สนข
สำนักงานนโยบายและแผนการขนส่งและจราจร

Executive Summary Report

The Study of Travel Data Analytics on Provincial Public Transportation

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April 2025

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Chapter 1

Introduction

Chapter 1 Introduction

1.1 Background

The National Strategy (2018 - 2037), Strategy 2 on Enhancing Competitiveness, sets development goals focused on elevating the country's potential across various dimensions to increase the country's competitiveness. Developing the country's infrastructure in various dimensions, including transportation and logistics networks, and science, technology, and digital infrastructure, must support enhancing the competitiveness of production and services, creating a good quality of life for everyone in society, reducing social inequality, and developing transportation systems to create complete network connections and reduce economic and social costs.

The Master Plan under the National Strategy (2018 - 2037) on Infrastructure of Logistics, and Digital Systems emphasizes the continuous development of transportation and logistics infrastructure as a crucial part of building the country's competitiveness. The Master Plan sets a goal in Sub-Master Plan 7.1 on Transportation and Logistics Infrastructure to increase urban public transport ridership. The target is to increase the modal share of urban public transport in proportion with all urban trips in provincial centers by at least 10 percent by 2023 - 2027 and by at least 20 percent by 2037.

On December 3, 2019, the Cabinet approved the designation of responsible agencies and tasks to drive the National Strategy's Master Plan issues. The Ministry of Transport, through the Office of Transport and Traffic Policy and Planning (OTP), was assigned to be the lead agency for the Infrastructure of Logistics, and Digital System issue, specifically the goal of increasing urban public transport ridership. Currently, there is no provincial public transport ridership data.

According to the data from the National Economic and Social Development Council (NESDC), the major cities in the provincial are Chiang Mai, Khon Kaen, Nakhon Ratchasima, Phitsanulok, Udon Thani, Phuket, and Songkhla (Hat Yai). OTP has also considered it necessary to include four additional provincials to gather more public transport data, i.e., Chiang Rai, Ubon Ratchathani, Phra Nakhon Si Ayutthaya, and Surat Thani. Therefore, OTP needs to study, survey, and develop tools to collect travel data from the public to understand and analyze changing travel behavior in the province.

1.2 Project Objectives

1) To study and survey travel data in 11 major provincials.
2) To develop a database system and a model for analyzing public transportation data using public transport in 11 major provincials.
3) To study and prepare a public transport system development plan and an urban traffic system development plan for 11 provinces, consists of Chiang Mai, Khon Kaen, Nakhon Ratchasima, Phitsanulok, Udon Thani, Phuket, Songkhla (Hat Yai), Chiang Rai, Ubon Ratchathani, Phra Nakhon Si Ayutthaya, and Surat Thani.

1.3 Project Study Area

The comprehensive city plan and its adjacent areas which require public transportation, i.e., Chiang Mai, Khon Kaen, Nakhon Ratchasima, Phitsanulok, Udon Thani, Phuket, Songkhla (Hat Yai), Chiang Rai, Ubon Ratchathani, Phra Nakhon Si Ayutthaya, and Surat Thani.

1.4 Project Implementation Plan

The consultant has developed a study framework that aligns with the project's scope of work, consisting of 5 main parts and 2 supporting parts, as shown in **Figure 1.4-1**.

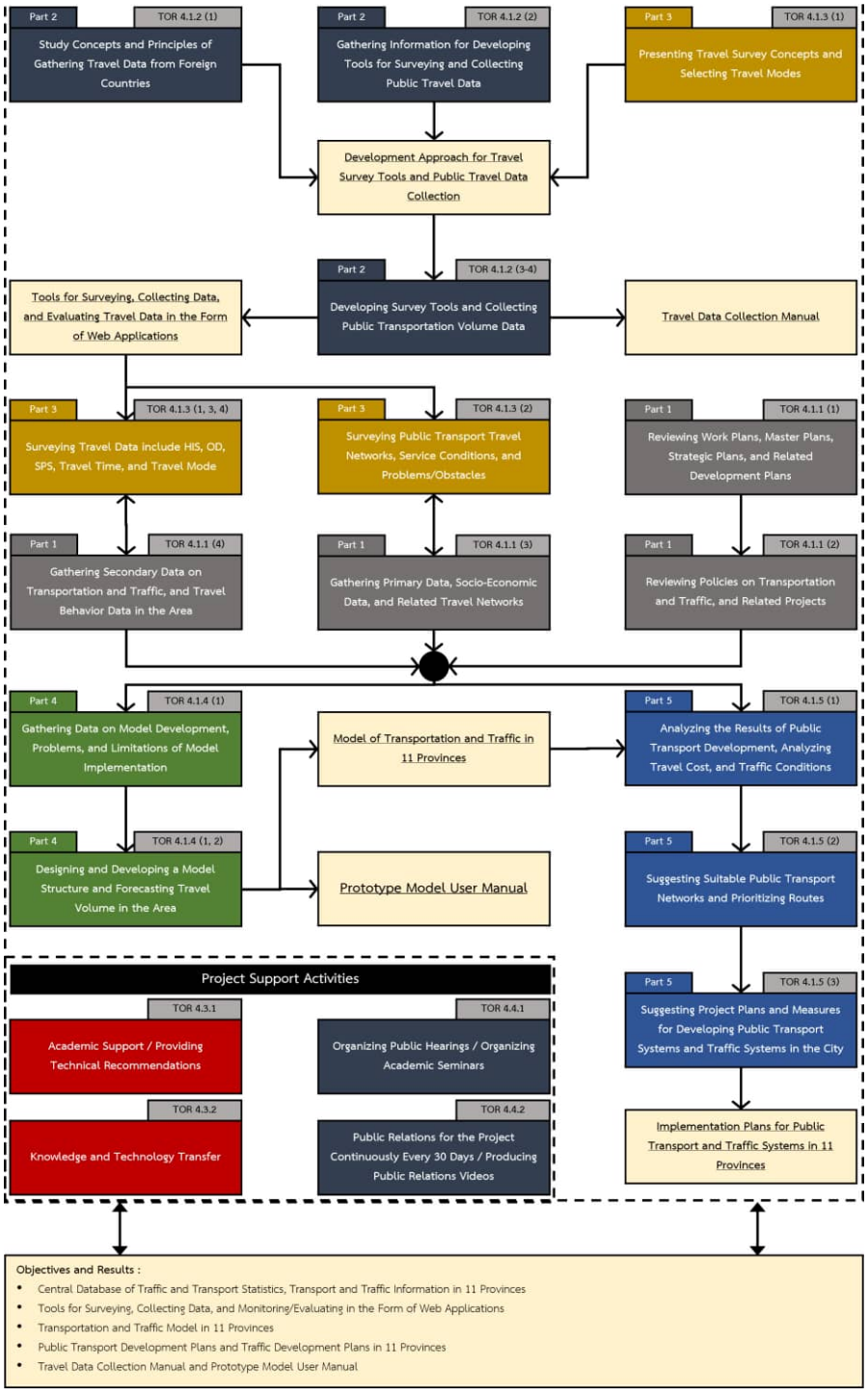


Figure 1.4-1 Study Framework Overview

Chapter 2

Consistency with Policies and Strategies

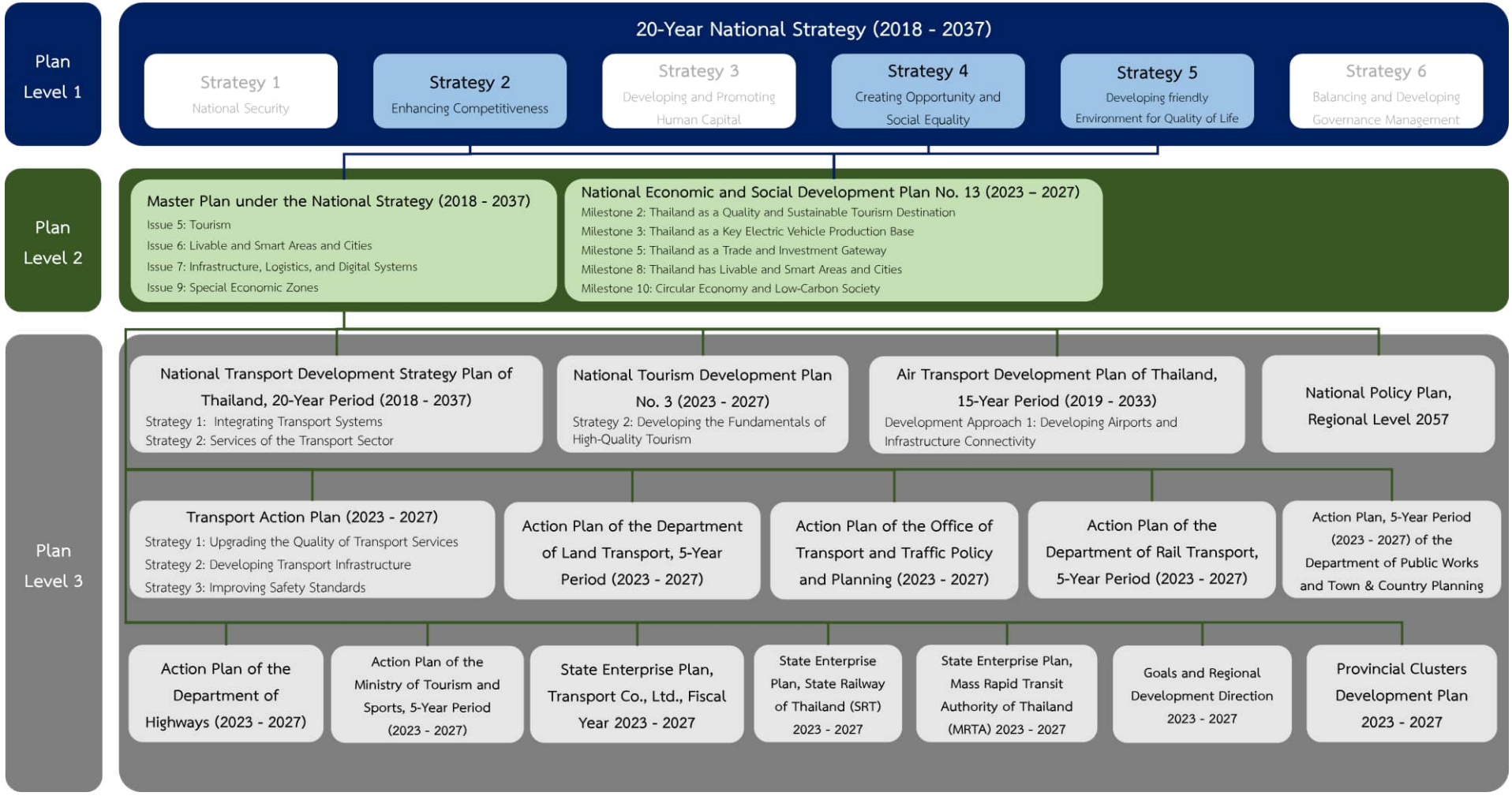
Chapter 2 Conformity to policies and strategies

2.1 Conformity to National and Regional Policies and Development Plans

The consultant has studied, reviewed, and compiled information on national policies and strategies related to the study project "Analysis of Public Transportation Data in provincials." The relevant strategies and policies are shown in **Figure 2.1-1.**

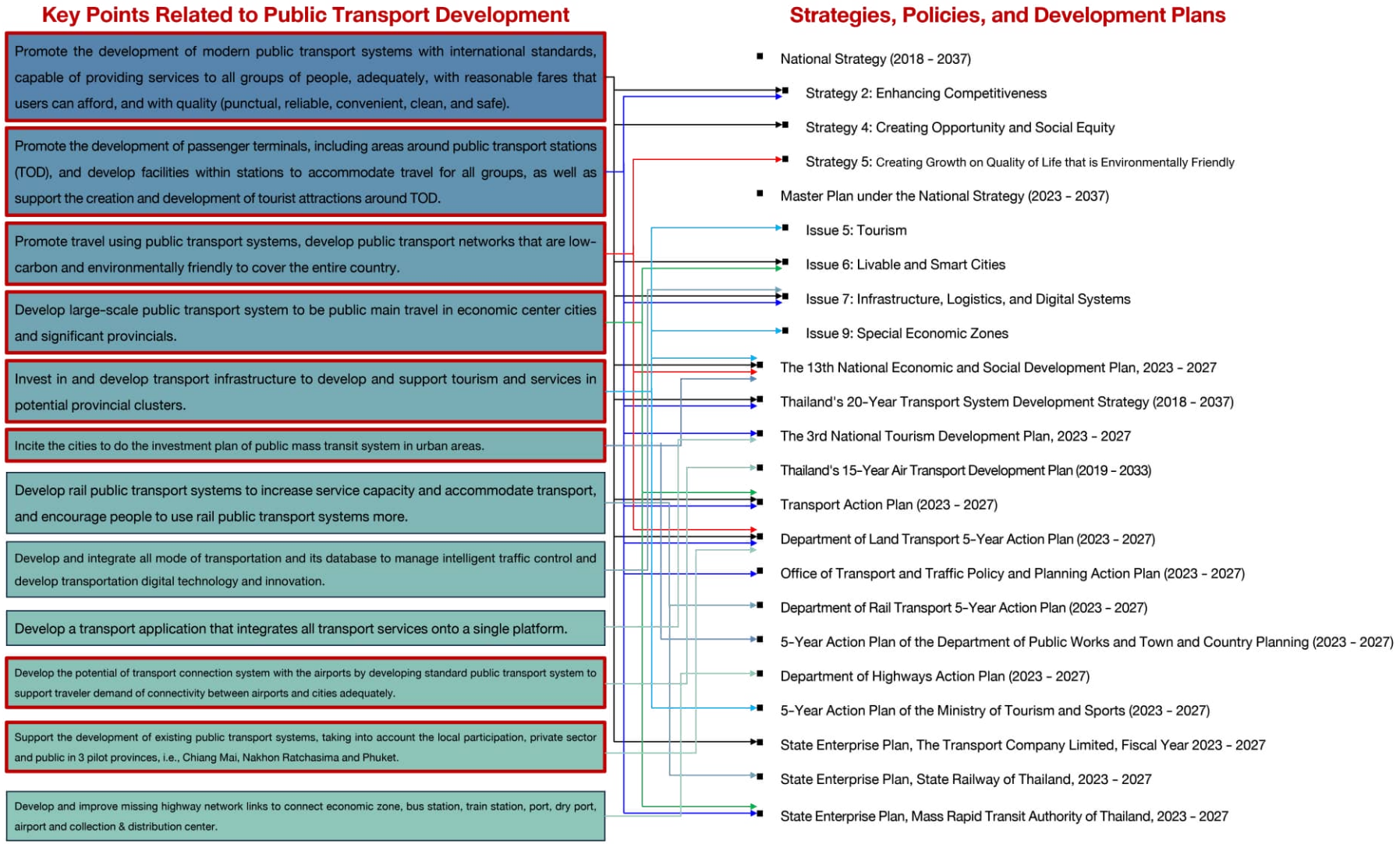
The review results were summarized into key issues and conformed to the project, and to be used for the study of public transportation development projects in provincials, as shown in **Figure 2.1-2.**

The targets of indicators related to the operation of the Ministry of Transport in different periods of time was summarized as shown in **Figure2.1-3.**



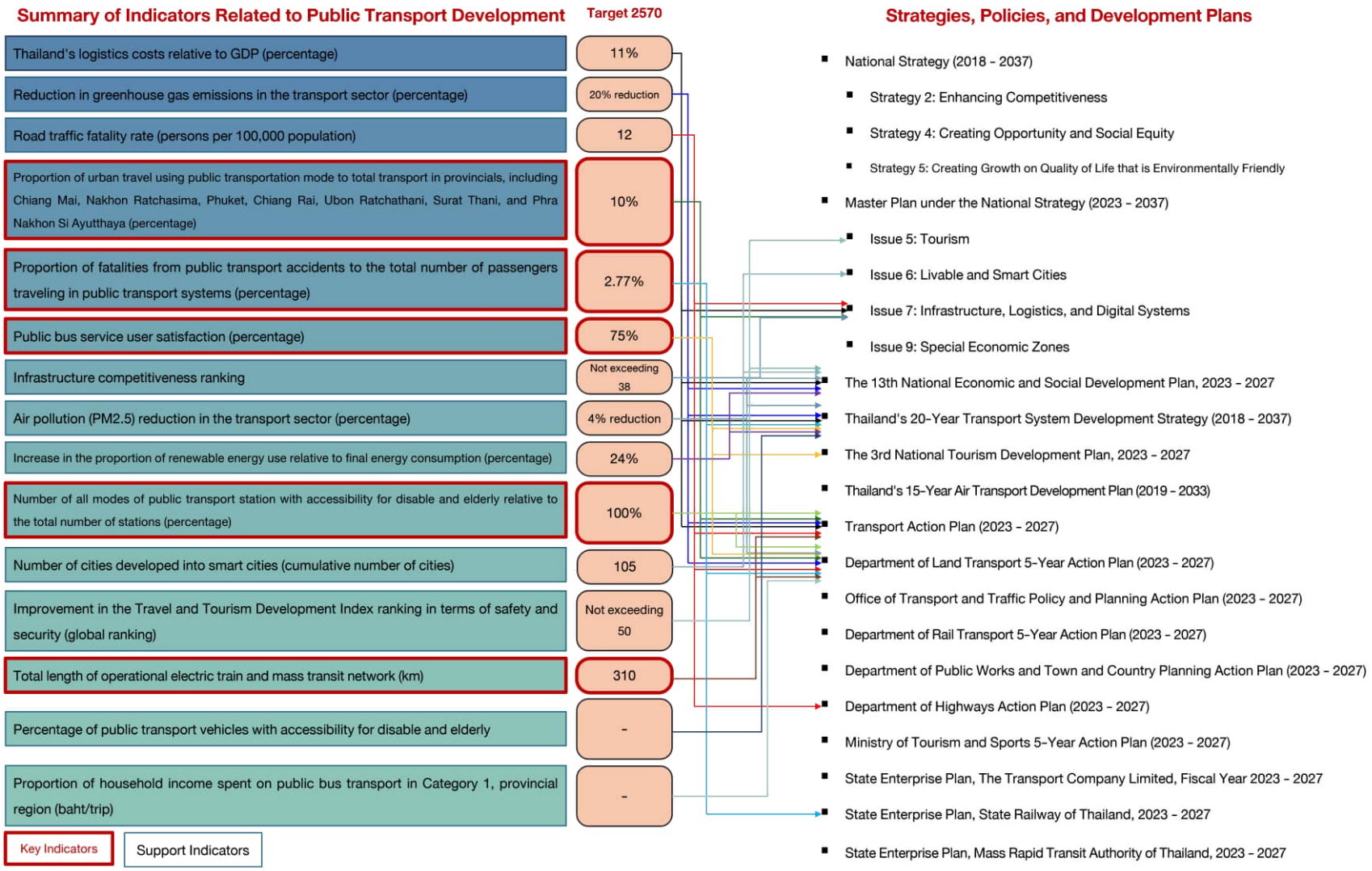
Source: Compiled by Consultants (2024)

Figure 2.1-1 Causal X-Y-Z Links from the Project to the 20-Year National Strategy



Source: Compiled by Consultants (2024)

Figure 2.1-2 Summary of the Consistency of Strategies, Policies, and Development Plans Related to the Development of Public Transport Systems in Principal City Areas in the Regions



Source: Compiled by Consultants (2024)

Figure2.1-3 Summary of Indicators of Strategies, Policies, and Development Plans Related to the Development of Public Transport Systems in Principal City Areas in the Regions

Chapter 3

General Characteristics of the Study Area, Economic, Social, and Transportation Conditions

Chapter 3 General Characteristics of the Study Area, Economic, Social, and Transportation Conditions

3.1 Study Area

3.1.1 Chiang Mai Study Area

Chiang Mai is a province where a public transportation system development plan has already been studied and prepared by the Office of Transport and Traffic Policy and Planning (OTP) under the project "Study and Preparation of the Chiang Mai Province Public Transportation System Master Plan," which was completed in 2017. The study area for public transportation system planning was defined using the Chiang Mai Comprehensive City Plan (3rd revision, 2012), with a total area of approximately 430 square kilometers. In this study, the consultant chose to use the same study area as the OTP study in 2017, with a total area of 430 square kilometers, as shown in **Figure 3.1-1.**

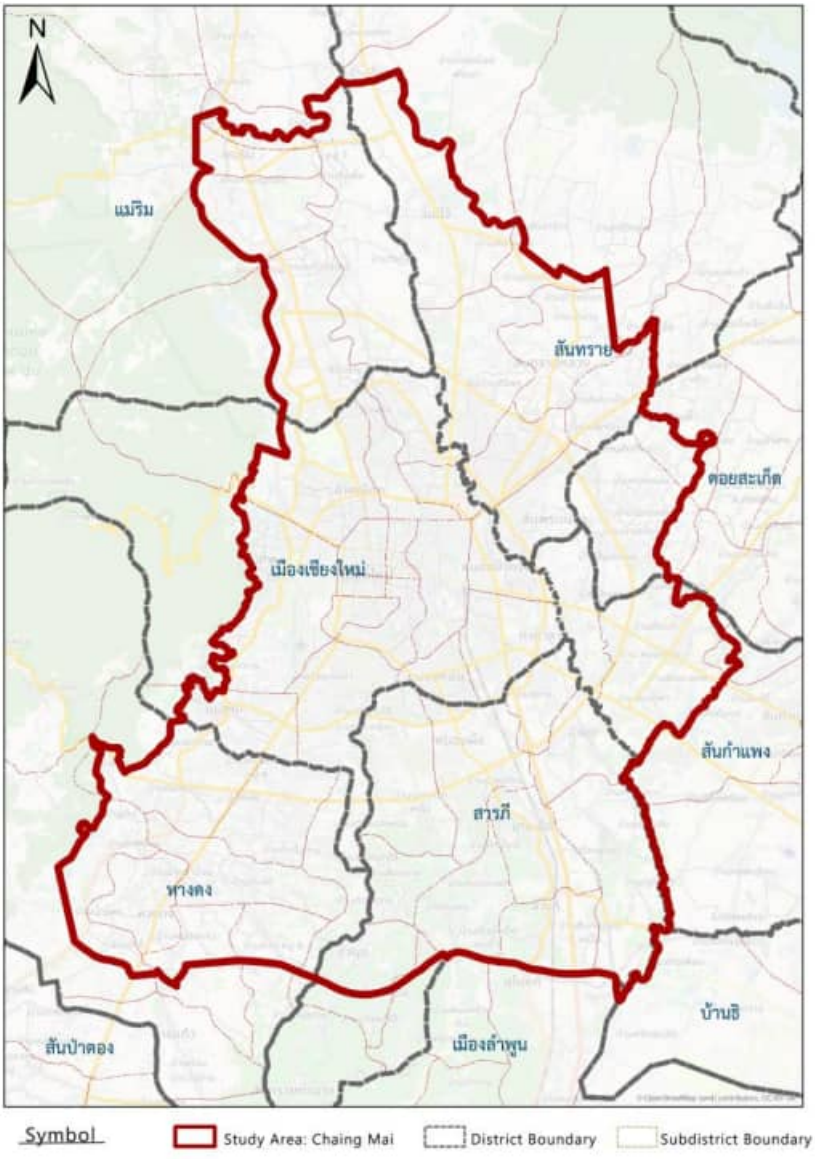


Figure 3.1-1 Chiang Mai Province Study Area in this Study

3.1.2 Chiang Rai Study Area

Chiang Rai is a province where a specific public transportation system development plan study has not yet been conducted. However, the OTP has previously conducted studies related to transportation planning in Chiang Rai Province and Chiang Rai city, such as the "Study for Surveying and Creating a Database for Developing Transportation and Traffic Networks in the Upper Northern Region 2 Strategic Group Area (Chiang Rai, Phayao, Phrae, and Nan Provinces)" in 2012. This study defined the traffic and transportation study area in Chiang Rai urban area, based on the Chiang Rai Comprehensive City Plan of 2007, which is no longer in effect.

