamnon, Project manager. The details of the lecture were as follows.

- Study, review of the results of the study or the results of operations with related agencies both domestic and international
- Survey and data collection from related agencies for analysis to link the public transport network via road, rail and waterways served in Bangkok and vicinity areas (Nonthaburi, Pathum Thani, Samut Prakan, Samut Sakhon and Nakhon Pathom)
- Integrating the database on public transport routes and public transport services of various agencies under the Ministry of Transport into the same system
- Preparing the Web Application and Mobile Application to disseminate the routes and public transport services as the information in planning and decision making in choosing the right, accurate, convenient and fast routes and public transportation.

The second part is the launch of application "Navigation" and presentation of application By Dr. Patthara Kiatsevi, expert in computer program development. The details of lectures include introduction to basic applications of mobile applications and Open Data web applications (data that can be used freely by everyone) and Open Source (programs that reveal source code).

The third part is the demonstration on the use of the "navigation" application by Khun Pawarothorn Chaiphet, lecturer, along with answering the questions and proposing the suggestions receiving the cooperation from participants in the seminar to exchange ideas. The seminar atmosphere is as shown in Picture 25.

	
Mr. Chaiwat Thongkamkoon Permanent Secretary for Ministry of Transport (Presided Over the Opening of The Seminar)	Mrs. Wilairat Sirisoponsilp Deputy Director of the Office of Transport and Traffic Policy and Planning (Reported)
	
Mr. Chaiwat Thongkamkoon Permanent Secretary for Ministry of Transport, Participate in Media Interviews	Assoc. Prof. Dr. Phisan Santitamnont Project Manager Narrator Project Overview
	
Dr. Phatara Kiatsavee Expert in Computer Program Development (Narrator Using the Basic Application)	Mr. Pawarotorn Chaiphet (Narrator Demonstrating use of the “Namtang” Application)

Picture 25 Atmosphere of the 2nd Seminar Relations and Listen to Opinions



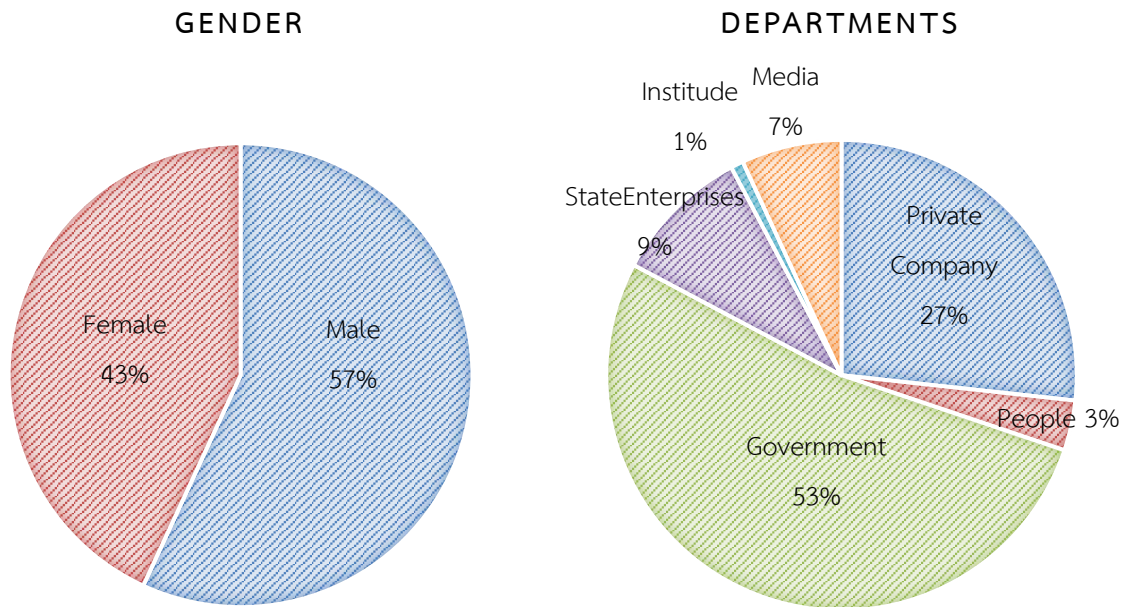
Picture 25 Atmosphere of the 2nd Seminar Relations and Listen to Opinions (con.)

(2.1) Summary of comments and suggestion to the project

From the Second public relations and receiving opinion seminar, the seminar gained a lot of interesting from attendants and include opinions and suggestions to the project. The consultants had collected details of opinions and suggestions which is shown below this

(2.1.1) General characteristics of the seminar attendants

There was 43% of female attendants and 57% of male attendants. Furthermore, there was 27% of attendants from Private companies and 53% of attendants from the government as shown in Picture 26.