In this study, the consultant expanded the study area to cover a larger area than previous studies and the old city plan, with a total area of 200 square kilometers. The study area boundary is shown in **Figure 3.1-2**

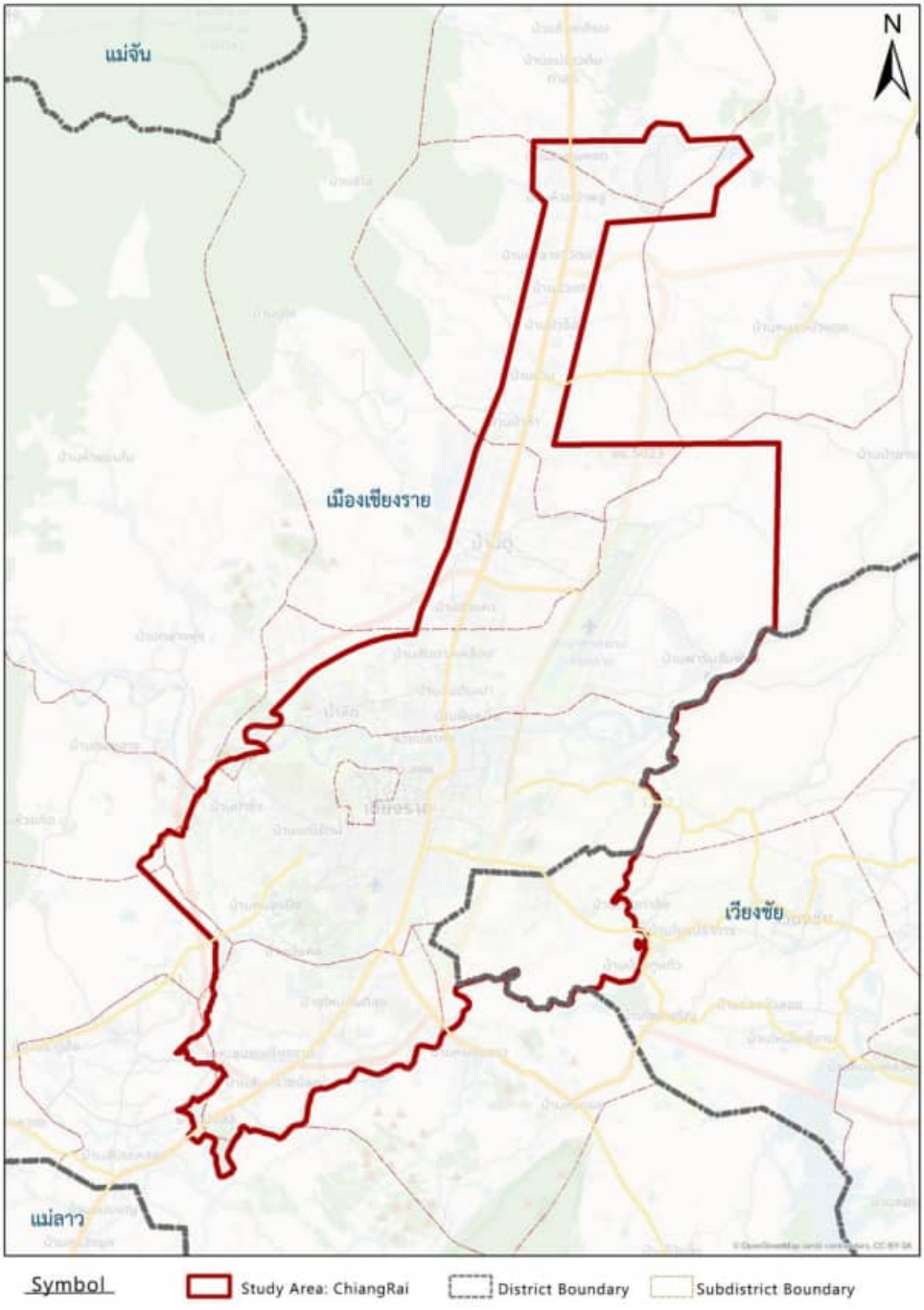


Figure 3.1-2 Chiang Rai Province Study Area in this Study

3.1.3 Phitsanulok Study Area

Phitsanulok is a province where a public transportation system development plan has already been studied and prepared by the OTP under the project "Feasibility Study and Design of the Phitsanulok City Public Transportation System," completed in 2018. This study defined the study area for public transportation system planning using the Phitsanulok Comprehensive City Plan of 2010 as the primary study area boundary.

In this study, the consultant chose to use the same study area as the OTP study in 2018, with a total area of 261 square kilometers, as shown in **Figure 3.1-3.**

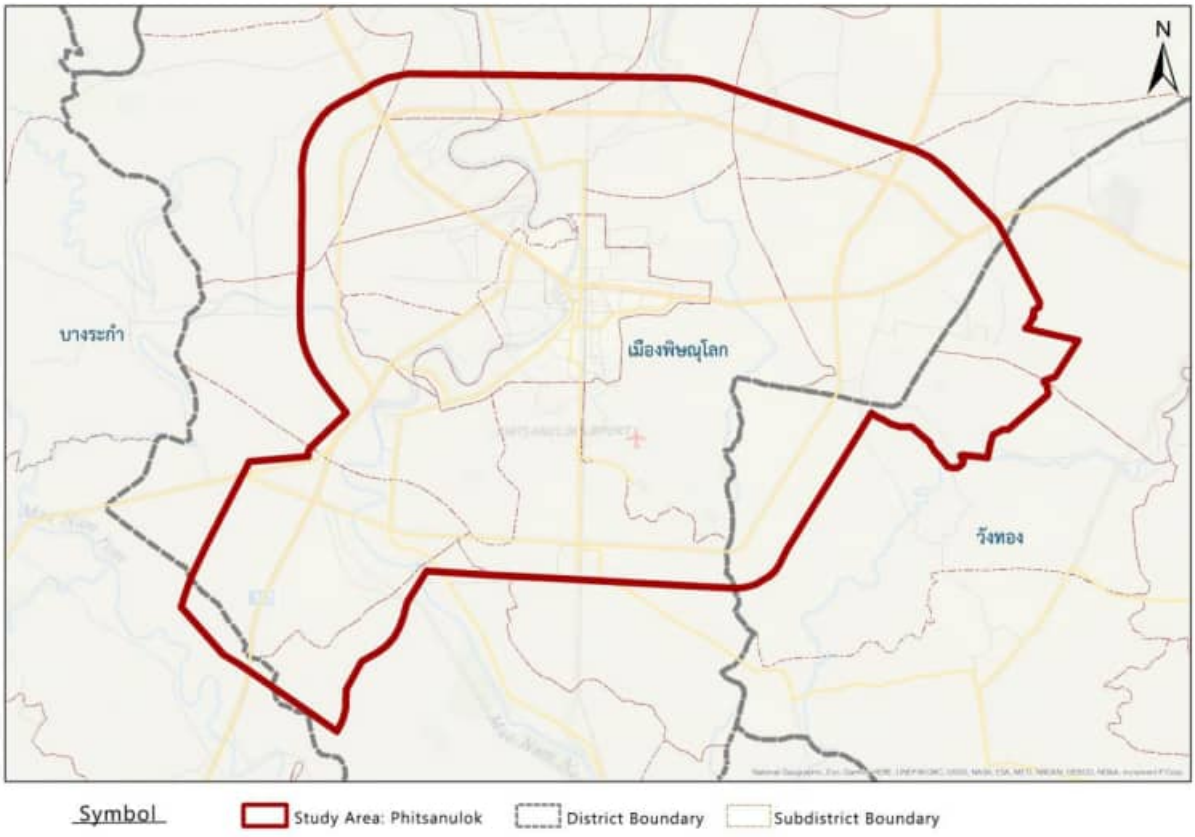


Figure 3.1-3 Phitsanulok Province Study Area in this Study

3.1.4 Udon Thani Study Area

Udon Thani is a province where a public transportation system development plan has already been studied and prepared by the OTP under the project "Master Plan Study for Public Transportation System Development in Udon Thani City," completed in 2019. This study defined the study area for public transportation system planning using the 2nd revised Udon Thani Comprehensive City Plan of 2010 as the primary study area boundary.

In this study, the consultant chose to use the same study area as the OTP study in 2019, with a total area of 169 square kilometers, as shown in **Figure 3.1-4.**

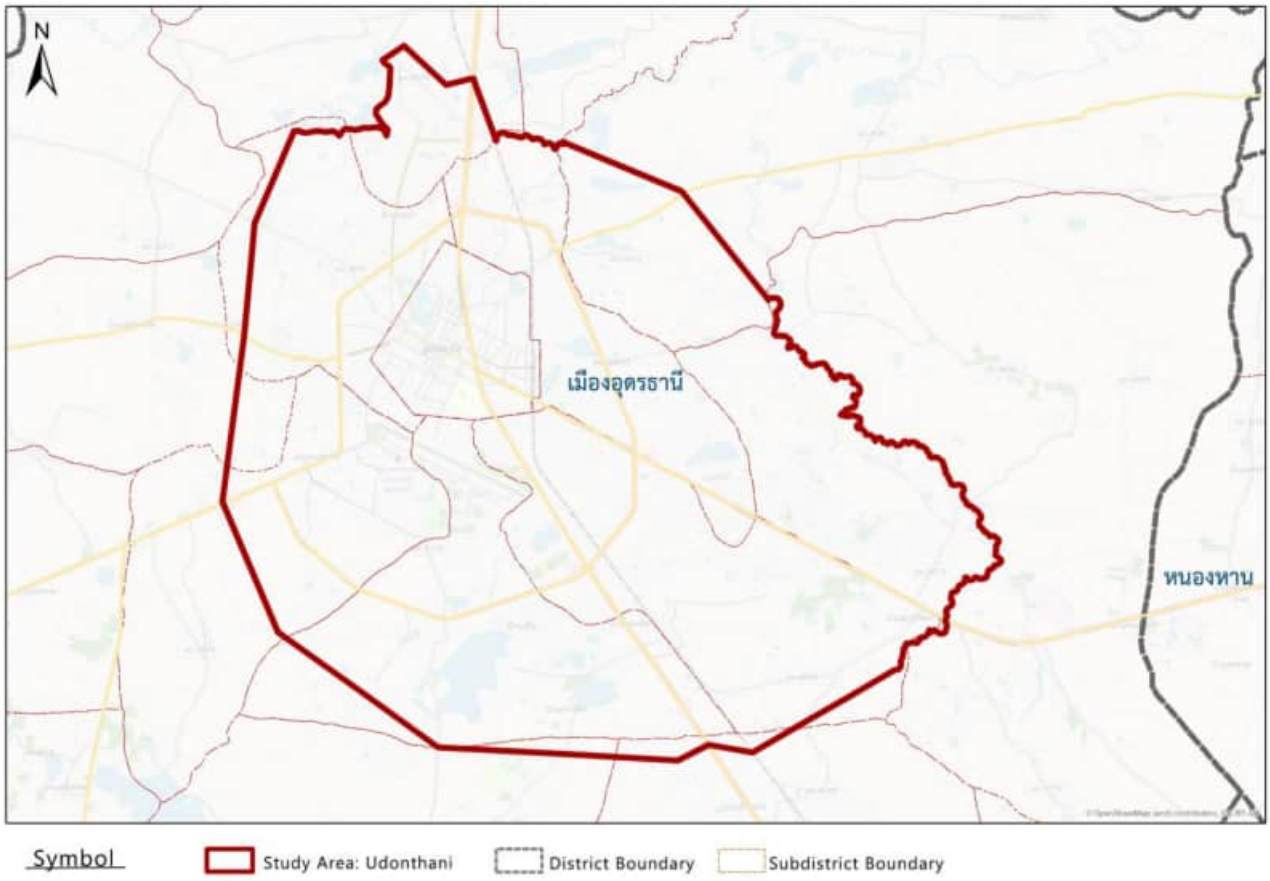


Figure 3.1-4 Udon Thani Province Study Area in this Study

3.1.5 Khon Kaen Study Area

Khon Kaen is a province where a public transportation system development plan has already been studied and prepared by the OTP under the project "Detailed Design Study of the Public Transportation System in Khon Kaen Province and Environmental Impact Assessment," completed in 2018. Additionally, OTP conducted the "Study of Urban Development with Transportation Infrastructure Systems (TOD)" in 2020. Both studies defined the study area for public transportation system planning using the Khon Kaen Comprehensive City Plan of 1999 as the primary study area boundary.

In this study, the consultant chose to use the same study area as the OTP study in 2018, with a total area of 241 square kilometers, as shown in **Figure 3.1-5.**

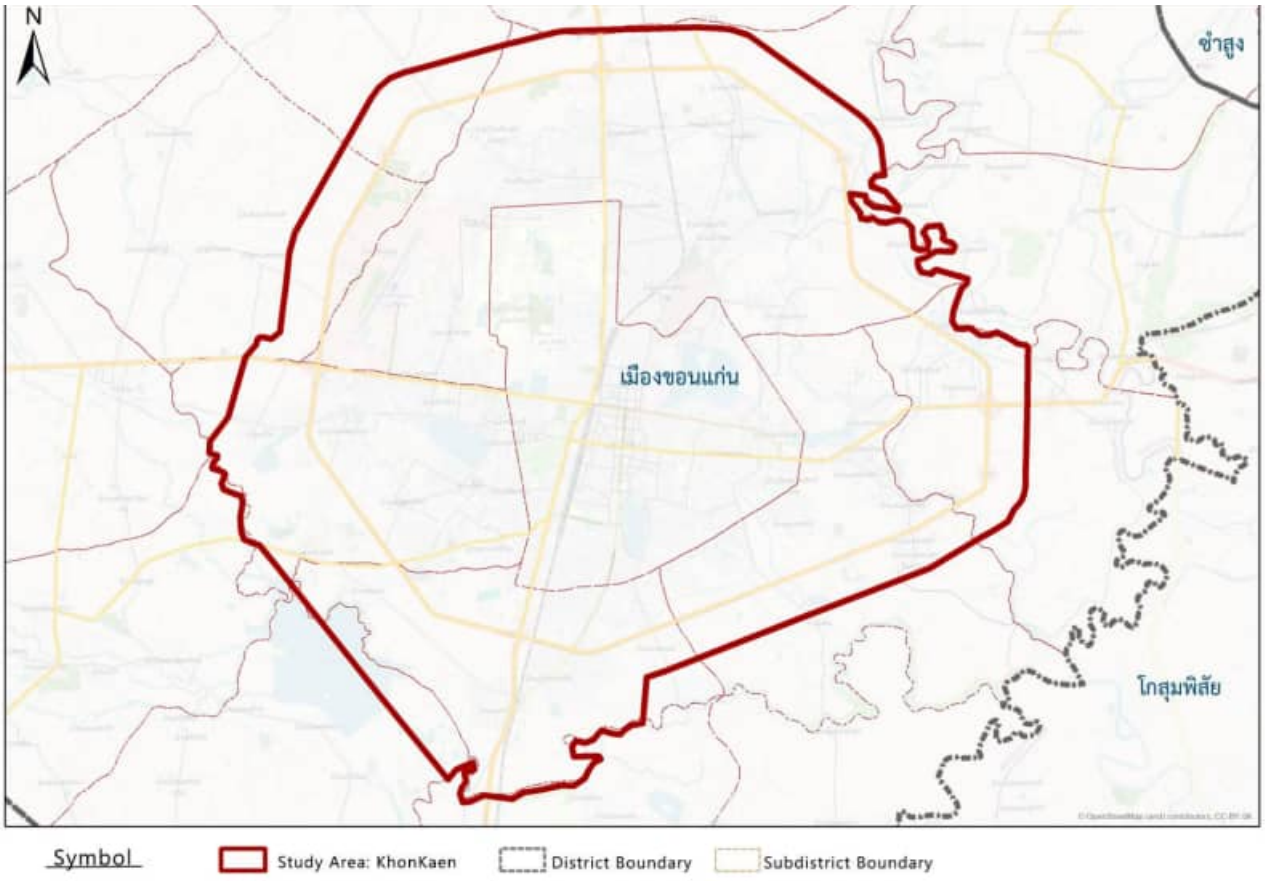


Figure 3.1-5 Khon Kaen Province Study Area in this Study

3.1.6 Nakhon Ratchasima Study Area

Nakhon Ratchasima is a province where a public transportation system development plan has already been studied and prepared by the OTP under the project "Traffic Master Plan and Public Transportation System Development Master Plan in Nakhon Ratchasima City," completed in 2017. This study defined the study area for public transportation system planning using the Nakhon Ratchasima City Comprehensive City Plan of 2004 as the primary study area boundary.

In this study, the consultant chose to use the same study area as the OTP study in 2017 and expanded the study area to partially cover Suranaree University of Technology, with a total area of 400 square kilometers, as shown in **Figure 3.1-6**.

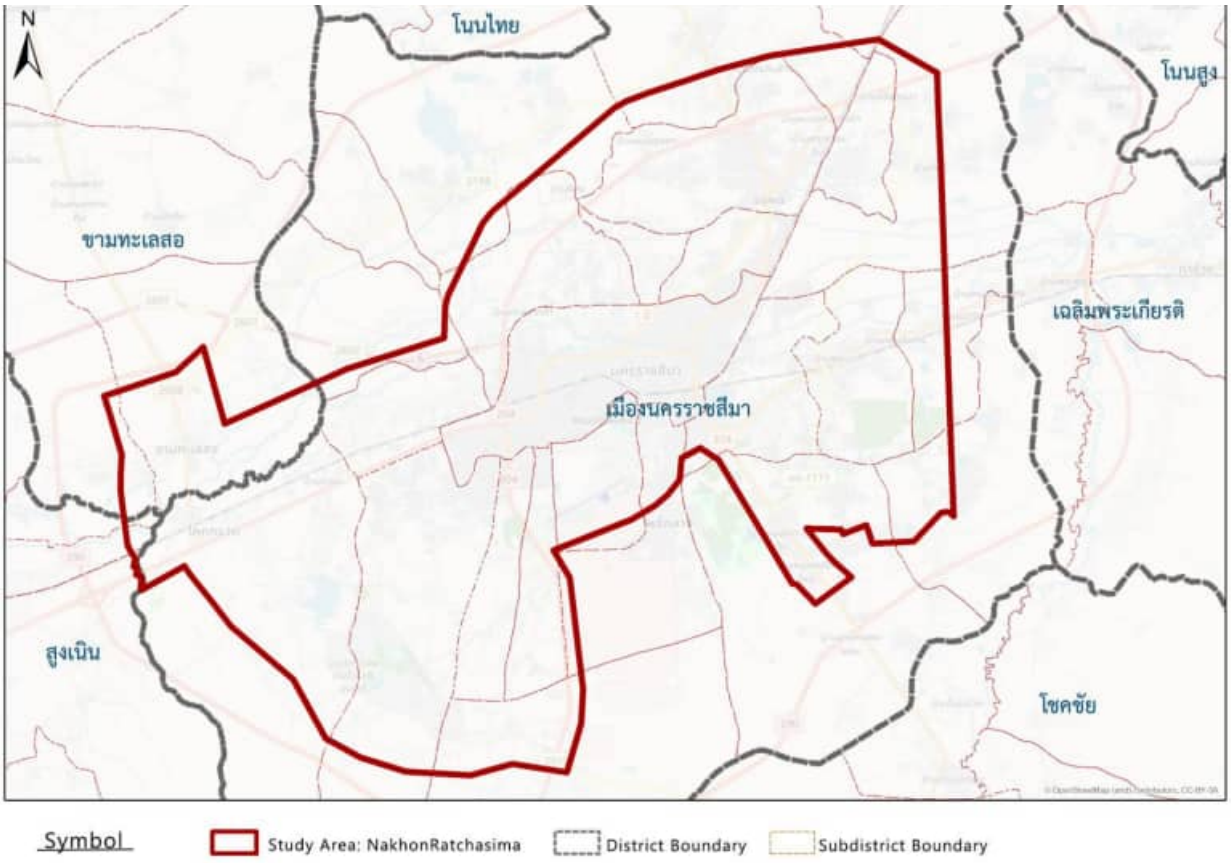


Figure 3.1-6 Nakhon Ratchasima Province Study Area in this Study

3.1.7 Ubon Ratchathani Study Area

Ubon Ratchathani is a province where a specific public transportation system development plan study has not yet been conducted. However, the OTP has previously conducted studies related to transportation planning in Ubon Ratchathani Province and Ubon Ratchathani city, such as the "Transportation and Traffic Data Survey Study for the Preparation of a Master Plan in Regional Cities: Ubon Ratchathani Province" in 2010. This study developed a travel model within the Ubon Ratchathani City Comprehensive City Plan of 2004, which is the latest city plan.

The consultant defined the study area based on the comprehensive city plan and expanded the study area to the north and south to cover all current and future urban activities and communities, as shown in **Figure 3.1-7.**

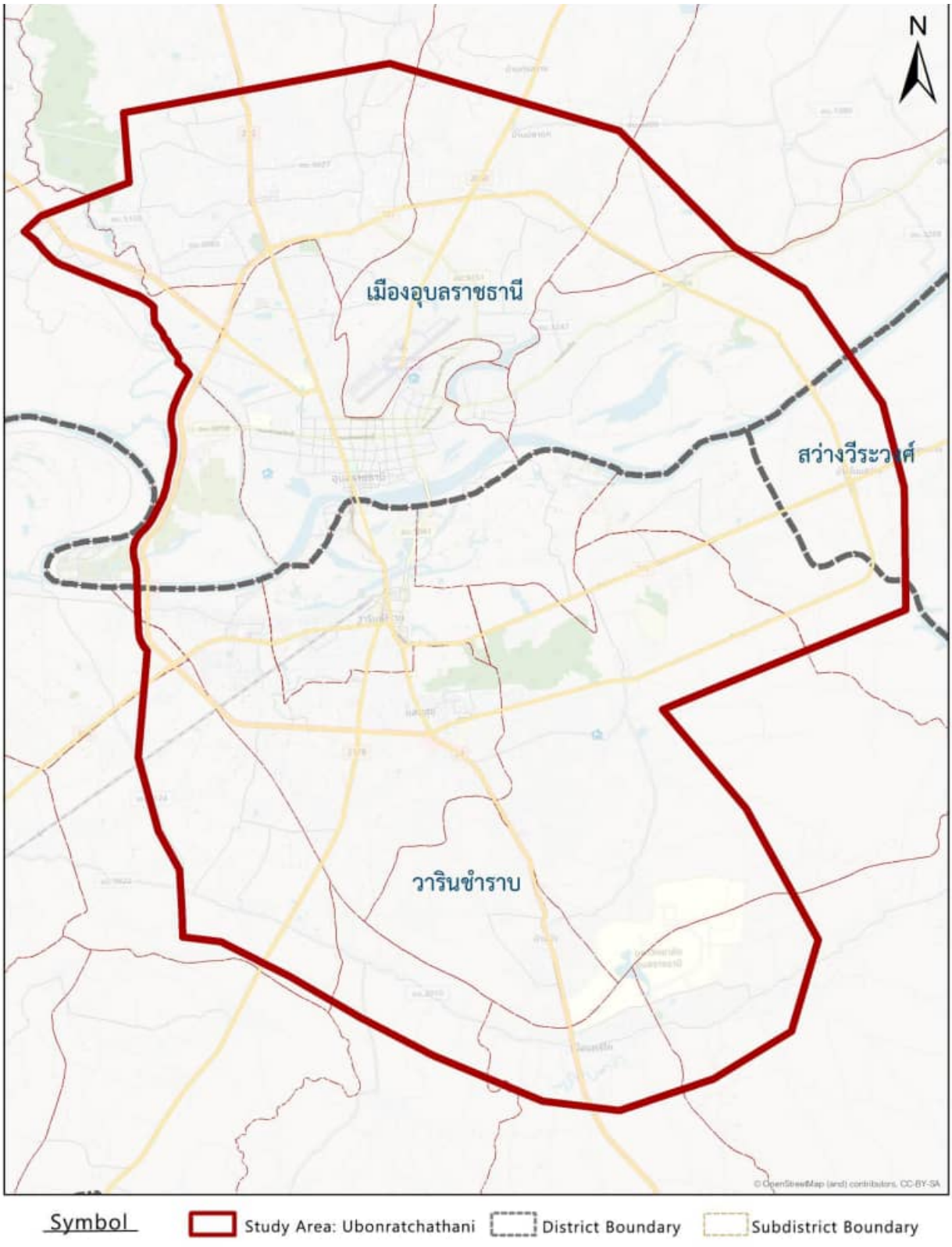


Figure 3.1-7 Ubon Ratchathani Province Study Area in this Study

3.1.8 Phra Nakhon Si Ayutthaya Study Area

Phra Nakhon Si Ayutthaya is a province where a specific public transportation system development plan study has not yet been conducted. The OTP has previously conducted studies related to transportation planning in Phra Nakhon Si Ayutthaya Province and Phra Nakhon Si Ayutthaya city, such as the "Study of Urban Development with Transportation Infrastructure Systems: Phra Nakhon Si Ayutthaya Prototype City" in 2021. However, a review of the project details revealed that the main study area was the vicinity of the railway station, and a model was developed within a 3-kilometer radius of the railway station. The 3-kilometer radius around the railway station does not cover the urban community, including nearby industrial areas of Phra Nakhon Si Ayutthaya.

Therefore, in this study, the consultant defined the study area based on the draft comprehensive city plan and expanded the study area to the east to cover all current and future urban community activities and industrial estates, as shown in **Figure 3.1-8**, with a total area of 210 square kilometers.

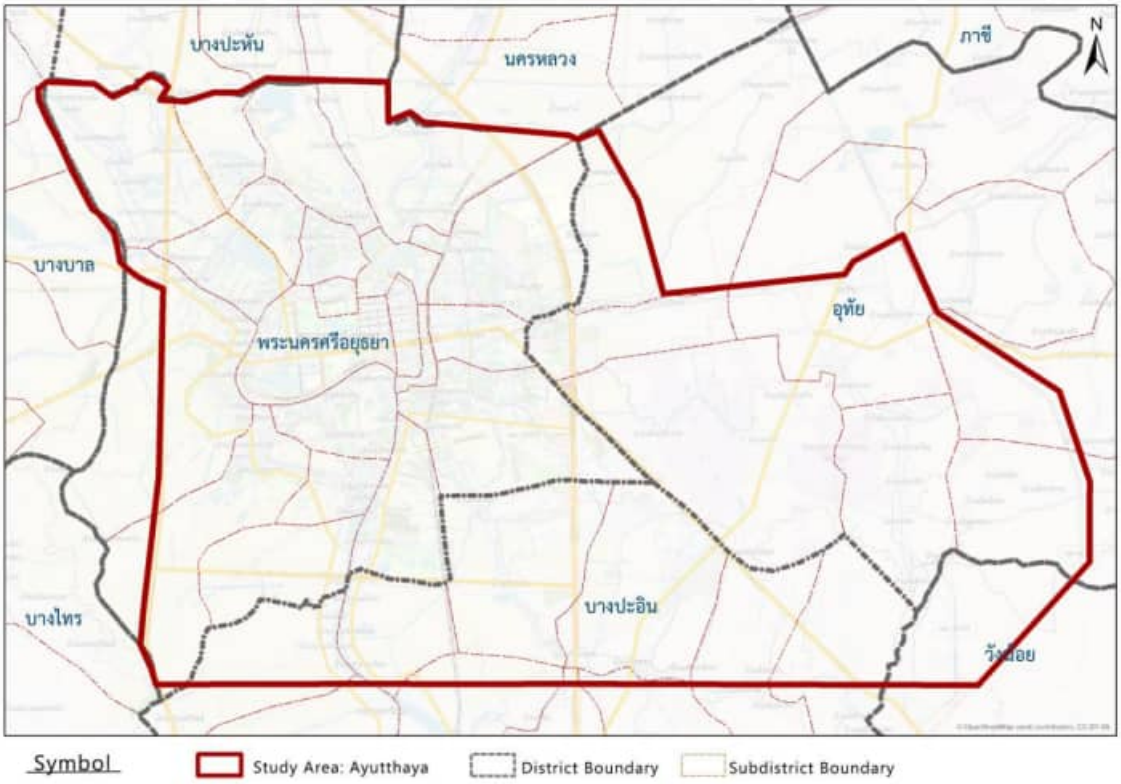


Figure 3.1-8 Phra Nakhon Si Ayutthaya Province Study Area in this Study

3.1.9 Surat Thani Study Area

Surat Thani is a province where a specific public transportation system development plan study has not yet been conducted. However, the OTP has previously conducted studies related to transportation planning in Surat Thani Province and Surat Thani city, such as the "Transportation and Traffic Data Survey Study for the Preparation of a Master Plan in Regional Cities: Surat Thani Province" in 2010.

In this study, the consultant defined the study area based on the comprehensive city plan and expanded the study area to the south to cover all current and future urban activities and communities, as shown in **Figure 3.1-9**, with a total area of 250 square kilometers.

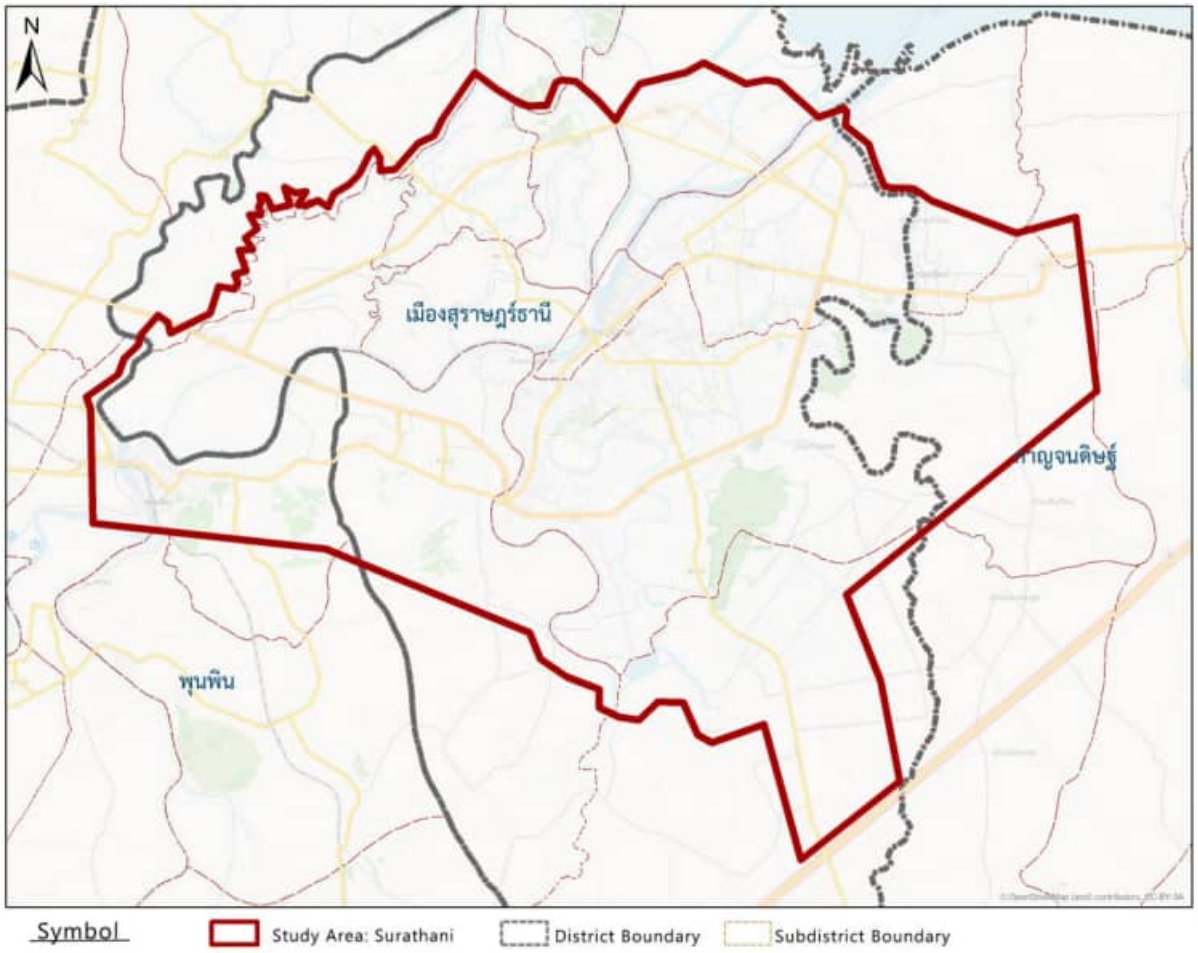


Figure 3.1-9 Surat Thani Province Study Area in this Study

3.1.10 Phuket Study Area

Phuket is a province where a public transportation system development plan study was conducted in 2006. Phuket Province commissioned a study for the "Construction of a Light Rail Transit System around Phuket Island and the Airport Route." The main study area was the entire Phuket Island. Later, the OTP conducted the "Feasibility Study and Design of the Phuket Mass Transit System on the Phuket International Airport - Chalong Intersection Route," which was completed in 2017. This study also defined the study area for public transportation planning using Phuket Island as the primary study area boundary.

Therefore, in this study, the consultant chose to use the same study area as the OTP study in 2017, with a total area of 543 square kilometers, as shown in **Figure 3.1-10.**

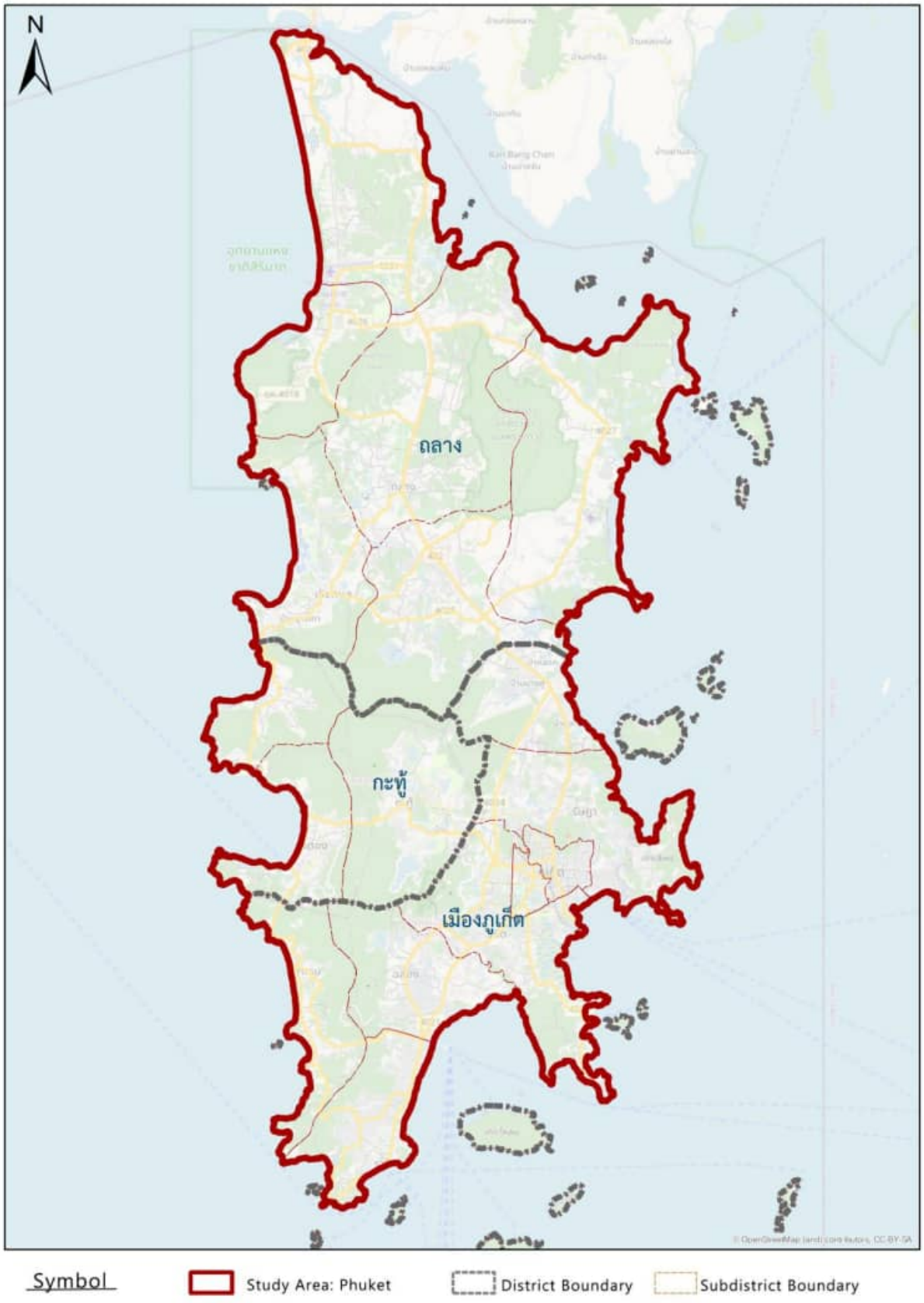


Figure 3.1-10 Phuket Province Study Area in this Study

3.1.11 Songkhla Study Area (Hat Yai)

Songkhla (Hat Yai) is another province where a public transportation system development plan has already been studied and prepared. In 2014, the Songkhla Provincial Administration Organization commissioned King Mongkut's University of Technology Thonburi to conduct the "Rail Transit System Design Study, Hat Yai District, Songkhla Province." This study defined the study area at two levels: the overall Hat Yai District level, covering the entire Hat Yai District, and the urban area within the comprehensive city plan and Hat Yai Municipality area, which was the primary study area for public transportation system planning.

The consultant chose to use the draft Hat Yai City Comprehensive City Plan, Songkhla Province (3rd Revision), which is currently undergoing legal processes, with a total area of 400 square kilometers, as shown in **Figure 3.1-11**. This covers the entire study area from 2014 study.

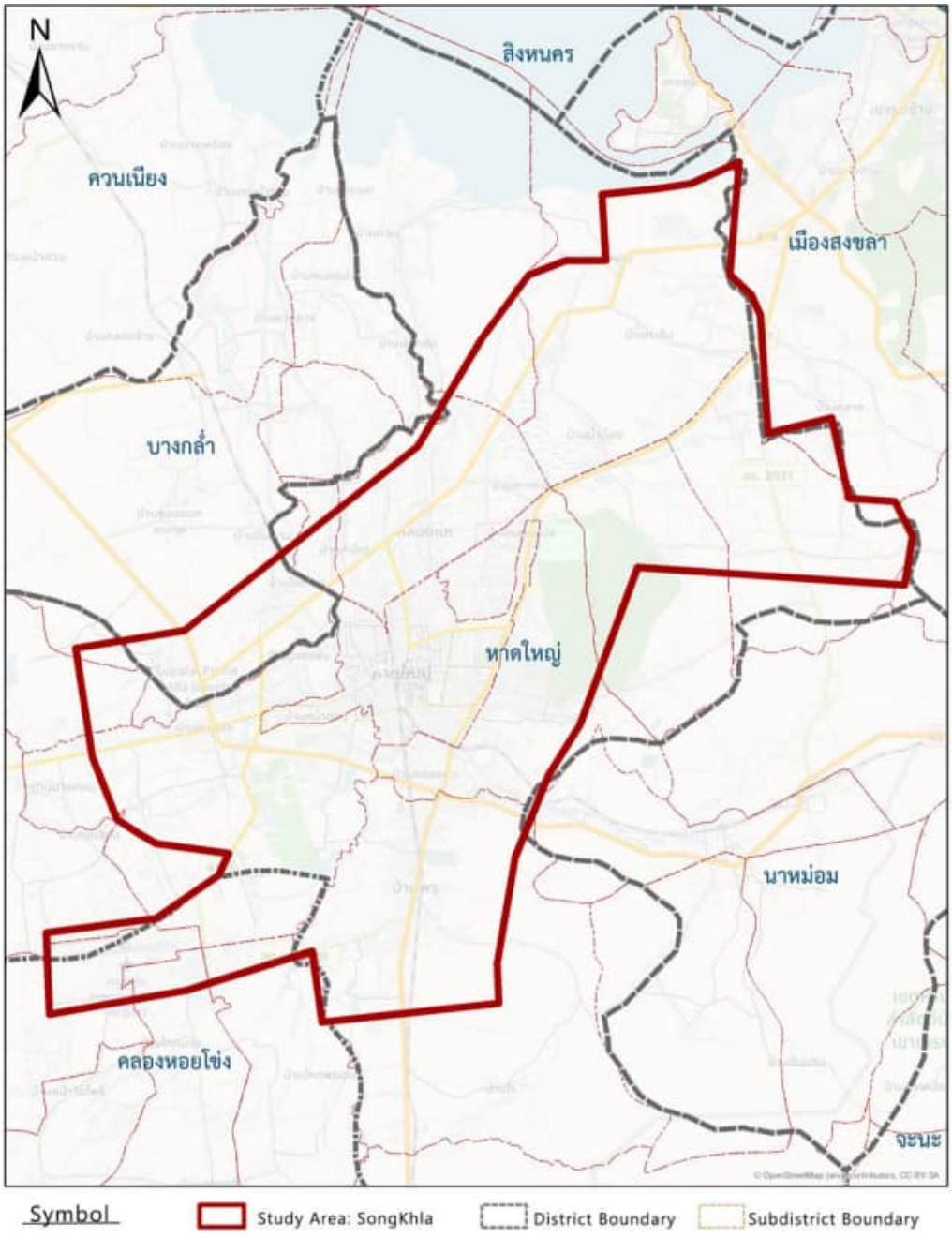


Figure 3.1-11 Songkhla Province (Hat Yai) Study Area in this Study

3.2 Economic and Social Conditions

3.2.1 Gross Provincial Product (GPP)

The Gross Provincial Product (GPP) tends to increase in most years, except for Phitsanulok, Surat Thani, and Phuket provinces, which show a decreasing trend. The proportion of the Gross Provincial Product of each province is shown in **Figure 3.2-1.**

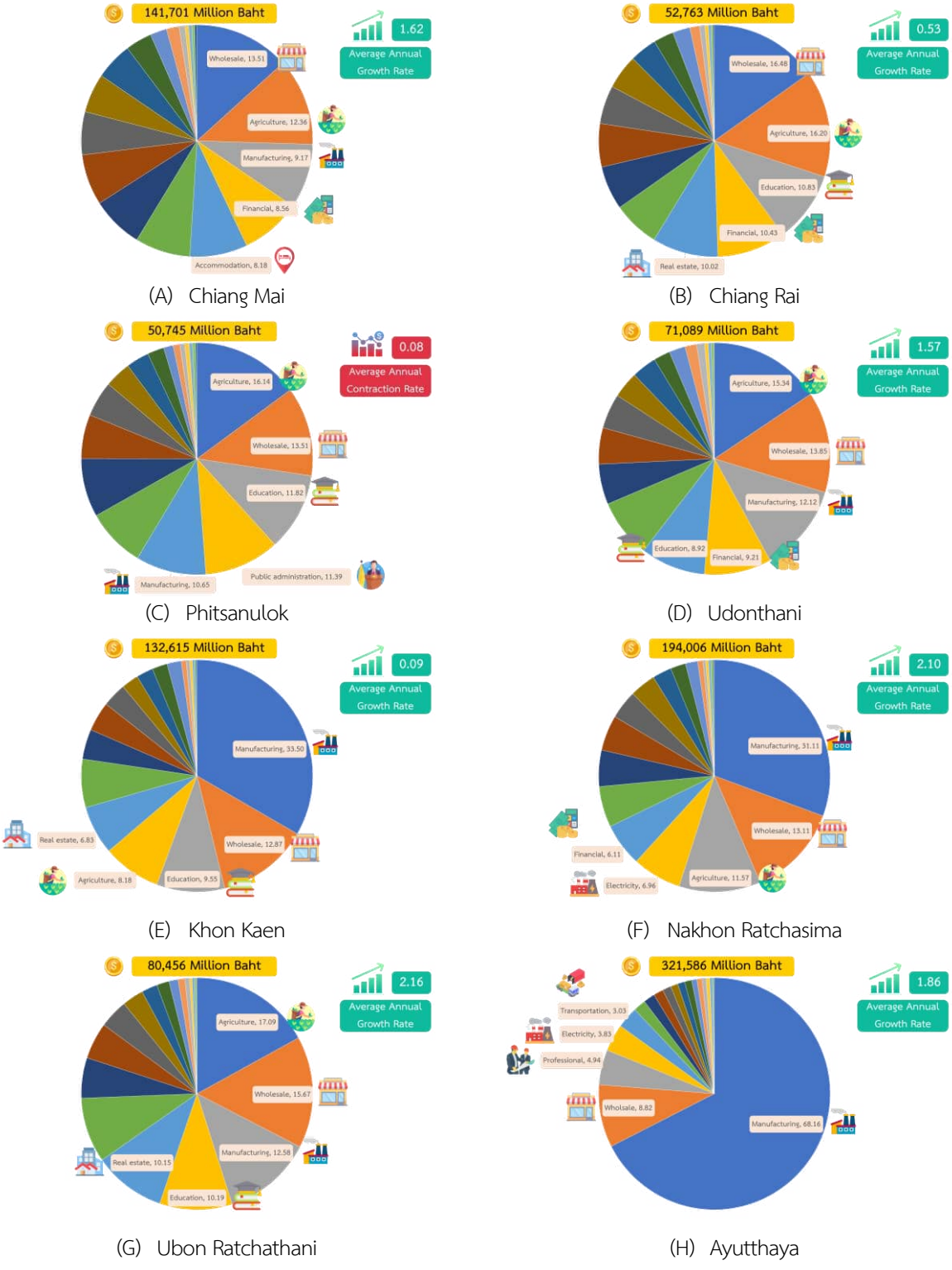
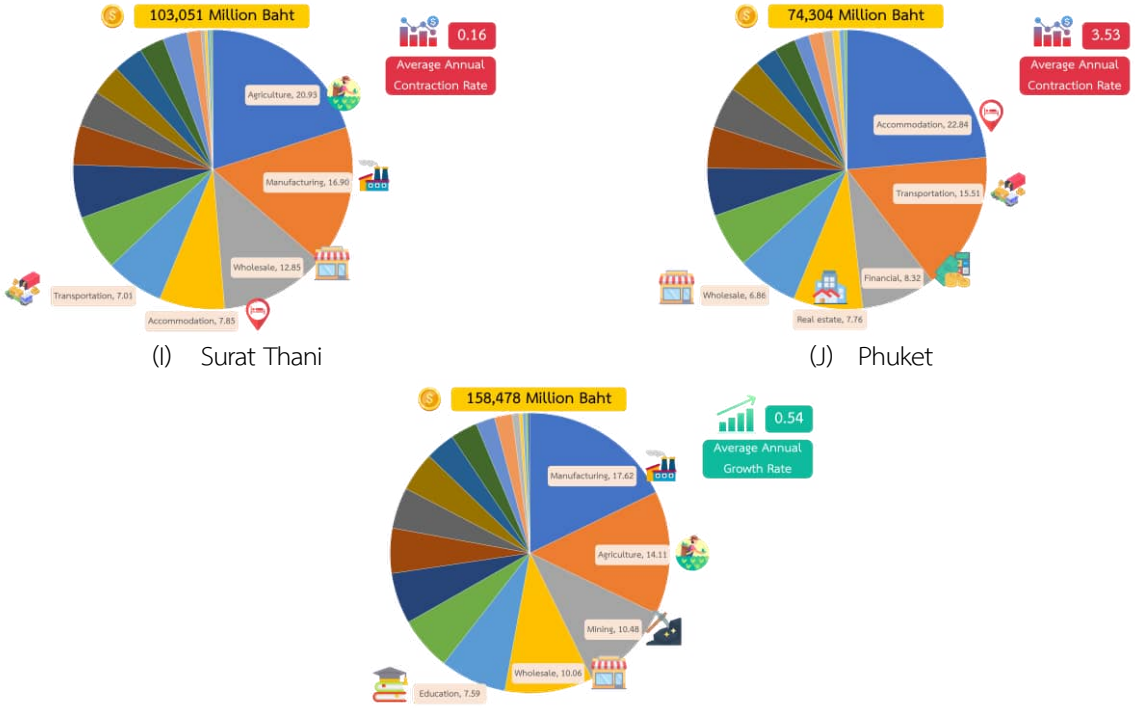


Figure 3.2-1 Proportion of Gross Provincial Product by Province, 2021



(I) Surat Thani (J) Phuket

(K) Songkhla

Figure 3.2-1 Proportion of Gross Provincial Product by Province, 2021 (Continued)

3.2.2 Household income

Average household income data for the 11 study provinces is shown in **Figure 3.2-2**. Nakhon Ratchasima province has the highest average household income growth rate at 4.67% per year.

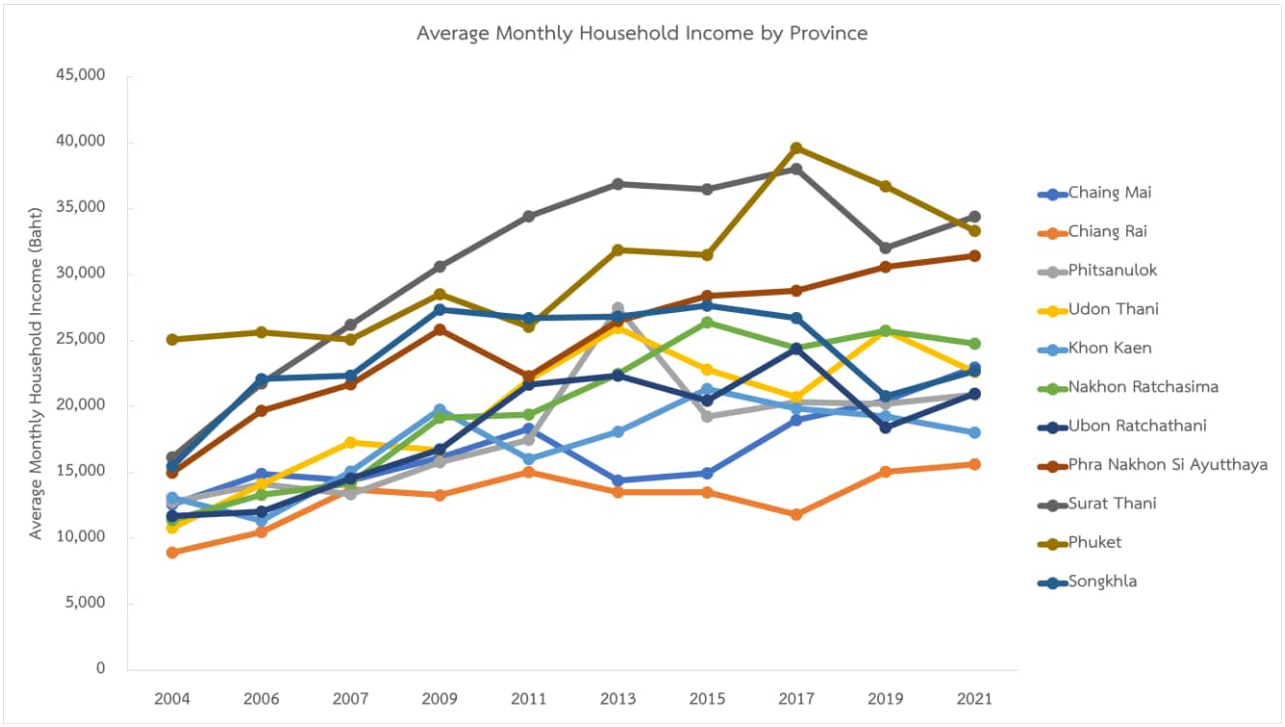


Figure 3.2-2 Average household income of the population in the study area of 11 provinces

3.2.3 The number of people and households

1) Population and households in Chiang Mai Province

Provincial Population Data on the population statistics of Chiang Mai Province over the past 12 years (2012 - 2023) from the Department of Provincial Administration, Ministry of Interior, shows that Chiang Mai Province has an average population increase of 0.75%, as shown in **Figure 3.2-3**. The district with the highest population is Mueang Chiang Mai District, followed by San Sai District and Mae Fang District. The district with the lowest population is Galyani Vadhana District.

In 2023, the total population was 1,797,075, consisting of 865,666 males (48.17%) and 931,409 females (51.83%). The largest population group in the province is between 31-40 years old (266,956 people), and the smallest group is over 90 years old (9,378 people).

The number of households in Chiang Mai Province has increased every year, with an average increase of 2.23%. In 2023, the total number of households was the highest, at 883,862 households, as shown in **Figure 3.2-3**. The district with the highest number of households is Mueang Chiang Mai District, followed by San Sai District and Hang Dong District. The district with the lowest number of households is Galyani Vadhana District.