Picture 26 The ratio of seminar attendants.

(2.1.2) Suggestions and opinions to the Operations

From the seminar, the consultant collected the interesting opinions and suggestions from each department for 11 topics as shows in table 11 include the answers by the consultant.

Table 11 Summary of suggestions and comments

No.	Suggestions and comments	Answer comments/suggestions by consultants
1	There are ways to encourage people to use navigation applications.	The consultant will use public relations through online channels and social media to encourage people to be aware of the application.
2	Is there a target to use the service? If there is any amount and if it doesn't meet the goal, what to do?	With the system in the beginning, open for service consultant will use the application promotion in various ways. For the public to have a preliminary trial And to achieve regular use Since the target of the service user is an important factor in bringing data to be integrated

Table 11 Summary of suggestions and comments (con.)

No.	Suggestions and comments	Answer comments/suggestions by consultants
3	Can GPS data be used as an API for Open Data for students to be able to extend?	GPS data used in the navigation system is information from the Department of Land Transport. Which if used in other ways. In addition to this navigation system needing consent or depending on the decision authority from the Department of Land Transport.
4	From the Mahidol University project, the BKK Rail application has a similar purpose. Should be combined into a single application from the government and presented to the general public Including Thai and foreign tourists. According to various transportation points such as airports, bus stations, railway stations, ports and various tourist attractions.	The origin of both projects is different. BKK Rail is the main standard for the rail system. Rail management system, passenger behavior within station, quantity analysis and planning, vehicle development, technology planning, management system planning and operation supervision measures and the designation of the name and code of station and application for displaying the train system information and public relations, the progress status of various electric train projects. And the central database of public transport to link the various systems of the agency. Related to each other and develop a navigation system application for people to use to plan travel and navigate to the desired destination By such data standards as a model to be used in the provinces that are ready for public transport in the future However, both projects have been coordinated to use the information to be the most beneficial to the government and the public. As for the promotion, the implementation will continue in the future. And both applications are supported in English Which can allow tourists to use it successfully.

Table 11 Summary of suggestions and comments (con.)

No.	Suggestions and comments	Answer comments/suggestions by consultants
5	Is it possible in the future? That the application will have a system to pay for public transportation.	The system for paying public transport services. It is necessary to have a feasibility study before further expansion in the future.
6	Is it possible in the future? That the application will have a navigation system for tourists, such as navigation systems to see places Tourist attractions / restaurants or may cooperate with TAT	At present, the application can be used to navigate to attractions, restaurants through POI, which can tell the basic details of the location or searching for positions through the map window only. Such systems require feasibility studies before further extending in the future.
7	Why don't tell which bus will arrive at the stop sign within a few minutes? Or the bus that wants to travel will arrive at the sign that is waiting within a few minutes.	GPS data is not yet fully available. The navigation system supports calculating the arrival of buses. Time from the beginning to the destination.
8	Will there be additional languages in the future? Because tourists can download applications to use.	Must consider from the needs of users / usage If supported by many users. It will consider further additional languages. The navigation system can support additional languages.
9	The word "Bang Rak Police Station" in English is the word "so no bang rak" which is not a standard word.	Data that is still in error will be improved. By using information from recommendations from users
10	Report Event window does not have the option "Other" to choose or enter other information that users do not know what it is.	Due to the reporting of event data, it is important to be clear what the incident is. Therefore there are no other options to choose from, but if there is an event that can indicate what events are seen and not yet in that system. The navigation system can add additional event options.
11	The information of the bus line is not yet complete. Lack of reformed bus information such as Y70E.	The consultant has already added new bus information. And improve the navigation system to prepare for future support.

The participants of the seminar conducted the evaluation form seminars have a total of 93 sets of opinions. The consultant conducted a compilation of the summary of the evaluation form as shown in Table 12, including details of the recommendations as follows:

Table 12 Summary of assessment results

Details	Max score	Min Score	Avg. score	Deviation
1. Staffs				
1.1 Coordination and clarification of information during the seminar	5.00	1.00	4.12	0.73
1.2 Roles and responsibilities of staff	5.00	3.00	4.26	0.57
1.3 Facilitation for participants	5.00	3.00	4.35	0.52
1.4 Interpersonal relationships with seminars	5.00	3.00	4.40	0.55
1.5 Appropriate dress	5.00	3.00	4.41	0.58
1.6 Caring for neatness during the seminar	5.00	3.00	4.37	0.55
2. Speakers				
2.1 Content knowledge	5.00	3.00	4.33	0.59
2.2 Techniques or methods used to transfer knowledge	5.00	3.00	4.27	0.63
2.3 Answer	5.00	2.00	4.07	0.69
2.4 Timing	5.00	3.00	4.33	0.54
3. facilities				
3.1 Banquet and seminar facilities.	5.00	3.00	4.40	0.61
3.2 Food and drink	5.00	3.00	4.26	0.67
3.3 Audiovisual equipment for seminars	5.00	3.00	4.23	0.65
4. Content				
4.1 Consistent with the objectives of the project	5.00	3.00	4.37	0.55
4.2 Complete content	5.00	2.00	4.22	0.74
4.3 Benefits in applying to work	5.00	2.00	4.26	0.72
5. Documents				
5.1 Documentation helps to understand the content	5.00	1.00	3.97	0.78
5.2 The documentation is clear and accurate	5.00	1.00	4.03	0.80
5.3 The supporting documents are enough for the participants.	5.00	2.00	4.26	0.65
Summary of overall assessment results			4.26	0.65

(2.1.3) Suggestions and comments to publicize the project / seminar

- should promote public relations projects in various media.
- There should be an extension of the project in next phase.
- should improve the way of analyzing and calculating routes. Because, it was found that the traveling method suggested by the system Not yet a route and the way people use real travel.
- Should improve the data processing system that is not stable. Because the system itself uses processing to redundant.

1.5.2 Arrange at least 2 technical trainings in technical work to disseminate knowledge in the use of traveling navigation system with public transport services provided in Bangkok and vicinity areas

The consultant holds technical workshop and training to disseminate knowledge in the use of navigation system by public transportation in Bangkok and vicinity areas from Tuesday, 26th March, 2019, to Thursday 28th March, 2019, at Computer Laboratory 502, Office of Computer Services, Kasetsart University, Bangkok. The details of the technical training for technical workshops consist of 20 staff members of the Transport and Traffic Policy and Planning Office and consists of 2 courses.. The details are as follows:

Course 1: Survey and database creation

Is a course in introducing procedures and methods for field survey Including how to create the data from the survey The details of the training courses are as follows.

- Introduce the procedure and method of surveying field data of Phadung Krung Kasem Canal (Pier, Hua Lamphong Railway Station) and the Light Green Line, Pu Chao Samingphrai - Keha

- Surveying the port information for the Phadung Krung Kasem Canal and the information on the facilities within the station for the Green Line, Pu Chao Samingphrai-Keha, along with storing station information.
- Propose a method for creating data obtained from surveys of rail and water transportation systems. Including previewing and testing the data from the survey using the QGIS program

Course 2: Using the Back-Office system of the travel system with public transport within Bangkok and its vicinity

Is a course in introducing the collection of travel information and testing the import of travel information of the travel system with public transport within Bangkok and its vicinity. The details of the training courses are as follows. training is shown in picture 27.

- Presenting the collection of travel information used in the navigation system, including
 - Service provider, regulators
 - Vehicle type
 - Service date
 - Service routes
 - Parking spots
 - Travel and Service frequency
 - Fares
 - Arrival time
- Test the import of travel information to the travel system with public transportation within Bangkok and its vicinity.



Instructors recommend steps and methods to explore field data.



Participants in the training program tried to explore the data.



Data collection of Phadung Krung Kasem Canal



facilities within the station and station location for the light green line train
 Pu Chao Samingphrai-Keha period