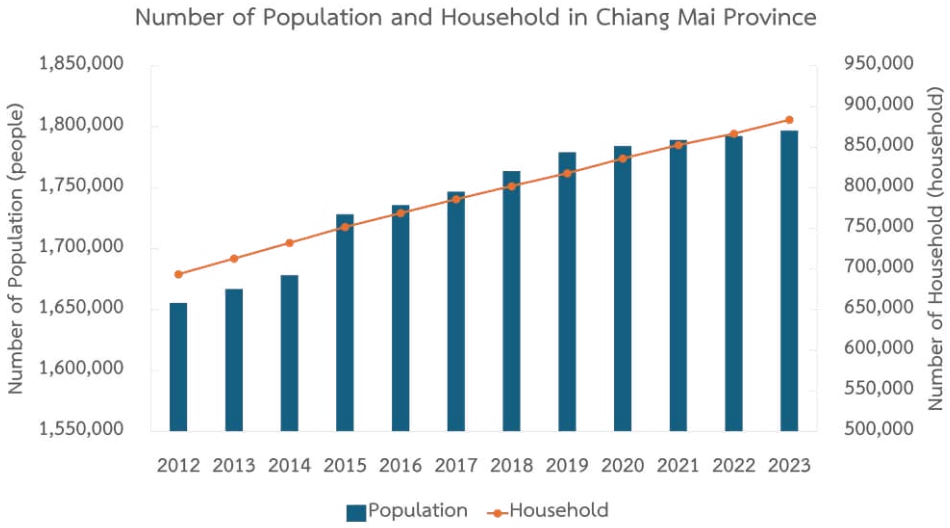


Figure 3.2-3 Population and Households in Chiang Mai Province 2012 – 2023

2) Population and households in Chiang Rai Province

Provincial Population Data on the population statistics of Chiang Rai Province over the past 12 years (2012 - 2023) from the Department of Provincial Administration, Ministry of Interior, shows that Chiang Rai Province has an average population increase of 0.72%, as shown in **Figure 3.2-4**. The district with the highest population is Mueang Chiang Rai District, followed by Mae Sai District and Phan District. The district with the lowest population is Doi Luang District.

In 2022, the total population was 1,298,977, consisting of 629,917 males (48.49%) and 669,060 females (51.51%). The largest population group in the province is between 51-60 years old (192,625 people), and the smallest group is over 90 years old (5,146 people).

The number of households in Chiang Rai Province has increased every year, with an average of 1.75%, and in 2023, there was the highest number of households, totaling 586,117 households, as shown in

Figure 3.2-4. The district with the most household is Mueang Chiang Rai District, followed by Mae Sai District and Phan District. The district with the fewest households is Doi Luang District.

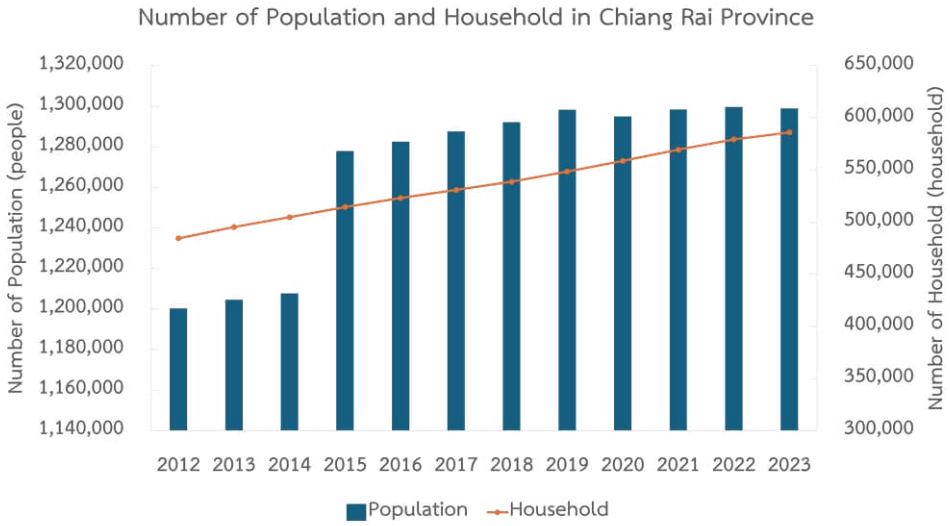


Figure 3.2-4 Population and Households in Chiang Rai Province 2012 – 2023

3) Population and households of Phitsanulok Province

Provincial population from the collection of population statistics in Phitsanulok Province over the past 12 years, 2012-2023, from the Department of Provincial Administration, Ministry of Interior, it was found that Phitsanulok Province has an average population decrease of 0.14%, as shown in **Figure 3.2-5**. The district with the highest population is Mueang Phitsanulok District. The next highest are Wang Thong District and Bang Rakam District. The district with the lowest population is Wat Bot District.

In 2023, there was a total population of 841,729 people, divided into 411,058 males, accounting for 48.83%, and 430,671 females, accounting for 51.17%. The majority of the population in the province is between 51-60 years old, with a population of 133,701 people, and the smallest population group is over 90 years old, with a population of 3,656 people.

The number of households in Phitsanulok Province has increased every year, with an average increase of 1.60%. In 2023, there was the highest number of households, totaling 368,521 households, as shown in **Figure 3.2-5**. The district with the highest number of households is Mueang Phitsanulok District. The next highest are Wang Thong District and Bang Rakam District. The district with the lowest number of households is Chat Trakan District.

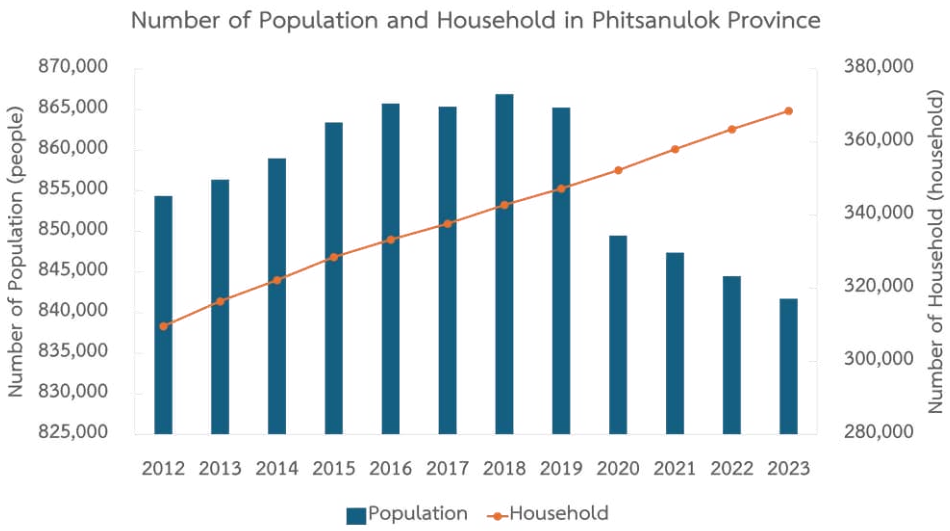


Figure 3.2-5 Population and Households in Phitsanulok Province 2012 – 2023

4) Population and households in Udon Thani Province

Provincial population from the collection of population statistics in Udon Thani Province over the past 12 years, 2012-2023, from the Department of Provincial Administration, Ministry of Interior, it was found that Udon Thani Province has an average population increase of 0.01%, as shown in **Figure 3.2-6**. The district with the highest population is Mueang Udon Thani District. The next highest are Ban Dung District and Kumphawapi District. The district with the lowest population is Ku Kaeo District.

In 2023, there was a total population of 1,558,528 people, divided into 769,682 males, accounting for 49.39%, and 788,846 females, accounting for 50.61%. The majority of the population in the province is between 41-50 years old, with a population of 257,468 people, and the smallest population group is over 90 years old, with a population of 3,926 people.

The number of households in Udon Thani Province has increased every year, with an average increase of 1.90%. In 2023, there was the highest number of households, totaling 557,058 households, as shown in **Figure 3.2-6**. The district with the highest number of households is Mueang Udon Thani District. The next highest are Kumphawapi District and Ban Dung District. The district with the lowest number of households is Ku Kaeo District.

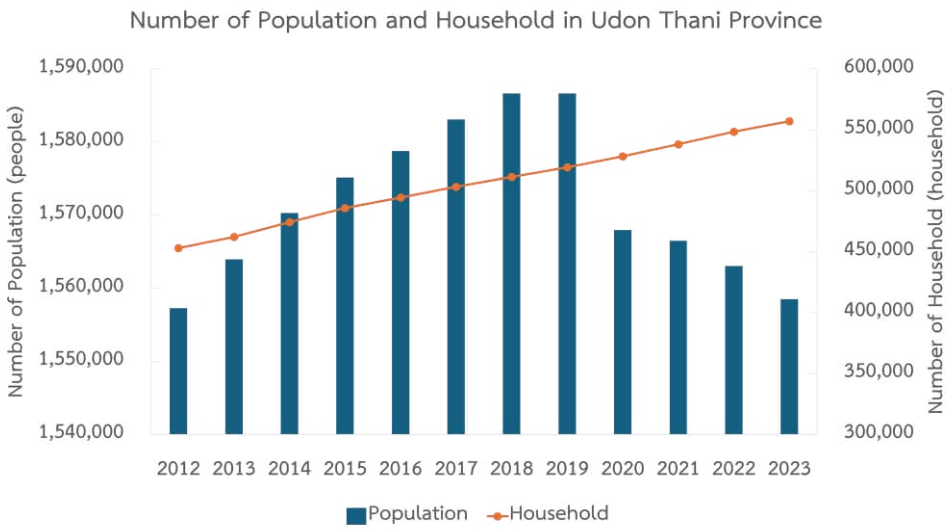


Figure 3.2-6 Population and Households in Udon Thani Province 2012 – 2023

5) Population and households in Khon Kaen province

Provincial population from the collection of population statistics in Khon Kaen province over the past 12 years, 2012-2023, from the Department of Provincial Administration, Ministry of Interior, it was found that Khon Kaen Province has an average population increase of 0.02%, as shown in **Figure 3.2-7**. The district with the highest population is Mueang Khon Kaen District. The next highest are Chum Phae District and Nam Phong District. The district with the lowest population is Wiang Kao District.

In 2023, there was a total population of 1,779,373 people, divided into 872,661 males, accounting for 49.04%, and 906,712 females, accounting for 50.96%. The majority of the population in the province is between 51-60 years old, with a population of 289,149 people, and the smallest population group is over 90 years old, with a population of 6,133 people.

The number of households in Khon Kaen Province has increased every year, with an average increase of 1.97%. In 2023, there was the highest number of households, totaling 680,877 households, as shown in **Figure 3.2-7**. The district with the highest number of households is Mueang Khon Kaen District. The next highest are Chum Phae District and Nam Phong District. The district with the lowest number of households is Wiang Kao District.

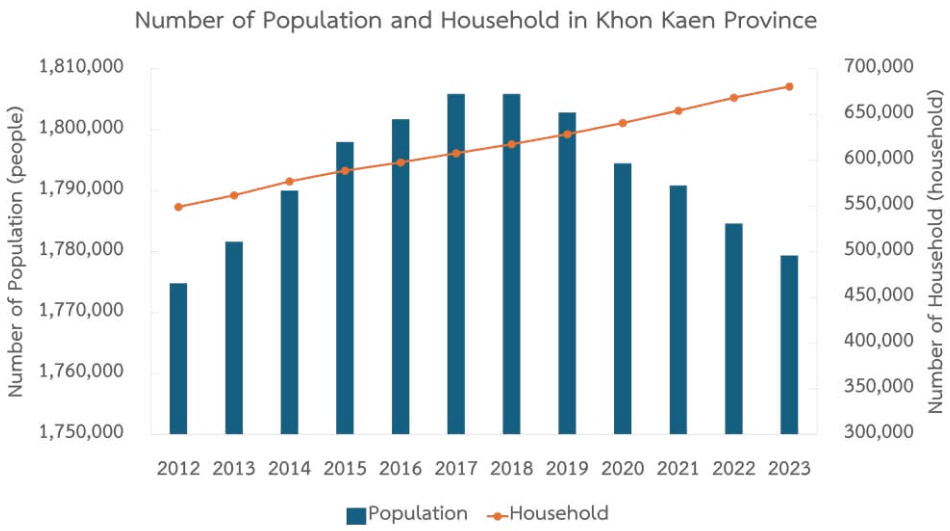


Figure 3.2-7 Population and households in Khon Kaen Province 2012 – 2023

6) Population and households of Nakhon Ratchasima Province

Provincial population from the collection of population statistics in Nakhon Ratchasima Province over the past 12 years, 2012-2023, from the Department of Provincial Administration, Ministry of Interior, it was found that Nakhon Ratchasima Province has an average population increase of 0.09%, as shown in **Figure 3.2-8**. The district with the highest population is Mueang Nakhon Ratchasima District. The next highest are Pak Chong District and Dan Khun Thot District. The district with the lowest population is Ban Lueam District.

In 2023, there was a total population of 2,625,794 people, divided into 1,286,634 males, accounting for 49.00%, and 1,339,160 females, accounting for 51.00%. The majority of the population in the province is between 41-50 years old, with a population of 420,706 people, and the smallest population group is over 90 years old, with a population of 10,719 people.

The number of households in Nakhon Ratchasima Province has increased every year, with an average increase of 2.09%. In 2023, there was the highest number of households, totaling 1,063,007 households, as shown in **Figure 3.2-8**. The district with the highest number of households is Mueang Nakhon Ratchasima District. The next highest are Pak Chong District and Sikhio District. The district with the lowest number of households is Ban Lueam District.

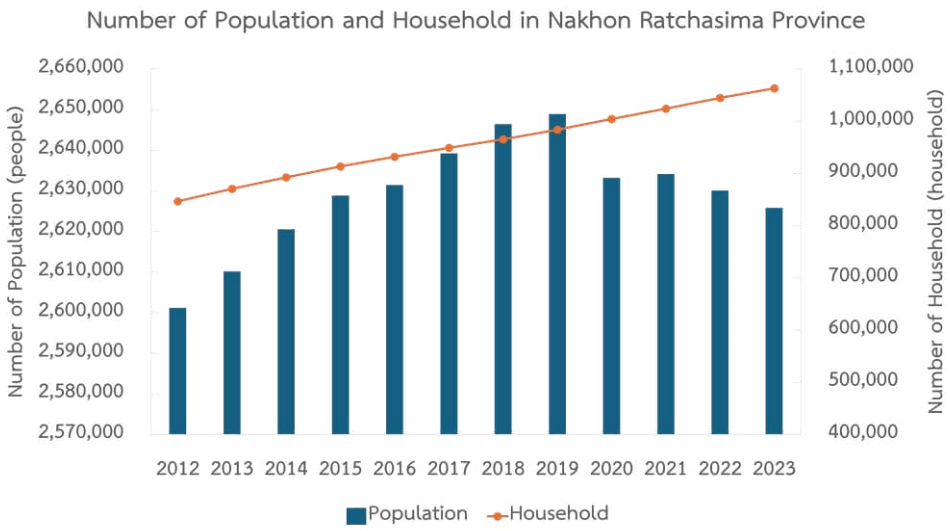


Figure 3.2-8 Population and Households in Nakhon Ratchasima Province 2012 – 2023

7) Population and households of Ubon Ratchathani Province

Provincial population from the collection of population statistics in Ubon Ratchathani Province over the past 12 years, 2012-2023, from the Department of Provincial Administration, Ministry of Interior, it was found that Ubon Ratchathani Province has an average population increase of 0.21%, as shown in **Figure 3.2-9**. The district with the highest population is Mueang Ubon Ratchathani District. The next highest are Det Udom District and Warin Chamrap District. The district with the lowest population is Don Mot Daeng District.

In 2023, there was a total population of 1,869,608 people, divided into 931,541 males, accounting for 49.83%, and 938,067 females, accounting for 50.17%. The majority of the population in the province is between 41-50 years old, with a population of 295,332 people, and the smallest population group is over 90 years old, with a population of 5,628 people.

The number of households in Ubon Ratchathani Province has increased every year, with an average increase of 2.04%. In 2023, there was the highest number of households, totaling 652,557 households, as shown in **Figure 3.2-9**. The district with the highest number of households is Mueang Ubon Ratchathani District. The next highest are Det Udom District and Warin Chamrap District. The district with the lowest number of households is Lao Suea Kok District.

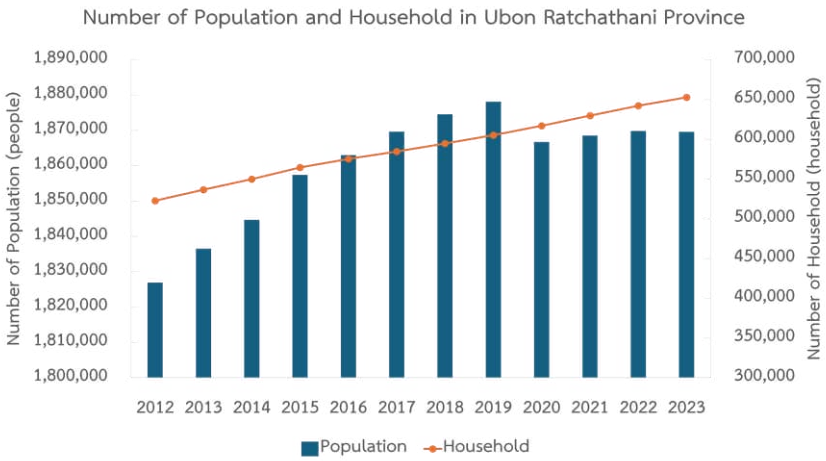


Figure 3.2-9 Population and Households in Ubon Ratchathani Province 2012 – 2023

8) Population and households of Phra Nakhon Si Ayutthaya Province

Provincial Population from the collection of population statistics in Phra Nakhon Si Ayutthaya Province over the past 12 years, 2012-2023, from the Department of Provincial Administration, Ministry of Interior, it was found that Phra Nakhon Si Ayutthaya Province has an average population increase of 0.32%, as shown in **Figure 3.2-10**. The district with the highest population is Phra Nakhon Si Ayutthaya District. The next highest are Bang Pa-in District and Wang Noi District. The district with the lowest population is Ban Phraek District.

In 2023, there was a total population of 822,106 people, divided into 394,255 males, accounting for 47.96%, and 427,851 females, accounting for 52.04%. The majority of the population in the province is between 41-50 years old, with a population of 131,092 people, and the smallest population group is over 90 years old, with a population of 4,439 people.

The number of households in Phra Nakhon Si Ayutthaya Province has increased every year, with an average increase of 2.10%. In 2023, there was the highest number of households, totaling 356,235 households, as shown in **Figure 3.2-10**. The district with the highest number of households is Bang Pa-in District. The next highest are Phra Nakhon Si Ayutthaya District and Wang Noi District. The district with the lowest number of households is Ban Phraek District.

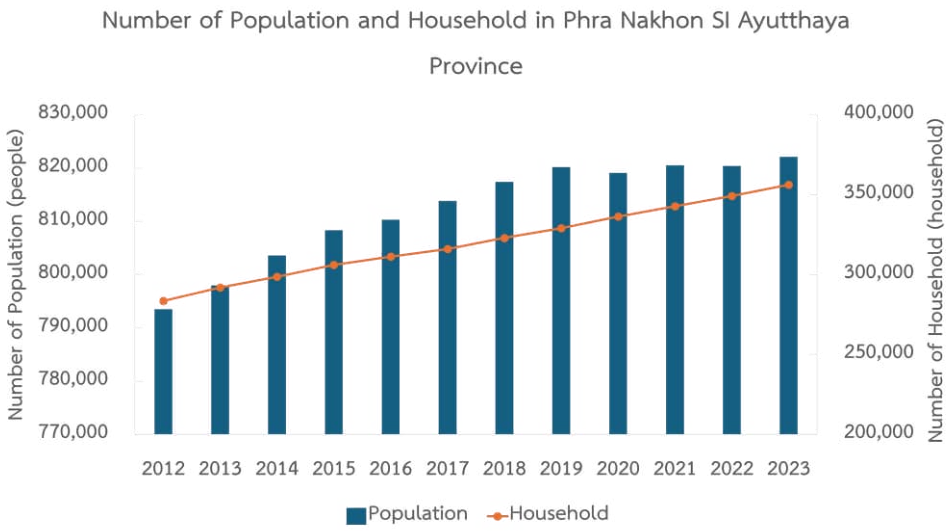


Figure 3.2-10 Population and Households in Phra Nakhon Si Ayutthaya Province 2012 - 2023

9) Population and households in Surat Thani Province

Provincial population from the collection of population statistics in Surat Thani Province over the past 12 years, 2012-2023, from the Department of Provincial Administration, Ministry of Interior, it was found that Surat Thani Province has an average population increase of 0.46%, as shown in **Figure 3.2-11**. The district with the highest population is Mueang Surat Thani District. The next highest are Kanchanadit District and Phunphin District. The district with the lowest population is Wiphawadi District.

In 2023, there was a total population of 1,075,788 people, divided into 528,358 males, accounting for 49.11%, and 547,430 females, accounting for 50.89%. The majority of the population in the province is between 41-50 years old, with a population of 165,722 people, and the smallest population group is over 90 years old, with a population of 6,145 people.

The number of households in Surat Thani Province has increased every year, with an average increase of 2.24%. In 2023, there was the highest number of households, totaling 539,755 households, as shown in **Figure 3.2-11**. The district with the highest number of households is Mueang Surat Thani District. The next highest are Ko Samui District and Kanchanadit District. The district with the lowest number of households is Wiphawadi District.

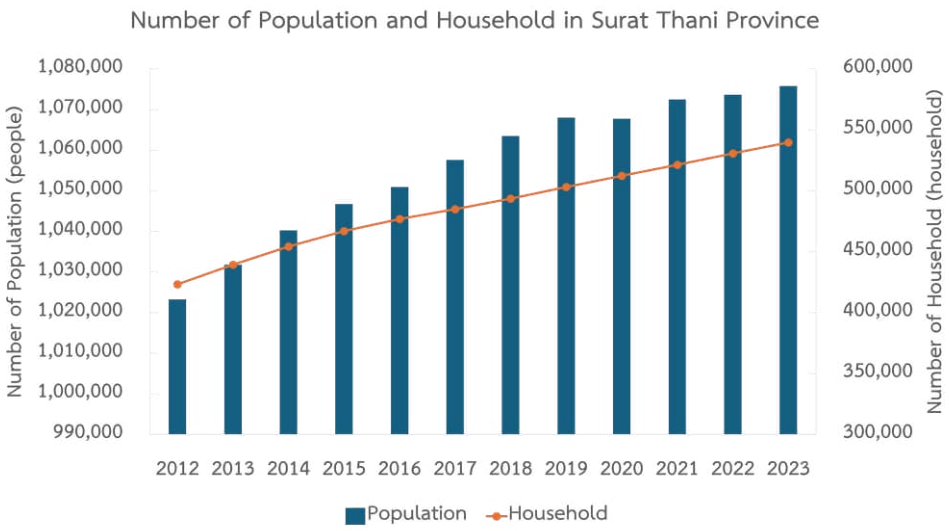


Figure 3.2-11 Population and Households in Surat Thani Province 2012 – 2023

10) Population and households of Phuket Province

Provincial Population Based on the collection of population statistics in Phuket Province over the past 12 years, 2012-2023, from the Department of Provincial Administration, Ministry of Interior, it was found that Phuket Province has an average population increase of 1.47%, as shown in **Figure 3.2-12**. The district with the highest population is Mueang Phuket District. The next highest are Thalang District and Kathu District.

In 2023, there was a total population of 423,599 people, divided into 199,500 males, accounting for 47.10%, and 224,099 females, accounting for 52.90%. The majority of the population in the province is between 41-50 years old, with a population of 70,696 people, and the smallest population group is over 90 years old, with a population of 1,168 people.

The number of households in Phuket Province has increased every year, with an average increase of 3.30%. In 2023, there was the highest number of households, totaling 285,937 households, as shown in **Figure 3.2-12**. The district with the highest number of households is Mueang Phuket District. The next highest are Thalang District and Kathu District.

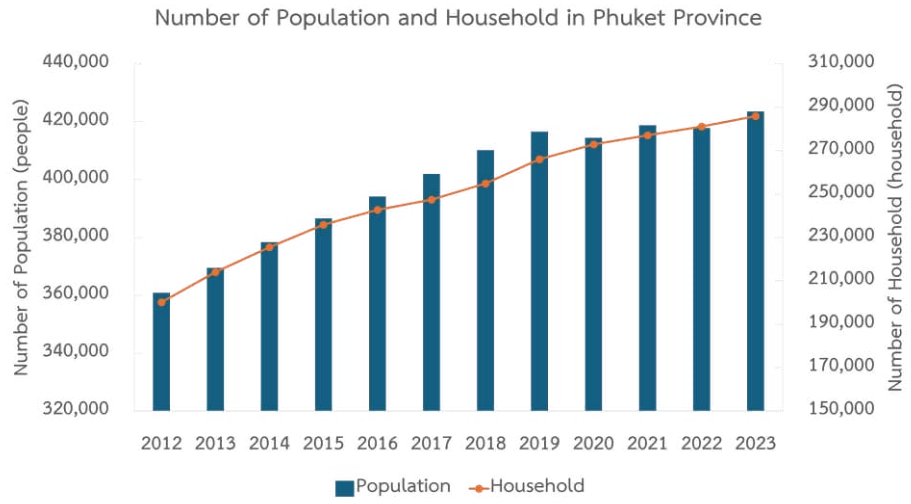


Figure 3.2-12 Population and Households in Phuket Province 2012 – 2023

11) Population and households in Songkhla Province

Provincial Population Based on the collection of statistical data on the population of Songkhla Province over the past 12 years, 2012-2023, from the Department of Provincial Administration, Ministry of Interior, it was found that Songkhla Province has an average population increase of 0.35%, as shown in **Figure 3.2-13**. The district with the highest population is Hat Yai District. The next highest are Mueang Songkhla District and Sadao District. The district with the lowest population is Krasae Sin District.

In 2023, there was a total population of 1,431,959 people, divided into 696,601 males, accounting for 48.65%, and 735,358 females, accounting for 51.35%. The majority of the population in the province is between 41-50 years old, with a population of 210,637 people, and the smallest population group is over 90 years old, with a population of 7,426 people.

The number of households in Songkhla Province has increased every year, with an average increase of 2.11%. In 2023, there was the highest number of households, totaling 584,425 households, as shown in **Figure 3.2-13**. The district with the highest number of households is Hat Yai District. The next highest are Mueang Songkhla District and Sadao District. The district with the lowest number of households is Krasae Sin District.

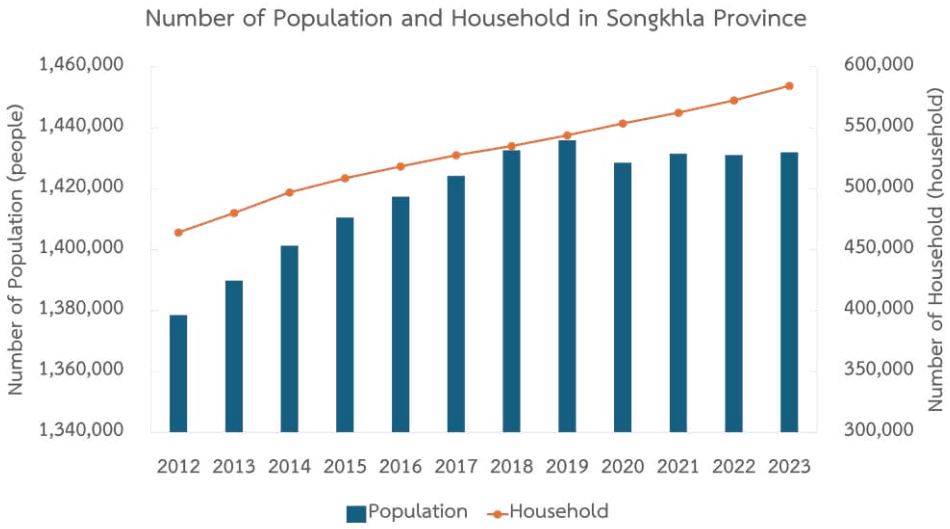


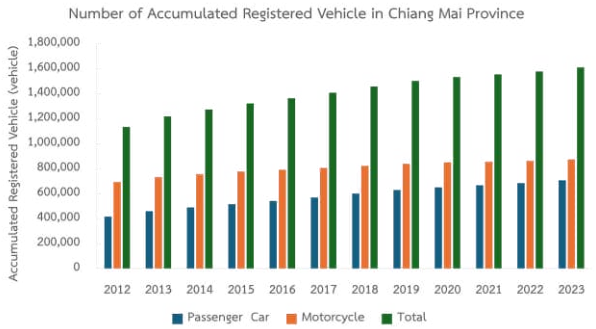
Figure 3.2-13 Population and Households in Songkhla Province 2012 - 2023

3.2.4 Number of Registered Vehicles Accumulation

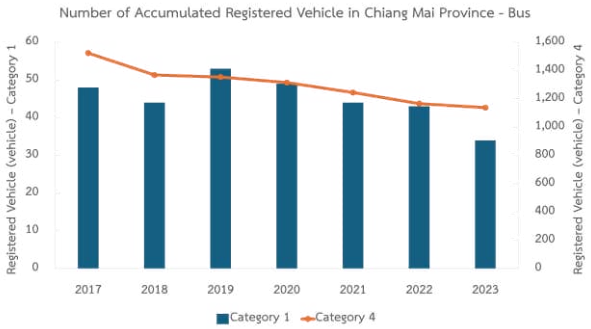
1) Accumulated Registered Vehicle Statistics in Chiang Mai Province

Accumulated Registered Vehicle Statistics in Chiang Mai Province, 2012-2023, from the Department of Land Transport, found that the total number of vehicles of all types - private cars and motorcycles - has a continuous upward trend, as shown in **Figure 3.2-14 (A)**. The highest number was in 2023, with the number of car-type vehicles being 1,585,249 vehicles, the number of bus-type vehicles being 5,108 vehicles, and the number of truck-type vehicles being 19,765 vehicles.

Regarding regular buses, the number of registered regular buses in Chiang Mai Province, 2017-2023, in Category 1 and Category 4, has a continuous downward trend. In 2023, there were regular passenger buses in Category 1 with 34 vehicles and in Category 4 with 1,138 vehicles, as shown in **Figure 3.2-14 (B).**



(A) Number of Registered Vehicles Accumulation 2012-2023



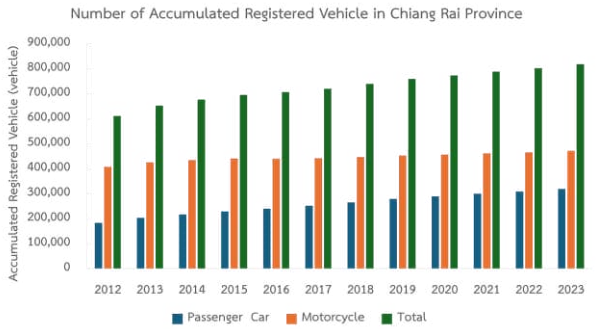
(B) Number of Registered Buses Accumulation 2017-2023

Figure 3.2-14 Number of Registered Vehicles Accumulation in Chiang Mai Province 2012-2023

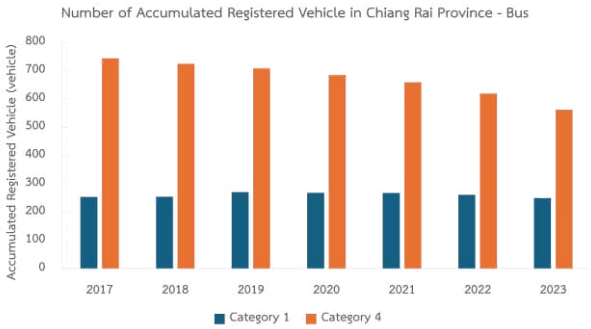
2) Accumulated Registered Vehicle Statistics in Chiang Rai Province

Accumulated Registered Vehicle Statistics in Chiang Rai Province, 2012-2023, from the Department of Land Transport, found that the total number of vehicles of all types - private cars and motorcycles - has a continuous upward trend, as shown in **Figure 3.2-15 (A)**. The highest number was in 2023, with the number of car-type vehicles being 799,798 vehicles, the number of bus-type vehicles being 1,320 vehicles, and the number of truck-type vehicles being 16,290 vehicles

Regarding regular buses, the number of registered regular buses in Chiang Rai Province, 2017-2023, in Category 1 and Category 4, has a continuous downward trend. In 2023, there were regular buses in Category 1 with 249 vehicles and in Category 4 with 562 vehicles, as shown in **Figure 3.2-15 (B).**



(A) Number of Registered Vehicles Accumulation 2012-2023



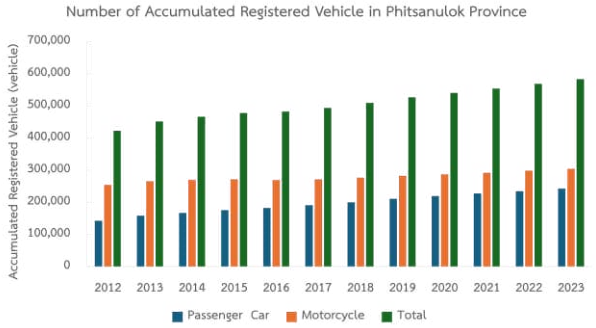
(B) Number of Registered Buses Accumulation 2017-2023

Figure 3.2-15 Number of Registered Vehicles Accumulation in Chiang Rai Province 2012 – 2023

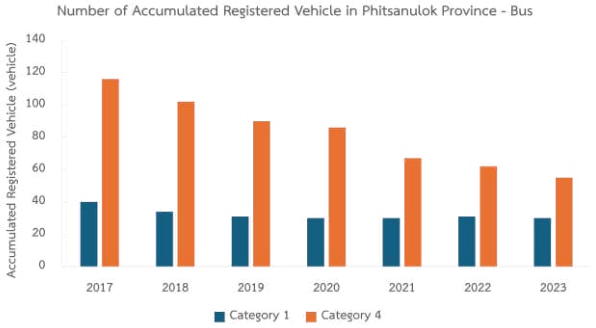
3) Accumulated Registered Vehicle Statistics in Phitsanulok Province

Accumulated Registered Vehicle Statistics in Phitsanulok Province, 2012-2023, from the Department of Land Transport, found that the total number of vehicles of all types - private cars and motorcycles - has a continuous upward trend, as shown in **Figure 3.2-16 (A)**. The highest number was in 2023, with the number of car-type vehicles being 566,737 vehicles, the number of bus-type vehicles being 631 vehicles, and the number of truck-type vehicles being 15,887 vehicles

Regarding regular buses, the number of registered regular buses in Phitsanulok Province, 2017-2023, in Category 1 and Category 4, has a continuous downward trend. In 2023, there were regular buses in Category 1 with 30 vehicles and in Category 4 with 55 vehicles, as shown in **Figure 3.2-16 (B).**



(A) Number of Registered Vehicles Accumulation 2012-2023



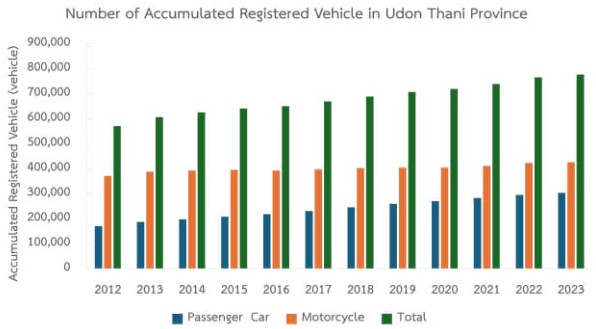
(B) Number of Registered Buses Accumulation 2017-2023

Figure 3.2-16 Number of Registered Vehicles Accumulation in Phitsanulok Province 2012 – 2023

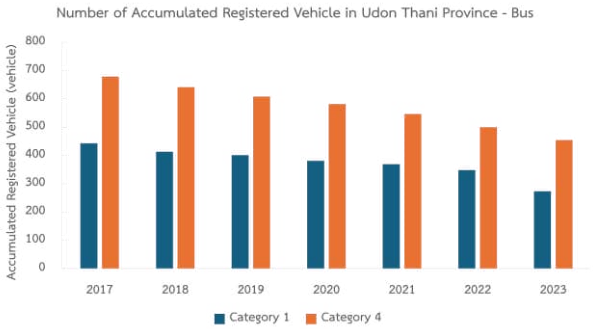
4) Accumulated Registered Vehicle Statistics in Udon Thani Province

Accumulated Registered Vehicle Statistics in Udon Thani Province, 2012-2023, from the Department of Land Transport, found that the total number of vehicles of all types - private cars and motorcycles - has a continuous upward trend, as shown in **Figure 3.2-17 (A)**. The highest number was in 2023, with the number of car-type vehicles being 752,272 vehicles, the number of bus-type vehicles being 1,818 vehicles, and the number of truck-type vehicles being 21,844 vehicles

Regarding regular buses, the number of registered regular buses in Udon Thani Province, 2017-2023, in Category 1 and Category 4, has a continuous downward trend. In 2023, there were regular buses in Category 1 with 273 vehicles and in Category 4 with 454 vehicles, as shown in **Figure 3.2-17 (B)**.



(A) Number of Registered Vehicles Accumulation 2012-2023



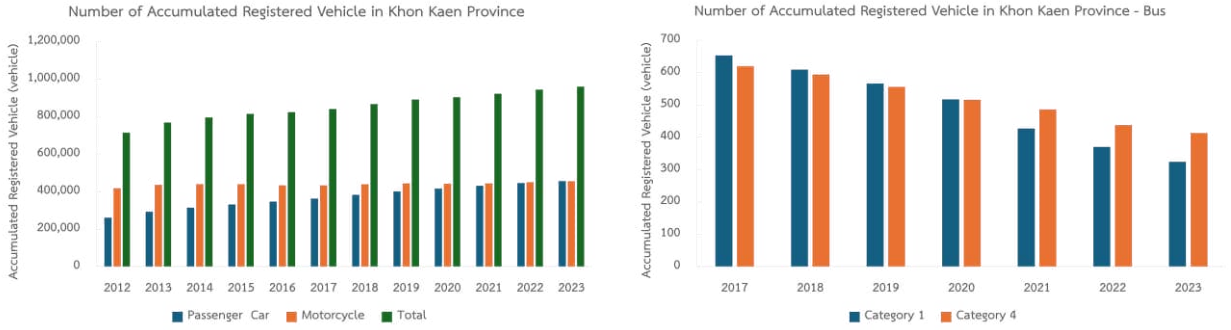
(B) Number of Registered Buses Accumulation 2017-2023

Figure 3.2-17 Number of Registered Vehicles Accumulation in Udon Thani Province 2012 – 2023

5) Accumulated Registered Vehicle Statistics in Khon Kaen Province

Accumulated Registered Vehicle Statistics in Khon Kaen Province, 2012-2023, from the Department of Land Transport, found that the total number of vehicles of all types - private cars and motorcycles - has a continuous upward trend, as shown in **Figure 3.2-18 (A)**. The highest number was in 2023, with the number of car-type vehicles being 929,886 vehicles, the number of bus-type vehicles being 1,970 vehicles, and the number of truck-type vehicles being 28,074 vehicles

Regarding regular buses, the number of registered regular buses in Khon Kaen Province, 2017-2023, in Category 1 and Category 4, has a continuous downward trend. In 2023, there were regular buses in Category 1 with 324 vehicles and in Category 4 with 413 vehicles, as shown in **Figure 3.2-18 (B)**.



(A) Number of Registered Vehicles Accumulation 2012-2023

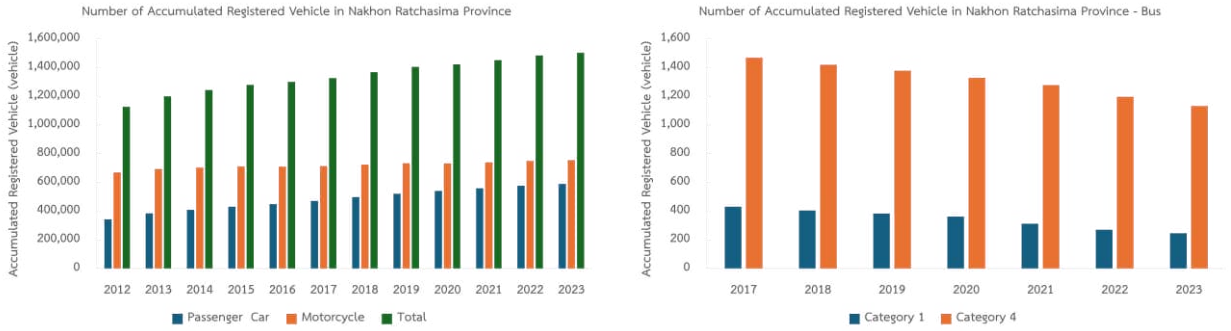
(B) Number of Registered Buses Accumulation 2017-2023

Figure 3.2-18 Number of Registered Vehicles Accumulation in Khon Khaen Province 2012 – 2023

6) Accumulated Registered Vehicle Statistics in Nakhon Ratchasima Province

Accumulated Registered Vehicle Statistics in Nakhon Ratchasima Province, 2012-2023, from the Department of Land Transport, found that the total number of vehicles of all types - private cars and motorcycles - has a continuous upward trend, as shown in **Figure 3.2-19 (A)**. The highest number was in 2023, with the number of car-type vehicles being 1,440505 vehicles, the number of bus-type vehicles being 4,939 vehicles, and the number of truck-type vehicles being 58,244 vehicles

Regarding regular buses, the number of registered regular buses in Nakhon Ratchasima Province, 2017-2023, in Category 1 and Category 4, has a continuous downward trend. In 2023, there were regular buses in Category 1 with 246 vehicles and in Category 4 with 1,133 vehicles, as shown in **Figure 3.2-19 (B)**.



(A) Number of Registered Vehicles Accumulation 2012-2023

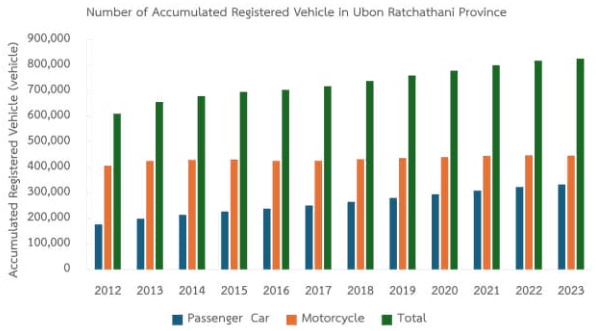
(B) Number of Registered Buses Accumulation 2017-2023

Figure 3.2-19 Number of Registered Vehicles Accumulation in Nakhon Ratchasima Province 2012 – 2023

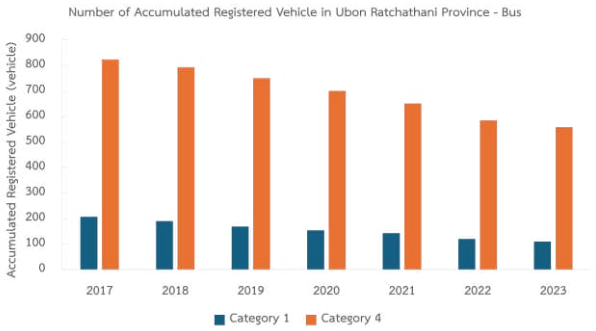
7) Accumulated Registered Vehicle Statistics in Ubon Ratchathani Province

Accumulated Registered Vehicle Statistics in Ubon Ratchathani Province, 2012-2023, from the Department of Land Transport, found that the total number of vehicles of all types - private cars and motorcycles - has a continuous upward trend, as shown in **Figure 3.2-20 (A)**. The highest number was in 2023, with the number of car-type vehicles being 803,457 vehicles, the number of bus-type vehicles being 1,567 vehicles, and the number of truck-type vehicles being 21,788 vehicles

Regarding regular buses, the number of registered regular buses in Ubon Ratchathani Province, 2017-2023, in Category 1 and Category 4, has a continuous downward trend. In 2023, there were regular buses in Category 1 with 110 vehicles and in Category 4 with 558 vehicles, as shown in **Figure 3.2-20 (B)**.



(A) Number of Registered Vehicles Accumulation 2012-2023



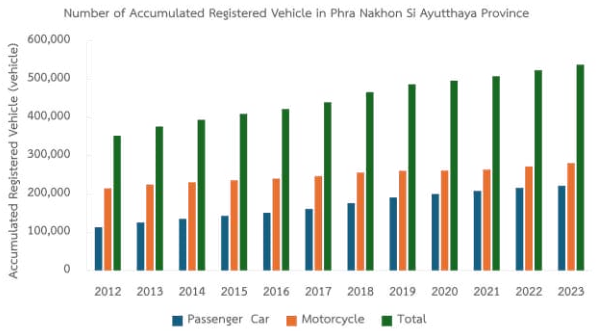
(B) Number of Registered Buses Accumulation 2017-2023

Figure 3.2-20 Number of Registered Vehicles Accumulation in Ubon Ratchathani Province 2012 – 2023

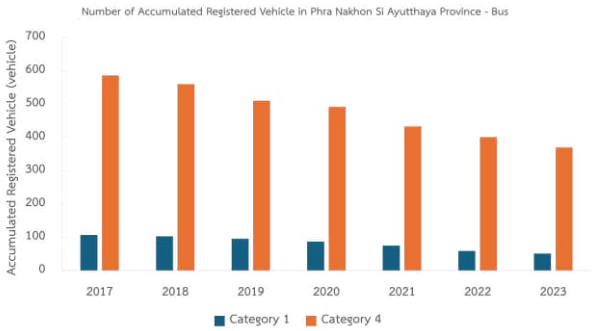
8) Accumulated Registered Vehicle Statistics in Phra Nakhon Si Ayutthaya Province

Accumulated Registered Vehicle Statistics in Phra Nakhon Si Ayutthaya Province, 2012-2023, from the Department of Land Transport, found that the total number of vehicles of all types - private cars and motorcycles - has a continuous upward trend, as shown in **Figure 3.2-21 (A)**. The highest number was in 2023, with the number of car-type vehicles being 508,489 vehicles, the number of bus-type vehicles being 3,319 vehicles, and the number of truck-type vehicles being 26,249 vehicles

Regarding regular buses, the number of registered regular buses in Phra Nakhon Si Ayutthaya Province, 2017-2023, in Category 1 and Category 4, has a continuous downward trend. In 2023, there were regular buses in Category 1 with 51 vehicles and in Category 4 with 370 vehicles, as shown in **Figure 3.2-21 (B)**.



(A) Number of Registered Vehicles Accumulation 2012-2023



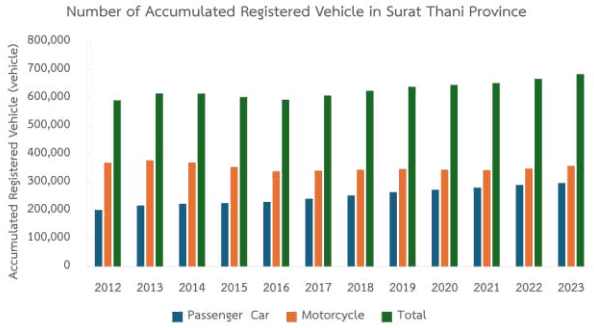
(B) Number of Registered Buses Accumulation 2017-2023

Figure 3.2-21 Number of Registered Vehicles Accumulation in Phra Nakhon Si Ayutthaya Province 2012 – 2023

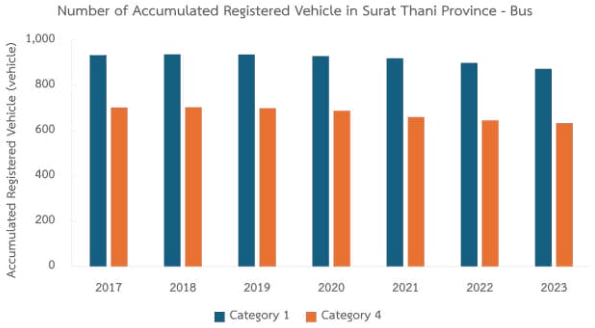
9) Accumulated Registered Vehicle Statistics in Surat Thani Province

Accumulated Registered Vehicle Statistics in Surat Thani Province, 2012-2023, from the Department of Land Transport, found that the total number of vehicles of all types - private cars and motorcycles - has a continuous upward trend, as shown in **Figure 3.2-22 (A)**. The highest number was in 2023, with the number of car-type vehicles being 661,454 vehicles, the number of bus-type vehicles being 2,946 vehicles, and the number of truck-type vehicles being 19,843 vehicles

Regarding regular buses, the number of registered regular buses in Surat Thani Province, 2017-2023, in Category 1 and Category 4, has a continuous downward trend. In 2023, there were regular buses in Category 1 with 874 vehicles and in Category 4 with 634 vehicles, as shown in **Figure 3.2-22 (B)**.



(A) Number of Registered Vehicles Accumulation 2012-2023



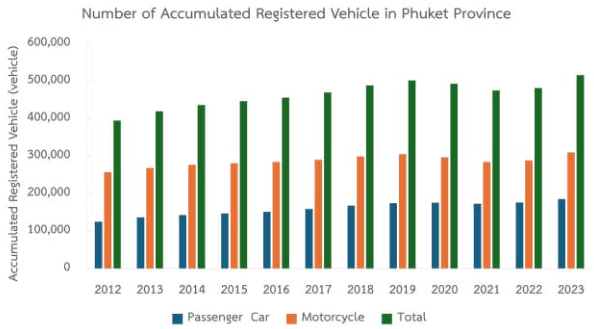
(B) Number of Registered Buses Accumulation 2017-2023

Figure 3.2-22 Number of Registered Vehicles Accumulation in Surat Thani Province 2012 – 2023

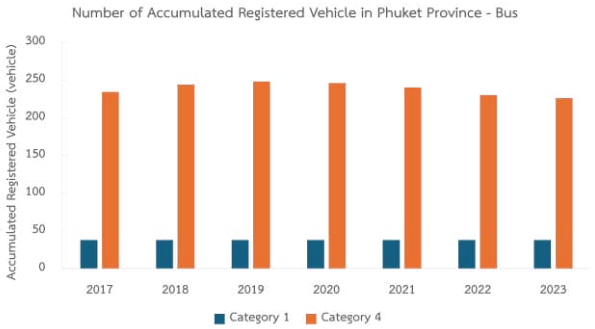
10) Accumulated Registered Vehicle Statistics in Phuket Province

Accumulated Registered Vehicle Statistics in Phuket Province, 2012-2023, from the Department of Land Transport, found that the total number of vehicles of all types - private cars and motorcycles - has a continuous upward trend, as shown in **Figure 3.2-23 (A)**. The highest number was in 2023, with the number of car-type vehicles being 503,885 vehicles, the number of bus-type vehicles being 7,996 vehicles, and the number of truck-type vehicles being 4,171 vehicles

Regarding regular buses, the number of registered regular buses in Phuket Province, 2017-2023, in Category 1 and Category 4, has a continuous downward trend. In 2023, there were regular buses in Category 1 with 38 vehicles and in Category 4 with 226 vehicles, as shown in **Figure 3.2-23 (B)**.