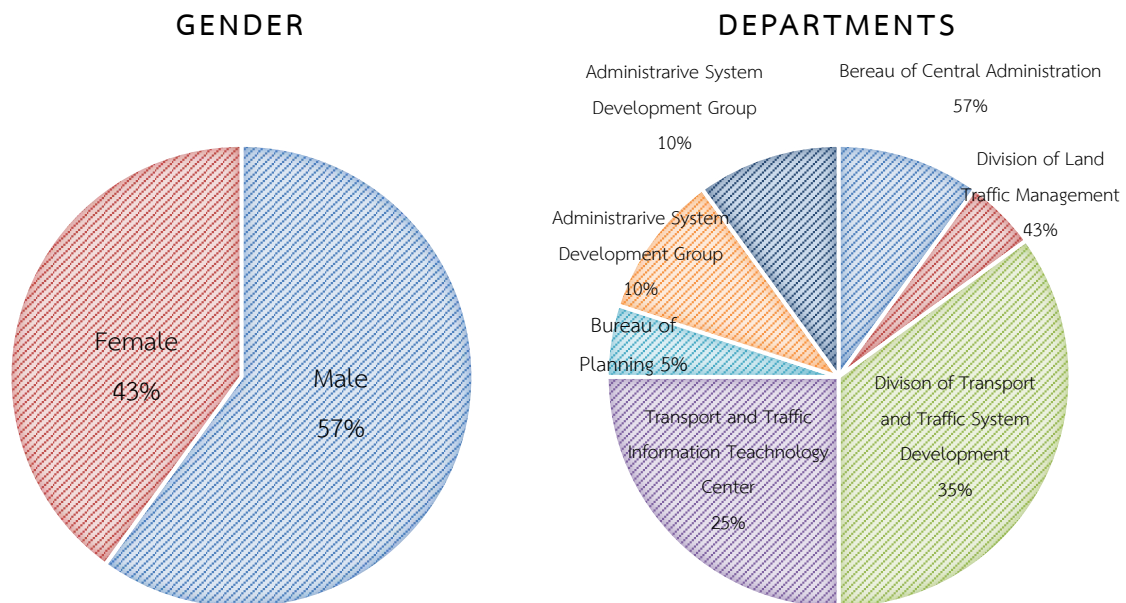
Picture 27 Field survey to collect public transport information

(1.1) Summary of comments and suggestion to the project

From technical training in technical work received great attention from the participants. The participants participated in the presentation of comments and suggestions for the project. The consultant compiled the details of the comments and suggestions as follows.

(1.1.1) General characteristics of the technical trainings attendants

There was 43% of female attendants and 57% of male attendants. Furthermore, there was 27% of attendants from private company and 53% of attendants from the government as shown in Picture 28.



Picture 28 The ratio of technical trainings attendants.

(1.1.2) Suggestions and opinions to the Operations

From the technical trainings, there are 5 interesting suggestions and comments as shown below.

1. Map on the front-end web. When changing the map language to English, the map is also displayed in Thai.

2. In case of relocating the parking spot Should have a feature to fill in the lat long to move the parking spot to the desired location (in this part, the system currently has only a part of the parking spot creation by filling the lat long value, but there are no features in the moving section by using lat long)
3. In the display of the route guidance of the system. The travel time between the website and the application does not match.
4. In terms of using the system in English Then the information in the section showing the results of the route guidance also shows some Thai results.
5. In search bar the system can search for all travel information, which can search for BTS and MRT. In this section, participants are suggested to edit the keyword for the media.

From the technical trainings, the consultant collected the interesting opinions and suggestions from each department for 20 topics as shows in table 13 include the answers by the consultant.

Table 13 Summary of assessment results

Details	Max score	Min Score	Avg. score	Deviation
1. Staffs				
1.1 Coordination and clarification of information during the seminar	5.00	3.00	4.50	0.64
1.2 Roles and responsibilities of staff	5.00	4.00	4.57	0.50
1.3 Facilitation for participants	5.00	3.00	4.57	0.57
1.4 Interpersonal relationships with seminars	5.00	3.00	4.64	0.62
1.5 Appropriate dress	5.00	4.00	4.68	0.48
1.6 Caring for neatness during the seminar	5.00	3.00	4.68	0.55
2. Speakers				
2.1 Content knowledge	5.00	4.00	4.61	0.50
2.2 Techniques or methods used to transfer knowledge	5.00	3.00	4.46	0.64
2.3 Answer	5.00	4.00	4.64	0.49
2.4 Timing	5.00	4.00	4.57	0.50

Table 13 Summary of assessment results (con.)

Details	Max score	Min Score	Avg. score	Deviation
3. facilities				
3.1 Banquet and seminar facilities.	5.00	4.00	4.57	0.50
3.2 Food and drink	5.00	4.00	4.54	0.51
3.3 Audiovisual equipment for seminars	5.00	4.00	4.71	0.46
4. Content				
4.1 Consistent with the objectives of the project	5.00	4.00	4.61	0.50
4.2 Complete content	5.00	3.00	4.61	0.57
4.3 Benefits in applying to work	5.00	3.00	4.57	0.57
5. Documents				
5.1 Documentation helps to understand the content	5.00	3.00	4.39	0.69
5.2 The documentation is clear and accurate	5.00	2.00	4.43	0.74
5.3 The supporting documents are enough for the participants.	5.00	4.00	4.64	0.49
Summary of overall assessment results			4.58	0.56

(1.1.3) Suggestions and comments to publicize the project/seminar

- Can each type of parking stop be able to set the color values of each type of parking spot by admin? It must be modified via the back-office system.
- Supporting the determination and display of the fare for the elderly.