(A) Number of Registered Vehicles Accumulation 2012-2023



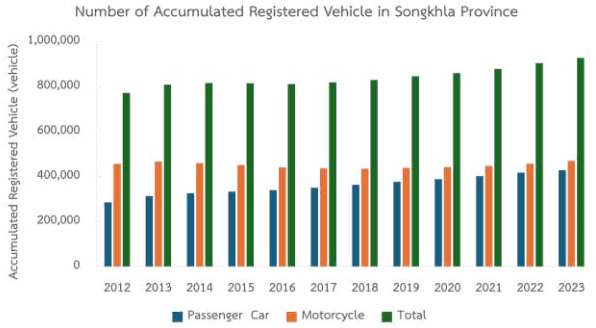
(B) Number of Registered Buses Accumulation 2017-2023

Figure 3.2-23 Number of Registered Vehicles Accumulation Phuket Province 2012 – 2023

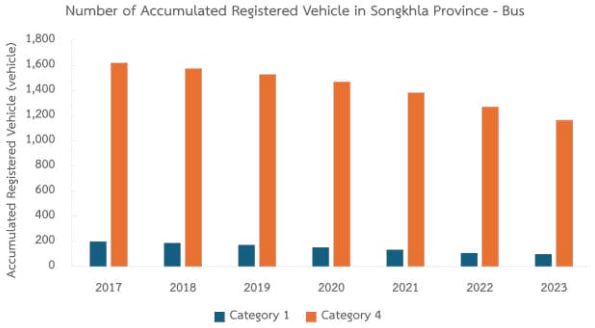
11) Accumulated Registered Vehicle Statistics in Songkhla Province

Accumulated Registered Vehicle Statistics in Songkhla Province, 2012-2023, from the Department of Land Transport, found that the total number of vehicles of all types - private cars and motorcycles - has a continuous upward trend, as shown in **Figure 3.2-24 (A)**. The highest number was in 2023, with the number of car-type vehicles being 901,789 vehicles, the number of bus-type vehicles being 4,093 vehicles, and the number of truck-type vehicles being 21,568 vehicles

Regarding regular buses, the number of registered regular buses in Songkhla Province, 2017-2023, in Category 1 and Category 4, has a continuous downward trend. In 2023, there were regular buses in Category 1 with 99 vehicles and in Category 4 with 1,165 vehicles, as shown in **Figure 3.2-24 (B).**



(A) Number of Registered Vehicles Accumulation 2012-2023



(B) Number of Registered Buses Accumulation 2017-2023

Figure 3.2-24 Number of Registered Vehicles Accumulation in Songkhla Province 2012 – 2023

3.3 Current Public Transportation System Data in Provinces

3.3.1 Chiang Mai Province

1) **Railway network:** The study area of Chiang Mai Province has 2 railway stations: Chiang Mai Station and Saraphi Station, as shown in **Figure 3.3-1**.
   (1) Chiang Mai Railway Station: Located on Charoen Mueang Road, Tambon Wat Ket, Mueang Chiang Mai District, Chiang Mai Province, 751.424 kilometers from Bangkok Railway Station, it is the terminal station (Class 1) of the Northern Line.
   (2) Saraphi Railway Station: Located in Tambon Yang Noeng, Saraphi District, Chiang Mai Province, between Chiang Mai Railway Station and Pa Sao Railway Station, Lamphun Province. Currently, Saraphi Railway Station serves local trains, Train No. 407 (Nakhon Sawan - Chiang Mai) and Train No. 408 (Chiang Mai - Nakhon Sawan). Other trains pass through.

Figure 3.3-1 Railway Stations in the Chiang Mai Study Area

2) **Airport:** Chiang Mai International Airport is located at 60 Mahidol Road, Tambon Suthep, Mueang Chiang Mai District, Chiang Mai Province, southwest, 4 kilometers from Chiang Mai city, as shown in **Figure 3.3-2**. It is an international airport and one of the 6 international airports operated by Airports of Thailand Public Company Limited. It is the aviation hub of the north, with the fourth-highest traffic volume after Suvarnabhumi Airport, Don Mueang Airport, and Phuket Airport.

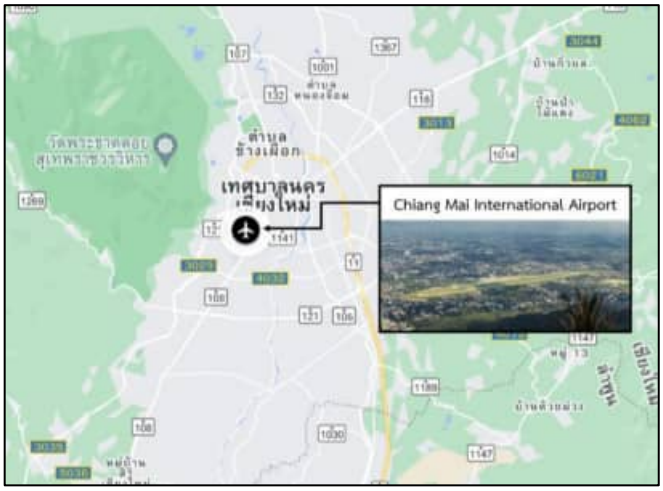


Figure 3.3-2 Location of the Airport in Chiang Mai Province

3) **Chiang Mai Bus Terminal:** There are a total of 3 bus terminals, as shown in **Figure 3.3-3**, with details as follows:

(1) Chiang Mai Bus Terminal 1: For buses serving routes within Chiang Mai Province only.

(2) Chiang Mai Provincial Bus Terminal 2

(3) Chiang Mai Provincial Bus Terminal 3

Chiang Mai Provincial Bus Terminal 2 and Chiang Mai Provincial Bus Terminal 3 are inter-provincial bus terminals for Chiang Mai. Both bus terminals are located in the same area in Tambon Wat Ket, Mueang Chiang Mai District, Chiang Mai Province. They were relocated from Chiang Mai Provincial Bus Terminal 1, Tambon Chang Phueak, Mueang Chiang Mai District, Chiang Mai Province, in 1980.

Passengers can purchase bus tickets for Chiang Mai Provincial Bus Terminal online at BusOnlineTicket.co.th, where they can check timetables, compare prices, and book bus tickets departing from Mo Chit Bus Terminal, as well as other bus terminals and locations.

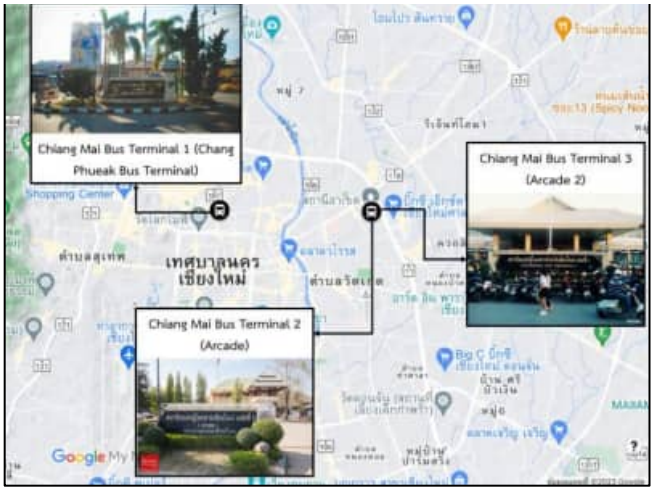


Figure 3.3-3 Locations of Chiang Mai Bus Terminals

4) **Red Songthaews (Four-wheeled passenger vehicles):** is a shared-ride transportation mode operating under the Nakhon Lanna Transportation Cooperative. Its service commenced in 1978 and continues to the present. While these vehicles are registered for fixed route operation, their actual operation is characterized by flexible routing, functioning as a form of paratransit. They accommodate additional passengers en route and may deviate from their nominal route to serve newly boarded passengers. The operational modalities can be categorized into three types:
   (1) Non-fixed route operation: These vehicles circulate within urban areas, picking up general passengers with intermittent stops upon encountering them.
   (2) Non-fixed routes: These vehicles also operate by stationing themselves at key urban nodes such as markets, hospitals, taxi ranks, Chiang Phueak Bus Terminal (Terminal 1), and Bus Terminals 2 and 3 (Arcade 1 and Arcade 2).
   (3) Fixed route operation along significant tourist corridors: In this mode, vehicles wait at central city locations and travel to a single designated point of interest, for example, Chiang Mai University to Wat Phra That Doi Suthep, or Warorot Market to Wat Phra That Doi Suthep.

The fare structure is based on negotiation between the driver and the passenger, lacking a standardized pricing system. The base fare typically starts at 20 baht, with subsequent increases depending on factors such as distance, time of travel, or perceived characteristics of the passenger.

5) **Category 1 and Category 4 Buses:** The consultants has compiled route information for 19 routes in Chiang Mai Province from the Department of Land Transport (DLT), as shown in **Table 3.3-1**, **Figure 3.3-4** and **Figure 3.3-6.**

Table 3.3-1 Route Information for Buses (Category 1 and Category 4), Chiang Mai Province

No.	Category	Route	Route Name	Distance (km)	Fare (Baht)	Number of Trips	Frequency (min)	Number of Vehicles	Timetable	S.2	S.3
1	1	6	Chiang Mai City Loop	38	30	16	60	10 - 16	06:00 - 22:00	✓	
2	1	16	Chiang Mai International Airport - Night Bazaar	16.5	40	29	30	5 - 15	07:00 - 21:00	✓	
3	1	22	Chiang Mai Zoo - Warorot Market - Central Festival Chiang Mai	25.2	30	42	30	5 - 15	06:00 - 21:15	✓	
4	1	24	Chiang Mai International Airport - Nimmanhaemin Road - Tha Phae Gate	16.7	30	52	20	5 - 15	06:00 - 22:00	✓	
5	4	1231 a	Chiang Mai - Tha Ton	NA	NA	NA	NA	NA	NA	✓	✓
6	4	1231 b.	Chiang Mai - Chiang Dao	75	15 - 44	10	180	4 - 5	06:45 - 17:00		✓
7	4	1232 a	Chiang Mai - Hod - Doi Tao	136	15 - 77	4 - 10	130	6 - 19	06:30 - 15:00	✓	✓
8	4	1232 b.	Chiang Mai - Chom Thong	58	15 - 36	20 - 40	50	5 - 14	06:10 - 16:20	✓	✓
9	4	1234 b.	Chiang Mai - Rom Luang	37	15 - 24	94 - 112	30	34 - 52	04:20 - 18:40		✓
10	4	2201 a	Chiang Mai - Phrao (South)	106	15 - 62	12 - 24	60	4 - 8	06:30 - 18:00	✓	✓
11	4	2314	Chiang Mai - Pyongluang - Ban Lak Sang (Thai Border Marker)	168	26 - 110	12 - 26	40	6 - 12	07:30 - 15:30	✓	
12	4	2345	Chiang Mai - San Kamphaeng Hot Springs	45	21 - 41	16	45	3 - 6	06:30 - 18:20	✓	
13	4	2428	Chiang Mai - Ban Wat Chan	145	15 - 108	12	60	50 - 60	05:00 - 18:00		✓
14	4	2524	Chiang Mai - Ban Tawai - Saraphi District	35	21 - 32	8	60	2 - 5	08:30 - 16:30	✓	
15	4	2552	Chiang Mai - Doi Saket	17.6	15	80	20	26 - 38	05:00 - 18:00		✓
16	4	2553	Chiang Mai - Tan Kham	58	15 - 36	32	30	18 - 23	05:00 - 18:00		✓
17	4	2556	Chiang Mai - Doi Nang Kaew	57	15 - 43	40	20	7 - 9	05:00 - 18:00		✓
18	4	2586	Chiang Mai - San Kamphaeng - Ban Pong Kum	54	15 - 34	48	40	70 - 120	06:00 - 21:00		✓
19	4	2587	Chiang Mai - Ban Pao	61	15 - 38	4	180	2 - 6	06:00 - 17:00		✓

origin: Department of Land Transport

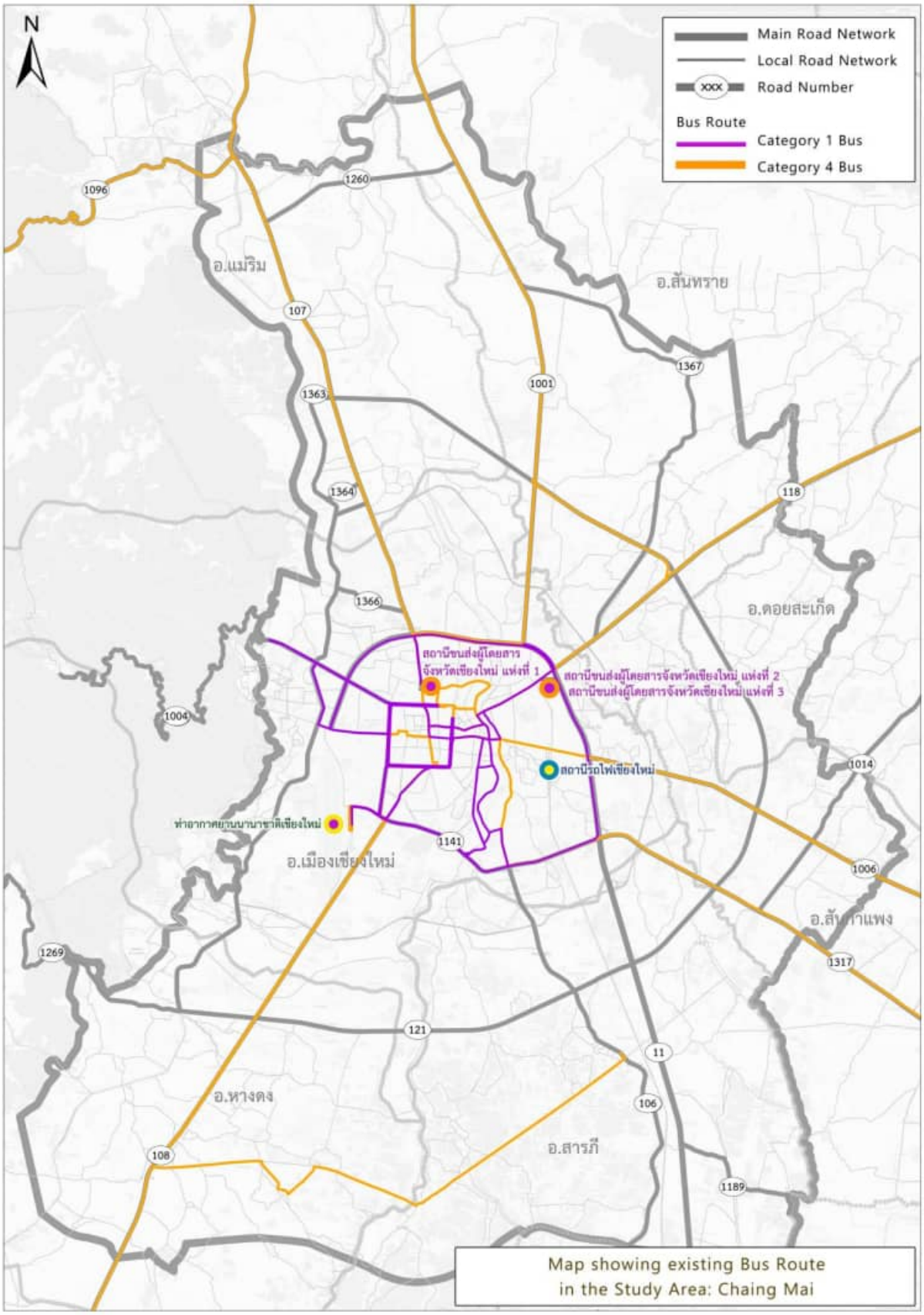


Figure 3.3-4 Map showing Category 1 and Category 4 bus routes in Chiang Mai Province

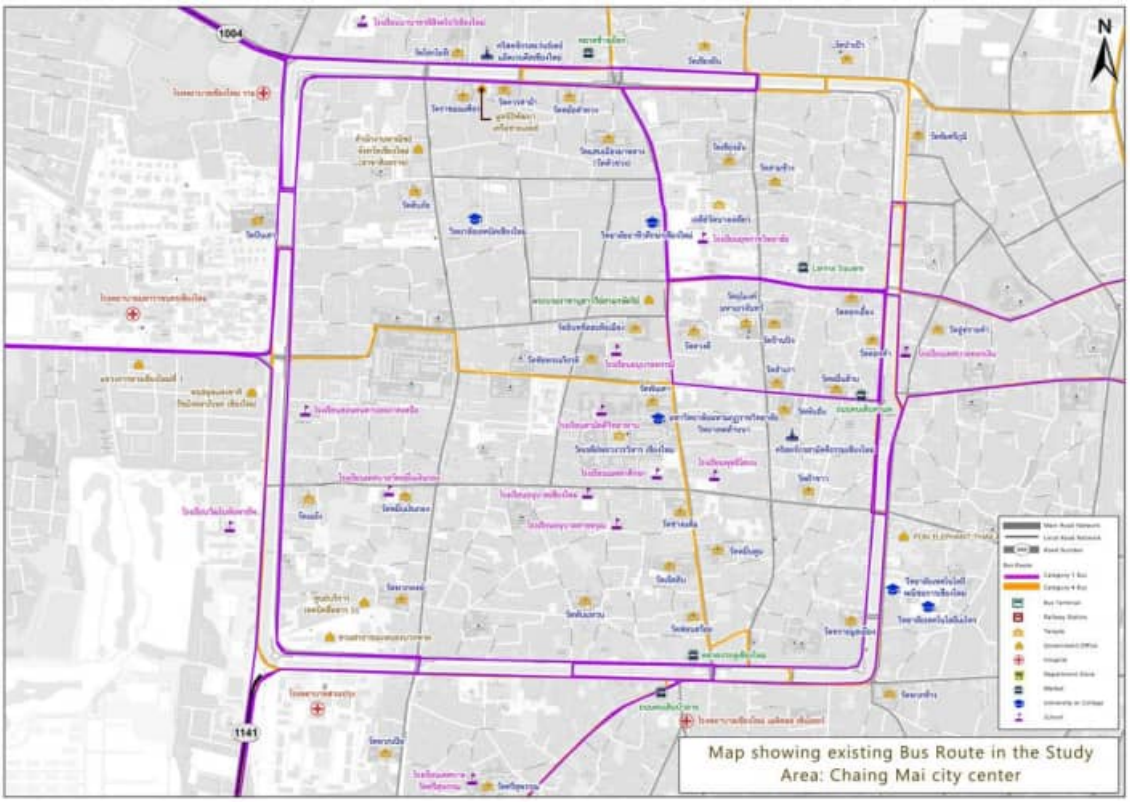


Figure 3.3-5 Map showing Category 1 and Category 4 bus routes in the Chiang Mai city center area

3.3.2 Chiang Rai Province

1) Airport

Mae Fah Luang Chiang Rai Airport, or Chiang Rai Airport, is located at 404 Moo 10, Ban Du Subdistrict, Mueang Chiang Rai District, Chiang Rai Province. It is situated approximately 2.6 kilometers east of Phaholyothin Road (Chiang Rai - Mae Chan) and about 8 kilometers from Chiang Rai city center. The airport has a total area of approximately 3,042 rai and serves as an international airport, as shown in **Figure 3.3-6.**

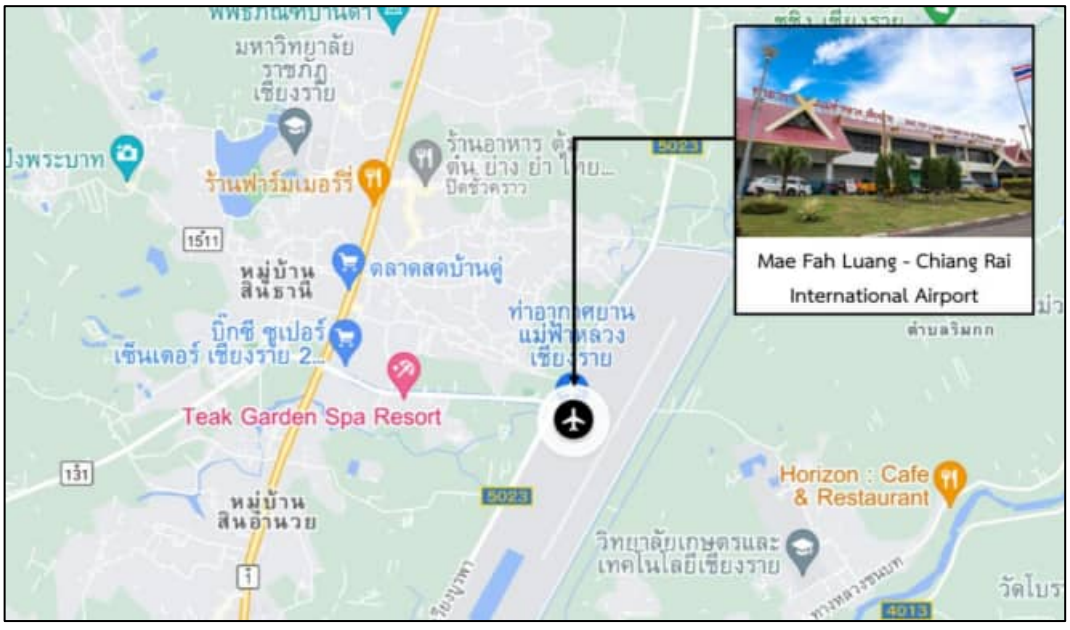


Figure 3.3-6 Location of the Airport in Chiang Rai Province

2) Chiang Rai Bus Terminal

Chiang Rai is a secondary city renowned for its distinctive natural beauty and rich cultural attractions. When Chiang Rai is mentioned, many people think of Wat Rong Khun, the stunning white temple uniquely designed and constructed by Ajarn Chalermchai Kositpipat. Additionally, the province boasts numerous natural landscapes and high-altitude viewpoints. Chiang Rai has two bus terminals, as shown in **Figure 3.3-7**, detailed as follows:

(1) Chiang Rai Bus Terminal 1 (Old Bus Terminal): Located in the heart of Chiang Rai city. Buses from areas around Chiang Rai city, such as Chiang Khong and Mae Sai, stop at this terminal. From Chiang Rai Bus Terminal 1, one can board southbound buses from Chiang Rai to Phayao and Chiang Rai to Lampang. Greenbus services traveling to and from Chiang Rai also stop at this terminal.

(2) Chiang Rai Bus Terminal 2 (New Bus Terminal): Located approximately 7 km from Chiang Rai city center, not far from the superhighway. Buses from other provinces typically stop at this terminal. Greenbus services operating to and from Chiang Rai also call at this station.

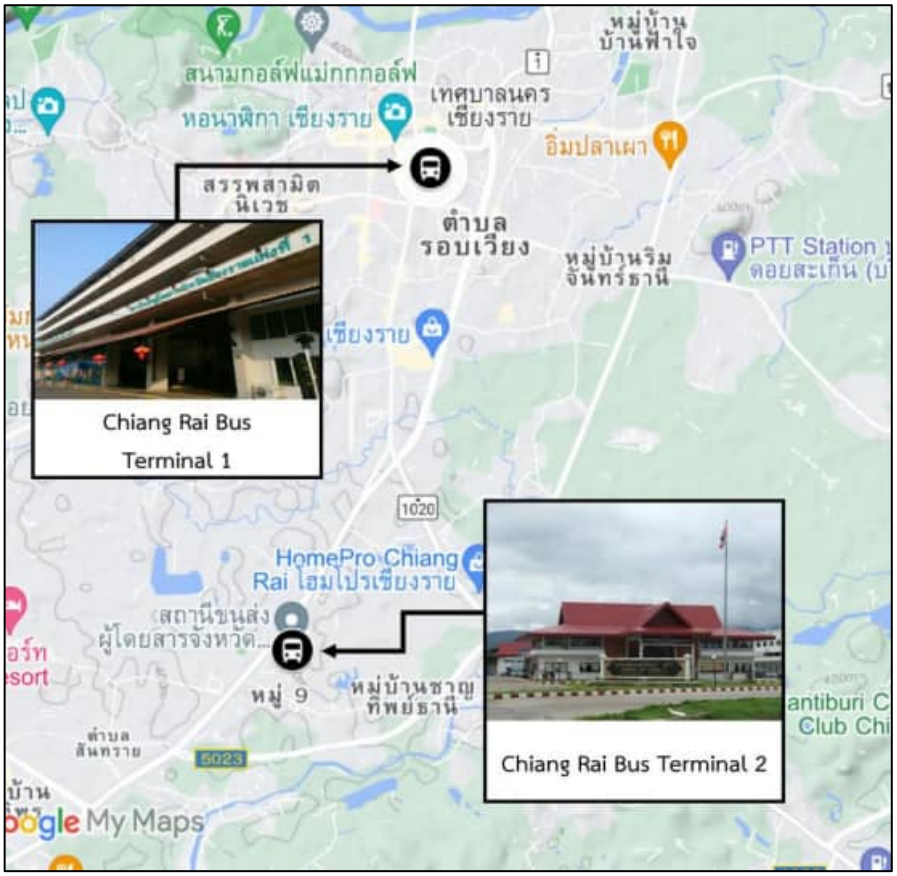


Figure 3.3-7 Locations of Chiang Rai Bus Terminals

3) **Intra-provincial Public Transportation**

- **Urban Public Transportation**
  - Tricycles: Approximately 120 units available, stationed near hotels, markets, and tourist attractions within the city, or can be hailed on the street.
  - Tuk-tuks: Used for short trips within the city and between sub-districts, stationed near hotels, markets, and tourist attractions within the city, or can be hailed when seen on the street.
  - Songthaews (Pickup Trucks):
    - Blue or light blue: Servicing around the city (outer ring road) and between sub-districts.
    - Red or maroon: Servicing between districts.
- **Inter-district Public Transportation**
  - Green or green-striped buses: Servicing northern routes such as Mae Chan, Mae Sai, Chiang Saen, etc. Passengers can board and alight along the route. Stops at Bus Terminal 1.
  - Pink or red buses: Servicing eastern routes such as Phaya Mengrai, Thoeng, etc. Passengers can board and alight along the route. Stops at Bus Terminal 1.
  - Light blue or blue buses: Servicing southern routes such as Phan District, Wiang Pa Pao District, etc. Passengers can board and alight along the route. Stops at Bus Terminal 1.
  - "Blue" vans: Servicing routes Chiang Rai City - Mae Sai, Chiang Rai, Phayao, with plans to expand to other routes. Blue vans are operated by the Greenbus company.

4) **Category 1 and Category 4 Buses:** The consultant has compiled route information for 24 bus routes (Category 1 and Category 4) in Chiang Rai Province from the Department of Land Transport (DLT), as shown in **Table 3.3-2**

Table 3.3-2 Route Information for Buses (Category 1 and Category 4), Chiang Rai Province

No.	Category	Route	Route Name	Distance (km)	Fare (Baht)	Number of Trips	Frequency (min)	Number of Vehicles	Timetable	S.2	S.3
1	1	2	Bus Station - San Sai	10	15	48	20	6 - 11	05:00 - 19:00		✓
2	1	3	Bus Station - Chiang Rai Teachers College	13	20	56	20	15 - 22	05:00 - 19:00		✓
3	1	4	Around the city - airport	23	20	25	40	4 - 6	06:00 - 17:00		✓
4	1	5	Chiang Rai Provincial Bus Terminal (No. 2) - Chiang Rai Airport	15	20	NA	NA	NA	NA	NA	NA
5	1	1	Rob Wiang - Chiang Rai Provincial Bus Terminal No. 2	12.5	20	320	10	6 - 171	05:00 - 19:00		✓
6	4	1241	Chiang Rai - Mae Sai	62	10 - 53	56	30	30 - 56	06:00 - 18:00	✓	✓
7	4	1243	Chiang Rai - Ban Kiu Stei - Thai Volunteer Military Shelter (Ban Mae Salong)	72	10 - 62	2 - 4	150	10 - 20	06:00 - 16:00		✓
8	4	1244	Chiang Rai - Phan	47	10 - 41	70	20	25 - 35	06:00 - 17:30		✓
9	4	1245	Chiang Rai - Chiang Khong	116	10 - 96	2		2 - 4	06:00 - 17:00		✓
10	4	1246	Chiang Rai - Mae Khachan	107	10 - 89	20	60	8 - 11	06:00 - 17:00	✓	✓
11	4	2127	Chiang Rai - Chiang Khong - Chiang Saen	201	13 - 161	50	30	25 - 45	06:00 - 17:00		✓
12	4	2224	Chiang Rai - Ban Kiu Phrao	92	10 - 77	20	70	10 - 20	06:00 - 17:30		✓
13	4	2243	Chiang Rai - Sanslee (Phaya Mengrai) - Chiang Khong	113	10 - 94	30	15	15 - 30	06:00 - 12:00		✓
14	4	2290	Chiang Rai - Ban Chambon - Phan	61	7 - 31	8	60	4 - 8	07:00 - 10:00		✓
15	4	2322	Chiang Rai - Wiang Kaen	120	11 - 99	20	30	10 - 20	07:00 - 12:00		✓
16	4	2350	Chiang Rai - Mae Lao - Ban Pa Sang Tai	29	10 - 24	10	30	5 - 10	08:00 - 13:00		✓
17	4	2402	Chiang Rai - Ban Pha Tang	141	76 - 162	4	120	2 - 4	10:00 - 12:00	✓	
18	4	2432	Chiang Rai - Mae Bong - Chiang Khong	107	10 - 91	20 - 24	60	10 - 15	06:30 - 17:00		✓
19	4	2433	Chiang Rai - Ban Wiang Dum	18	7 - 10	4	360	2 - 5	06:00 - 18:00		✓
20	4	2438	Chiang Rai - Ban Pa Yang	17	7 - 9	4	360	2 - 7	06:00 - 18:00		✓
21	4	2441	Chiang Rai - Ban Nong Kao Phong	33	10 - 29	18	80	10 - 15	05:00 - 17:30		✓
22	4	2444	Chiang Rai - Ban Huay Kham	14	10 - 12	2	330	3 - 11	06:00 - 17:00		✓
23	4	2597	Chiang Rai - Ban Panasawan	40	10 - 37	10	60	5 - 15	06:00 - 10:00		✓
24	4	2598	Chiang Rai - Doi Luang	55	7 - 29	4	60	2 - 5	06:00 - 8:00		✓

origin: Department of Land Transport

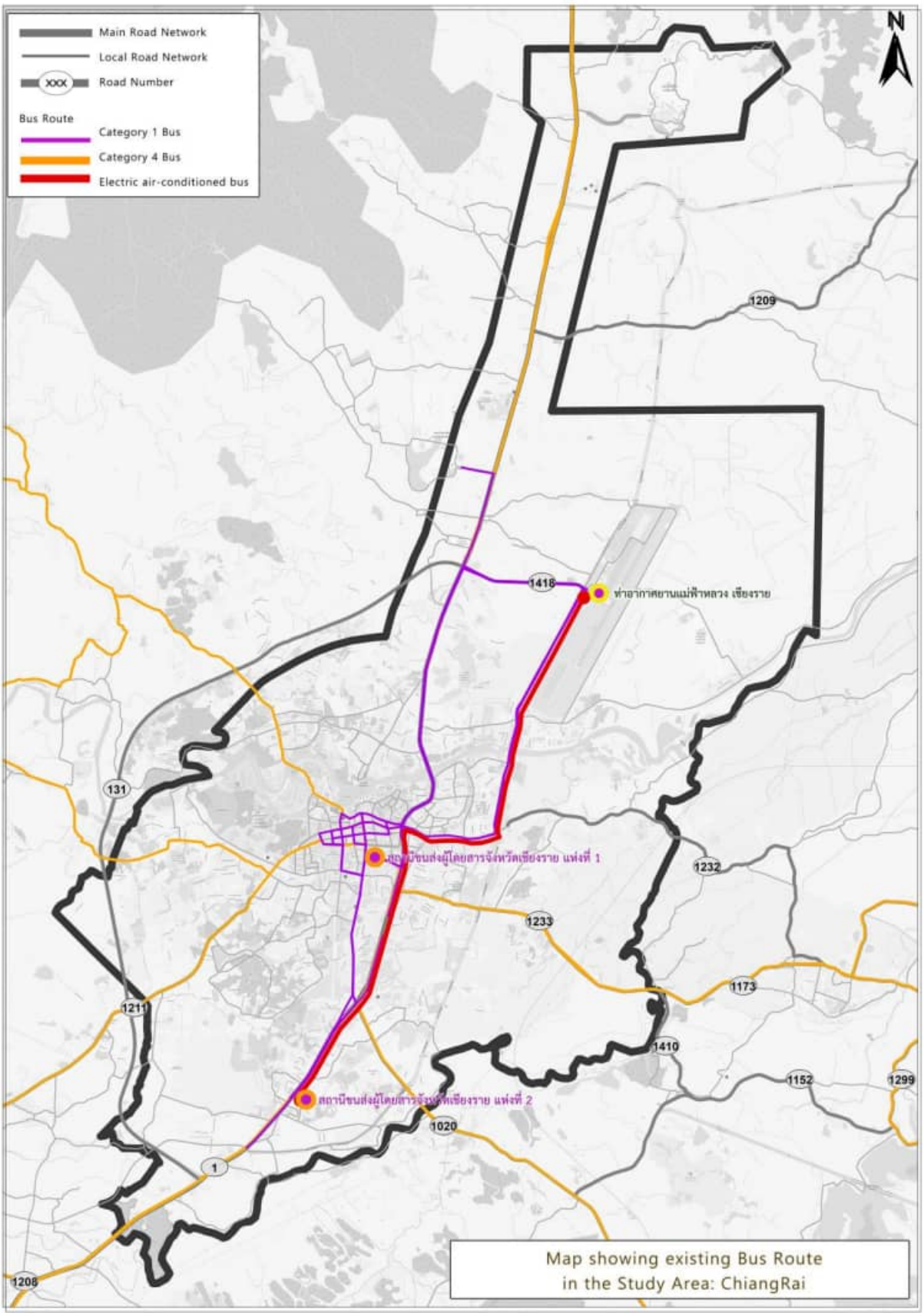


Figure 3.3-8 Map showing Category 1 and Category 4 bus routes in Chiang Rai Province

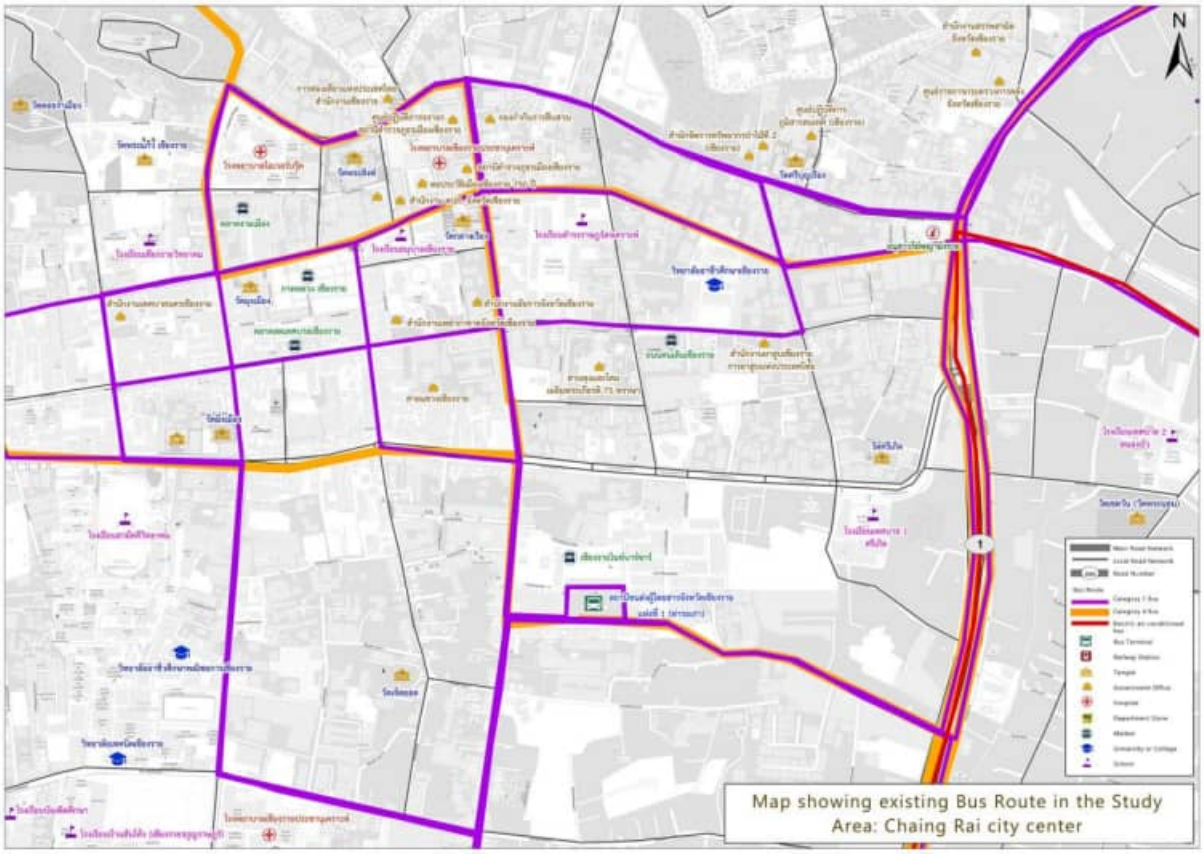


Figure 3.3-9 Map showing Category 1 and Category 4 bus routes in the Chiang Rai city center area

3.3.3 Phitsanulok Province

1) **Railway network:** The main station serving the public in the urban area is Phitsanulok Station, as shown in **Figure 3.3-10**.

Phitsanulok Station is located at the roundabout where Naresuan Road and Ekathotsarot Road intersect. Access to the train station is via Ekathotsarot Road. For connections to various locations within Phitsanulok city, hired vehicles (tuk-tuks and tricycles) are available in front of the station. Additionally, taxis and public buses (songthaews) that pass by the station also provide services.

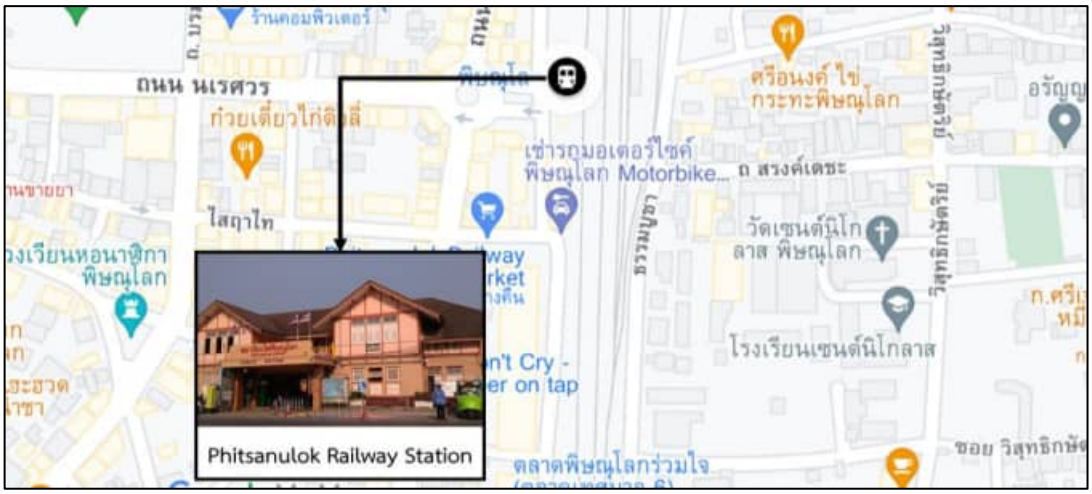


Figure 3.3-10 Railway Stations in the Phitsanulok Study Area

2) **Airport:** Phitsanulok Airport is a commercial airport located in Aranyik Subdistrict, Mueang Phitsanulok District, Phitsanulok Province. It is situated approximately 3 kilometers from the city center, as shown in **Figure 3.3-11**. On December 13, 1954, it was designated as a permitted airport with a runway size of 3,000 meters x 45 meters. Currently, it is under the jurisdiction of the Department of Airports, Ministry of Transport.

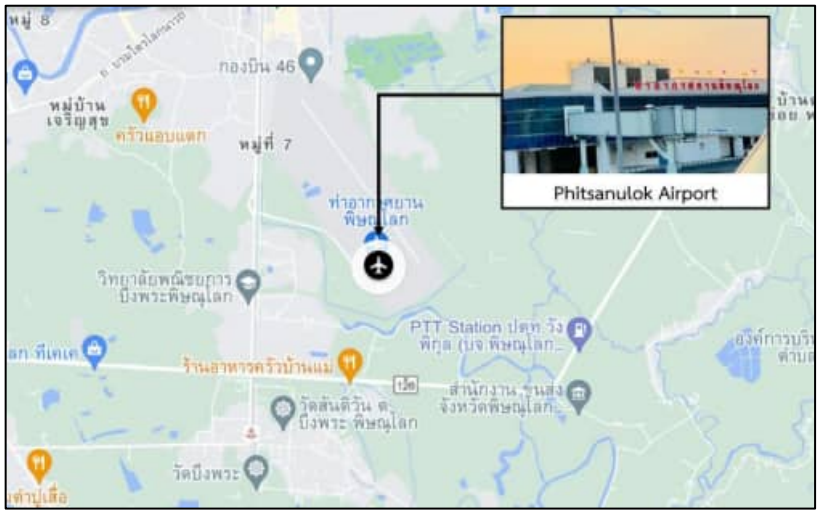


Figure 3.3-11 Location of the Airport in Phitsanulok Province

3) **Phitsanulok Bus Terminal** There are a total of 2 bus terminals, as shown in **Figure 3.3-12**, detailed as follows:

(1) **Phitsanulok Bus Terminal 1:** Located on Singkhawat Road, or National Highway No. 12, near the business district of Phitsanulok city. Currently, it is under the responsibility of the Phitsanulok City Municipality. It exclusively serves intercity buses that originate from and terminate in Phitsanulok Province.

(2) **Phitsanulok Bus Terminal 2:** Located at the Indo-China Intersection, approximately 6 kilometers from Phitsanulok Bus Terminal 1. It serves intercity buses that do not originate from or terminate in Phitsanulok Province (or public buses that pass through Phitsanulok Province), to prevent such intercity public buses from entering the city area.

Figure 3.3-12 Locations of Phitsanulok Bus Terminals

4) **Non-fixed route hired vehicles (tuk-tuks, tricycles, taxis, motorcycles):** Another popular form of public transportation in urban Phitsanulok is the non-fixed route hired vehicle system, with many services available, such as motorcycles, public hired cars, pedicabs, motorized tricycles, and tuk-tuks. The general passenger commonly uses these services due to their abundance and service points around the city and at key locations such as Phitsanulok Railway Station.

5) **Category 1 and Category 4 Buses:** The consultant has compiled route information for 11 bus routes (Category 1 and Category 4) in Phitsanulok Province from the Department of Land Transport (DLT), as shown in **Table 3.3-3, Figure 3.3-13** and **Figure 3.3-14.**

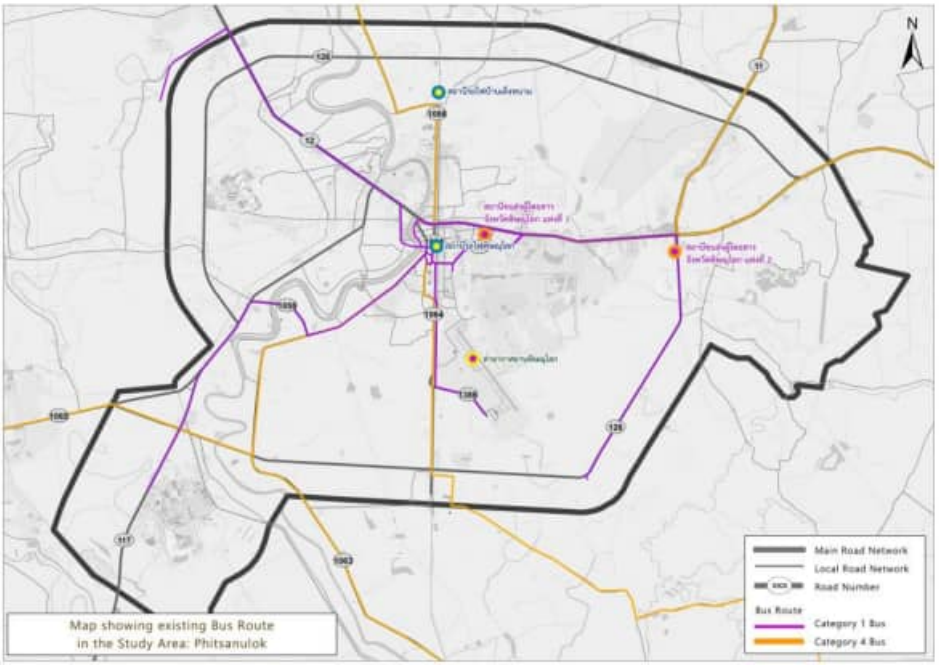


Figure 3.3-13 Map showing Category 1 and Category 4 bus routes in Phitsanulok Province

Figure 3.3-14 Map showing Category 1 and Category 4 bus routes in the Phitsanulok city center area

Table 3.3-3 Route Information for Buses (Category 1 and Category 4), Phitsanulok Province

No.	Category	Route	Route Name	Distance (km)	Fare (Baht)	Number of Trips	Frequency (min)	Number of Vehicles	Timetable	S.2	S.3
1	1	1	Around City (a)	17.2	30	20	60	2	06:00 - 17:00		✓
2	1	6	Phitsanulok Provincial Bus Terminal No. 1 - Ban Krang	18	30	8	120	1	06:00 - 17:00		✓
3	1	12	Naresuan University (Airport Road) - Naresuan University (Thung Nong O)	15	30	16	30	4	06:00 - 17:00	✓	✓
4	1	14	Central Plaza Phitsanulok - Phitsanulok Airport Phitsanulok Provincial Bus Terminal 1 - Phitsanulok Provincial Bus Terminal 2 - Phitsanulok Provincial Transport Office 2	37	30	6	180	2	06:00 - 17:00	✓	✓
5	4	1142 a	Phitsanulok - Bang Rakam	19	30	15	30	5	07:00 - 17:00		✓
6	4	1143 a	Phitsanulok - Wat Bott - Ban Pong Khae	76	35	20	120	4	06:30 - 17:30		✓
7	4	1143 b.	Phitsanulok - Wangthong	17	30	12	120	7	06:00 - 17:00		✓
8	4	2223	Phitsanulok - Peace Entertainment	60	30	10	120	1	06:00 - 17:00	✓	✓
9	4	2262	Phitsanulok - Noen Maprang	69	30	4	180	2	06:00 - 17:00		✓
10	4	2389	Phitsanulok - Ban Wang Nam Sai - Ban Mae Raka	29	30	12	120	2	06:00 - 17:00		✓
11	4	2590	Phitsanulok - Ban Choeng Wai	56	50	12	90	6	06:00 - 17:00	✓	✓

origin: Department of Land Transport

3.3.4 Udon Thani Province

1) **Railway network** The study area of Udon Thani Province has two railway stations: Udon Thani Station and Nong Khon Kwang Station, as shown in **Figure 3.3-15**.

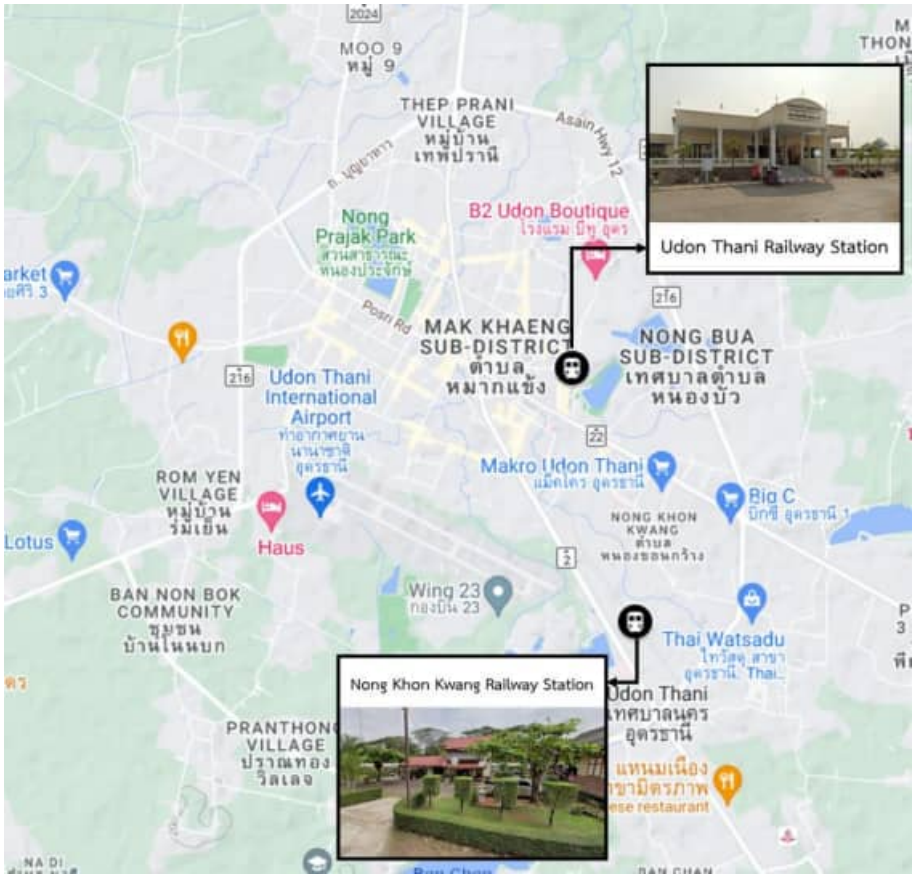


Figure 3.3-15 Railway Stations in the Udon Thani Study Area

2) **Airport:** Udon Thani Municipality has one airport: Udon Thani International Airport, located on Phrom Praphakai Road, Mueang Udon Thani District, Udon Thani Province (approximately 7 kilometers from the city center). The airport is situated within the Royal Thai Air Force military zone (Wing 23), as shown in **Figure 3.3-16**. Udon Thani International Airport is under the jurisdiction of the Department of Airports, Ministry of Transport. The airport has undergone renovations and the construction of an additional passenger terminal, connected to the original building, funded by the government. This expansion, completed in 2006, increased the annual passenger capacity from 2,200,000 to approximately 4,400,000. Udon Thani Airport serves as a regional aviation hub for the upper northeastern region due to its status as an economic and border center. It is located close to the Nong Khai Special Economic Zone and Vientiane Capital, Lao PDR, only 50 kilometers away. Therefore, Udon Thani Airport is a significant component of the border economic development strategy. In 2014, the airport served over 1.6 million passengers, followed by approximately 2.2 million passengers in 2015, and 2.3 million passengers in 2016. During the seven-day New Year festival period, passenger numbers exceeded one hundred thousand.

Figure 3.3-16 Location of the Airport in Udon Thani Province

3) **Udon Thani Bus Terminal** There are a total of 2 bus terminals, as shown in **Figure 3.3-17**, detailed as follows:

(1) Udon Thani Bus Terminal 1

(2) Udon Thani Bus Terminal 2

There are two bus terminals within the Udon Thani Municipality. Terminal 1 is located on Uthit Road, and Terminal 2 is situated on Mittraphap Road (Udon Thani – Khon Kaen). These terminals serve buses operating within the province, between provinces, and internationally. Public transportation services available include both scheduled and non-scheduled buses, such as regular buses, air-conditioned vans, and motorized tricycles.

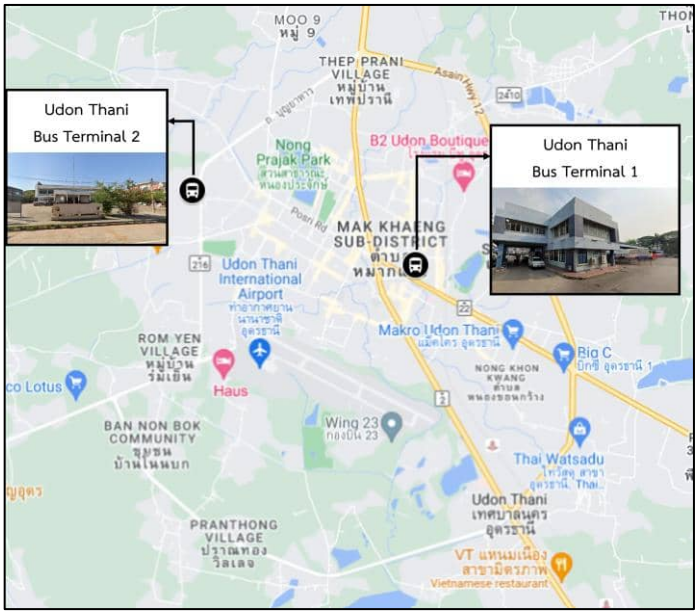


Figure 3.3-17 Locations of Udon Thani Bus Terminals

4) **Non-fixed Route Public Transportation:** Taxis in the Udon Thani Municipality area, taxi services are available for travel within the city. They primarily station themselves at key activity points within the urban area, such as shopping centers, bus terminals, and government offices. The fare is calculated based on distance via a meter.

Skylab Tricycles or Tuk-tuks: These are very popular local vehicles among both locals and tourists visiting Udon Thani Province. They are mainly used for transporting passengers over relatively short distances and are distributed throughout communities and at important activity points within the city, such as markets, shopping centers, and government offices. The fare is determined by the duration of the journey.

5) **Category 1 and Category 4 Buses:** The consultant has compiled route information for 32 bus routes (Category 1 and Category 4) in Udon Thani Province from the Department of Land Transport (DLT), as shown in **Table 3.3-4**, **Figure 3.3-18** and **Figure 3.3-19**.

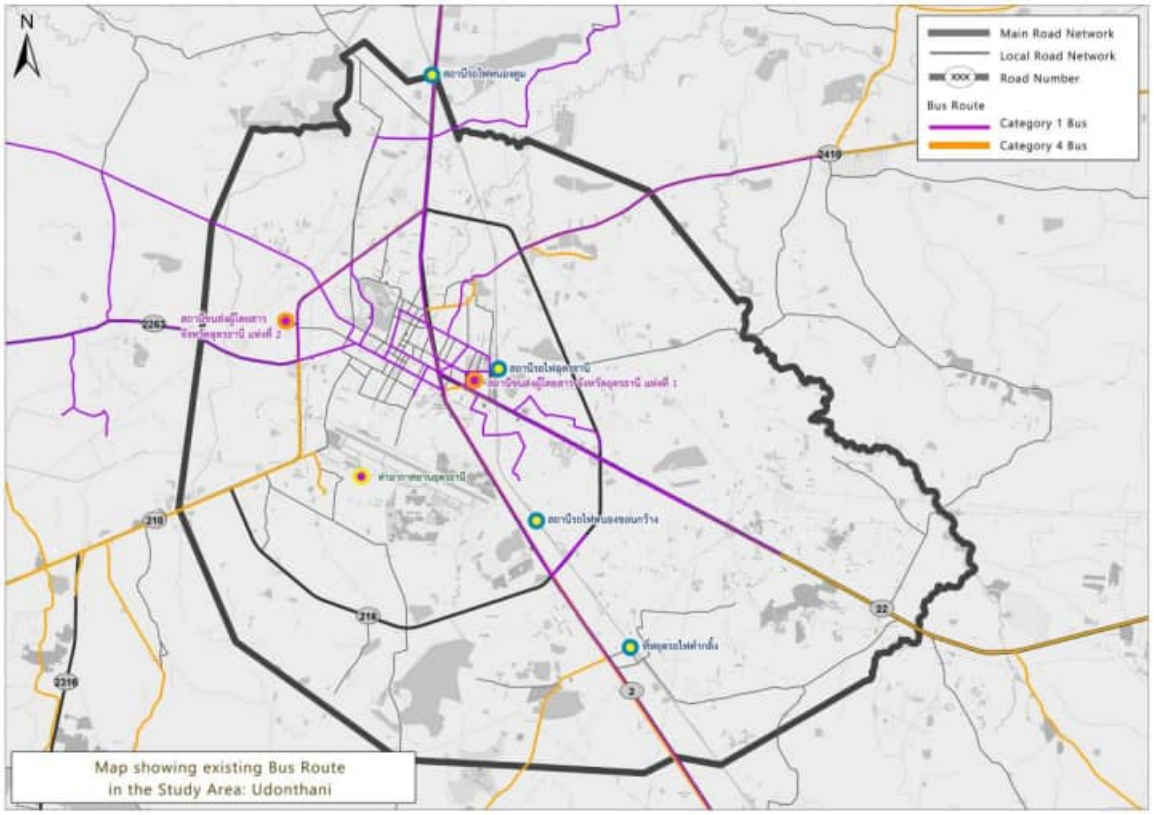


Figure 3.3-18 Map showing Category 1 and Category 4 bus routes in Udon Thani Province

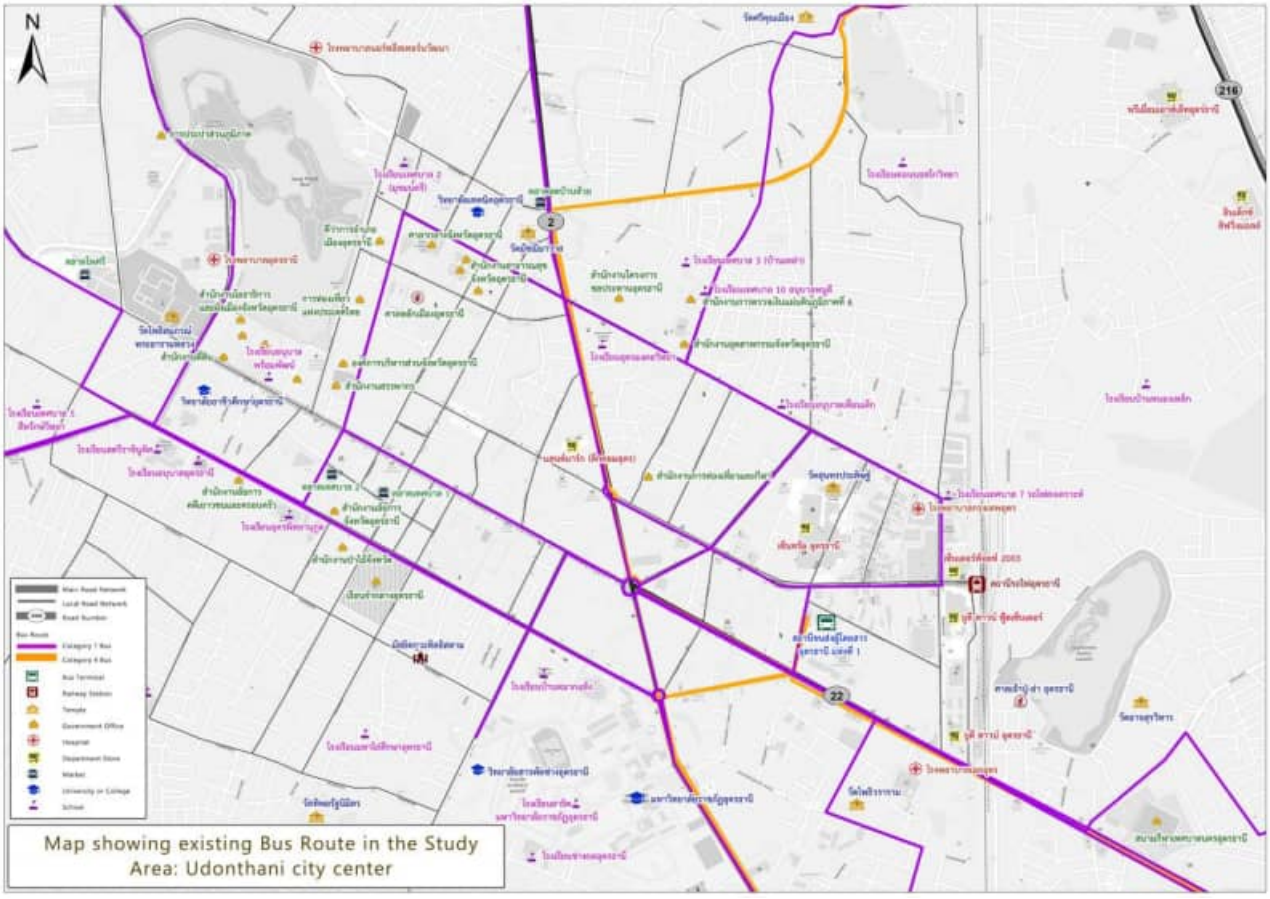


Figure 3.3-19 Map showing Category 1 and Category 4 bus routes in the Udon Thani city center area

Table 3.3-4 Route Information for Buses (Category 1 and Category 4), Udon Thani Province

No.	Category	Route	Route Name	Distance (km)	Fare (Baht)	Number of Trips	Frequency (min)	Number of Vehicles	Timetable	S.2	S.3
1	1	2	Udon Thani Provincial Rural Highway Office - Udon Thani Provincial Bus Terminal No. 2	13.9	10 - 11	120	15	12 - 16	05:00 - 18:00		✓
2	1	3	Ban Non Sung - Ban Hedgehog	35.5	10 - 13	20	60	10 - 16	06:00 - 17:00		✓
3	1	5	Ban Nong Samrong - Lakshmi Village	12	10 - 11	30	50	4 - 8	05:00 - 18:00		✓
4	1	6	Ban Chan Intersection - Udon Thani Provincial Bus Terminal No. 2	15	10 - 11	60	20	30 - 40	06:00 - 17:00		✓
5	1	7	Udon Thani Provincial Bus Terminal No. 2 - Udon Thani Provincial Bus Terminal No. 1 - Ban Kao Chan	6.9	10	20	60	10 - 15	06:00 - 17:00		✓
6	1	9	Ban Sam Phrao - Ban Chiang Yuen	61	10 - 12	140 - 164	20	70 - 82	06:00 - 18:00		✓
7	1	10	Train Station - Around City	30	20	10	200	5 - 15	05:00 - 22:00	✓	
8	1	11	Ban Tat - Ban Nong Bu intersection, bypass road - Santapol Commercial School	27.8	10 - 12	130	10	30 - 40	06:00 - 18:00		✓
9	1	12	Udon Thani Provincial Bus Terminal (No. 2) - Ban Nong Bu intersection on the bypass road	23.5	10 - 12	10	120	5 - 10	06:00 - 17:00		✓
10	1	13	Rachinuthit School 2 - Rangsina Market	16	10 - 11	12	120	2 - 4	06:00 - 18:00		✓
11	1	14	Udon Thani Railway Station - Ban Nong Nam Kem	17	10 - 11	42	35	20 - 30	06:00 - 18:00		✓
12	1	15	Santapol College - Udon Thani Provincial Bus Terminal No. 2 - Ban Nong Hin School	13	10 - 11	200	8	50 - 70	06:00 - 18:00		✓
13	1	16	Ban Nong Na Kham - Ban Chiang Pang	34	10 - 13	60	20	35 - 45	06:00 - 16:00		✓
14	1	17	Santapol Commercial School - Udon Thani Provincial Bus Terminal No. 2	16	10 - 11	40	40	10 - 20	06:00 - 20:00		✓
15	1	20	Big C Department Store Udon Thani Branch - Udon Thani Airport	14.5	20	10	200	5 - 15	05:00 - 22:00	✓	
16	1	21	Rangsina Market Intersection - Ban Chan Intersection	8	20	10	200	5 - 15	05:00 - 22:00	✓	
17	4	1371	Udon Thani - Ban Non Muang Wan	86	10 - 60	6	220	1 - 4	06:00 - 17:00		✓
18	4	1373	Udon Thani - Nong Saeng	66	10 - 46	6 - 8	210	2 - 4	06:30 - 17:00		✓
19	4	4225	Udon Thani - Ban Nong Wang Chumphon	58	10 - 41	10	130	5 - 35	06:00 - 17:00		✓
20	4	4305	Udon Thani - Ban Nong Bua Ban - Ban Nong Wua Seo	29	10 - 22	60	22	20 - 41	06:00 - 17:00		✓
21	4	4343	Udon Thani - Ban Sum Sao	35	10 - 25	24	60	4 - 8	06:00 - 17:00		✓
22	4	4344	Udon Thani - Ban Thap Kung	59	10 - 42	20	60	4 - 5	06:00 - 17:00		✓
23	4	4345	Udon Thani - Non Saet	66	10 - 46	72 - 88	10	36 - 45	06:00 - 17:00		✓
24	4	4381	Udon Thani - Wang Sam Mo	98	11 - 68	10	60	5 - 10	06:00 - 17:00	✓	✓
25	4	4403	Udon Thani - Nayung	114	4 - 44		20		06:00 - 19:00		
26	4	4409	Udon Thani - Ban Phue	54	10 - 38	48 - 96	28	21 - 36	06:00 - 17:00		✓
27	4	4565	Udon Thani - Ban Taling Chan	78	10 - 54	20 - 28	72	10 - 14	06:00 - 18:00		✓
28	4	4574	Udon Thani - Ban Hin Ngom - Sangcom	73	14 - 51	4	330	2 - 4	06:00 - 17:00		✓
29	4	4604	Udon Thani - Kumphawapi	44	10 - 31	80	20	35 - 75	06:00 - 18:30		✓
30	4	4613	Udon Thani - Ban Lao - Nong Saeng	45	10 - 32	26 - 40	46	13 - 20	06:00 - 16:00		✓
31	4	4620	Udon Thani - Nong Han - Phibun Rak	63	10 - 44	14 - 30		7 - 27			✓
32	4	4621	Udon Thani - Thung Rainn - Ban Kut Kha	70	10 - 46	10 - 18		5 - 19			✓

origin: Department of Land Transport

3.3.5 Khon Kaen Province

1) Railway network

Khon Kaen Province has a total of 12 railway stations. The main station serving the public in the city is Khon Kaen Railway Station, located at the intersection of Rot Fai Road and Ruen Rom Road. The station can be accessed via either Rot Fai Road or Ruen Rom Road and has recently been renovated to be more modern and convenient for passengers. For connections to various locations in Khon Kaen city, taxis and hired tricycles (tuk-tuks) are available, waiting in the parking area in front of the station. Additionally, songthaews pass by the front of the station. Within the study area, there are 2 railway stations: Khon Kaen Station and Samran Station, as shown in **Figure 3.3-20.**

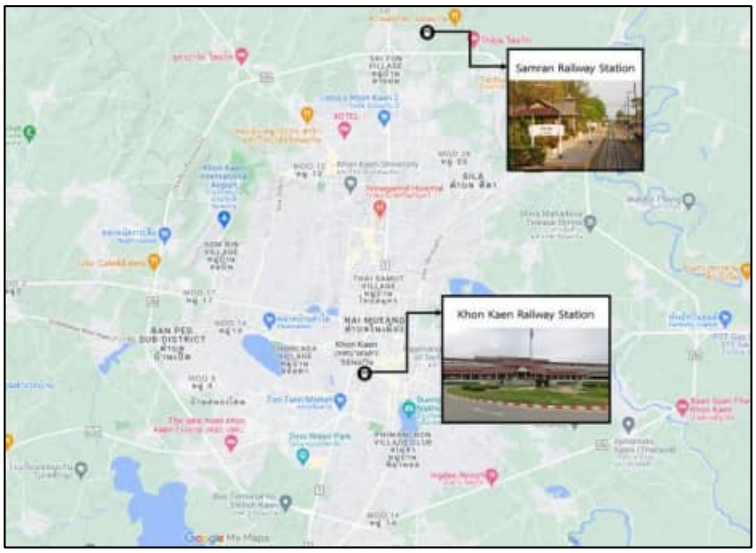


Figure 3.3-20 Railway Stations in the Khon Kaen Study Area

2) **Airport:** Khon Kaen Province has one airport under the jurisdiction of the Department of Airports, Ministry of Transport. It is located approximately 8 kilometers from the city center along the Khon Kaen - Chum Phae route (Maliwan Road), with a travel time of about 45 minutes from Khon Kaen to Bangkok by air. Non-fixed route public transportation, specifically metered taxis, provides connections between the airport and the city, offering convenience for people traveling to and from Khon Kaen Airport. Khon Kaen Airport has a total area of 1,113 rai. In 2019, it served 1.88 million passengers. However, due to the COVID-19 pandemic, passenger numbers decreased to 1.12 million in 2020 and further to 545,911 in 2021.

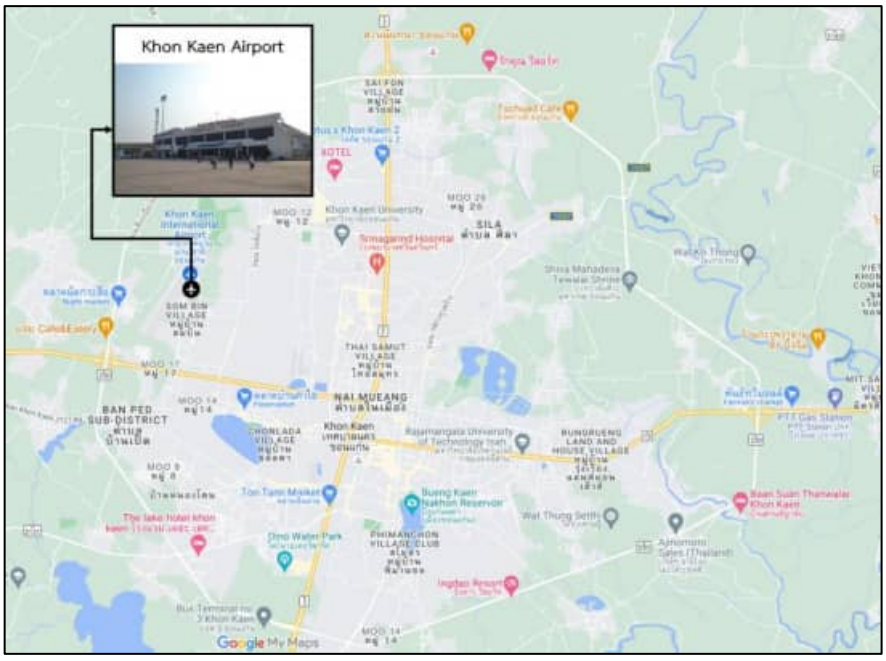


Figure 3.3-21 Location of the Airport in Khon Kaen Province

3) **Khon Kaen Bus Terminal** There is one bus terminal within the Khon Kaen Municipality area, which is Khon Kaen Bus Terminal 3. It is located on the western side of the Khon Kaen city ring road, in Mueang Kao Subdistrict, Mueang District, Khon Kaen Province. Construction was completed in 2011. (Khon Kaen Bus Terminals 1 and 2 have been relocated and consolidated at Bus Terminal 3), as shown in **Figure 3.3-22**, detailed as follows:

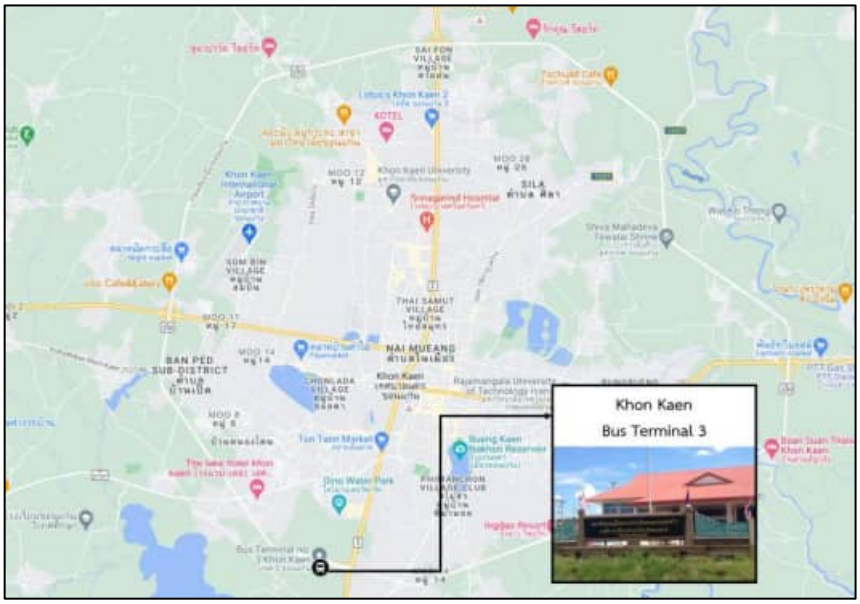


Figure 3.3-22 Location of Khon Kaen Bus Terminal

4) **Category 1 and Category 4 Buses:** The consultant has compiled route information for 35 bus routes (Category 1 and Category 4) in Khon Kaen Province from the Department of Land Transport (DLT), as shown in **Table 3.3-5, Figure 3.3-23** and **Figure 3.3-24.**

Table 3.3-5 Route Information for Buses (Category 1 and Category 4), Khon Kaen Province

No.	Category	Route	Route Name	Distance (km)	Fare (Baht)	Number of Trips	Frequency (min)	Number of Vehicles	Timetable	S.2	S.3
1	1	2	Ban Khok Fun Pong - Ban Khok Noi	19	10 - 11	6	300	5 - 35	05:30 - 21:00		✓
2	1	3	Khon Kaen Provincial Bus Terminal No. 3 - Ban Phrom Nimit	28	10 - 12	90	20	35 - 70	06:00 - 21:00		✓
3	1	4	Khon Kaen Provincial Bus Terminal No. 3 - Ban Nong Nam Kliang	23	10 - 12	160	12	15 - 25	06:00 - 21:00		✓
4	1	5	Nong Phai Lom Market - Ban Thum	12	10 - 11	30	60	10 - 26	05:30 - 21:00		✓
5	1	6	Municipal Fresh Market 1 - The House of the Birds	27	10 - 12	48	40	10 - 26	06:00 - 21:00		✓
6	1	8	Khon Kaen University - Ban Don Bom	12	10 - 11	30	60	30 - 60	06:00 - 21:00		✓
7	1	9	Triangle House - Clean House	13	10 - 11	200	10	20 - 50	06:00 - 20:00		✓
8	1	10	Khon Kaen University - Khon Kaen Racecourse	15	10 - 11	80	20	20 - 50	06:00 - 21:00		✓
9	1	11	Ban Non Sawan - Ban Kham Charoen - Maliwan Road (Km.8)	18	10 - 11	20	80	5 - 10	06:00 - 19:00		✓
10	1	12	Khon Kaen National Museum - Tha Phra Wittayayon School	17	10 - 11	20	80	5 - 15	06:00 - 19:00		✓
11	1	13	Noi Niwet Village - Baan Sawang Moraka	22	10 - 12	60 -72	25	34 - 78	06:00 - 19:00		✓
12	1	14	Khon Kaen University (Modin Daeng Gate) - Ban Non Tun	17	12 - 17	20	100	10 - 15	05:00 - 22:00	✓	
13	1	15	Dacha Village - Baan Aomon	15	12 - 16	8 -16	90	8 - 16	06:00 - 18:00	✓	
14	1	16	Ban Non Tan - Wat Pa Adulyaram	12	10 - 11	40	40	5 - 10	06:00 - 18:00		✓
15	1	17	Ban Non Tan - Ban Khok Tha	24	10 - 12	180	10	20 - 50	06:00 - 21:00		✓
16	1	18	Khon Kaen - Ban Dong Phong Railway Station	16	10 - 11	24 -32	30	6 - 8	06:00 - 18:00		✓
17	1	19	Nong Phai Lom Market - Ban Non Rueang	17	10 - 11	4	330	2 - 5	06:00 - 17:00		✓
18	1	20	Nong Phai Lom Market - Ban Kang Hung	18	10 - 11	24	60	12 - 30	06:00 - 18:00		✓
19	1	21	Ban Non Kao - Ban Don Yang	20	10 - 11	200	10	25 - 50	06:00 - 19:00		✓
20	1	22	Ban Nong Hai - Ban Don Ya Nang	12	10 - 11	40	40	4 - 10	06:00 - 18:00		✓
21	1	23	Municipal Fresh Market 1 - Ban Huai Toei	22	10 - 12	16	90	2 - 5	06:00 - 18:00		✓
22	1	24	Khon Kaen Provincial Bus Terminal Circle No. 3	17	17	10	60	4 - 18	06:00 - 12:00	✓	

origin: Department of Land Transport

Table 3.3-5 Route Information for Buses (Category 1 and Category 4), Khon Kaen Province (Continued)

No.	Category	Route	Route Name	Distance (km)	Fare (Baht)	Number of Trips	Frequency (min)	Number of Vehicles	Timetable	S.2	S.3
23	4	1352	Khon Kaen - Muang Phol	70	14 - 60	24	60	6 - 10	06:00 - 18:00	✓	
24	4	1353	Khon Kaen - Nam Phong	41	14 - 36	4	60	2 - 6	06:30 - 14:00	✓	✓
25	4	1354	Khon Kaen - Ban Phai District	40	14 - 41	8	180	5 - 13	05:30 - 18:00	✓	✓
26	4	1358	Khon Kaen - Manjakiri	63	14 - 49	14	100	4 - 8	06:00 - 18:00	✓	✓
27	4	4174	Khon Kaen - Ubon Ratna Dam	58	14 - 45	4	300	2 - 8	07:30 - 17:30	✓	✓
28	4	4175	Khon Kaen - Nam Phong (b)	54	10 - 34	30	25	14 - 31	06:30 - 17:15		✓
29	4	4177	Khon Kaen - Ban Nong Xiang Sui	38	10 - 24	8	200	12 - 50	06:00 - 19:00		✓
30	4	4227	Khon Kaen - Kranuan (b)	59	10 - 37	40	40	20 - 27	06:00 - 18:00		✓
31	4	4269	Khon Kaen - Ban Bueng Peng - Nam Phong	59	11 - 33	4	360	2 - 6	06:00 - 18:00		✓
32	4	4422	Khon Kaen - Ban Non Somboon - Phra Standing	42	10 - 27	2	720	5 - 10	06:00 - 18:00		✓
33	4	4427	Khon Kaen - Ban Wang Pea - Khao Suan Kwang	60	10 - 39	2	720	4 - 20	06:00 - 18:30		✓
34	4	4713	Khon Kaen - Nong Song Phong	NA	NA	NA	NA	NA	NA	NA	NA
35	4	4714	Khon Kaen - Wang Noi	NA	NA	NA	NA	NA	NA	NA	NA

origin: Department of Land Transport

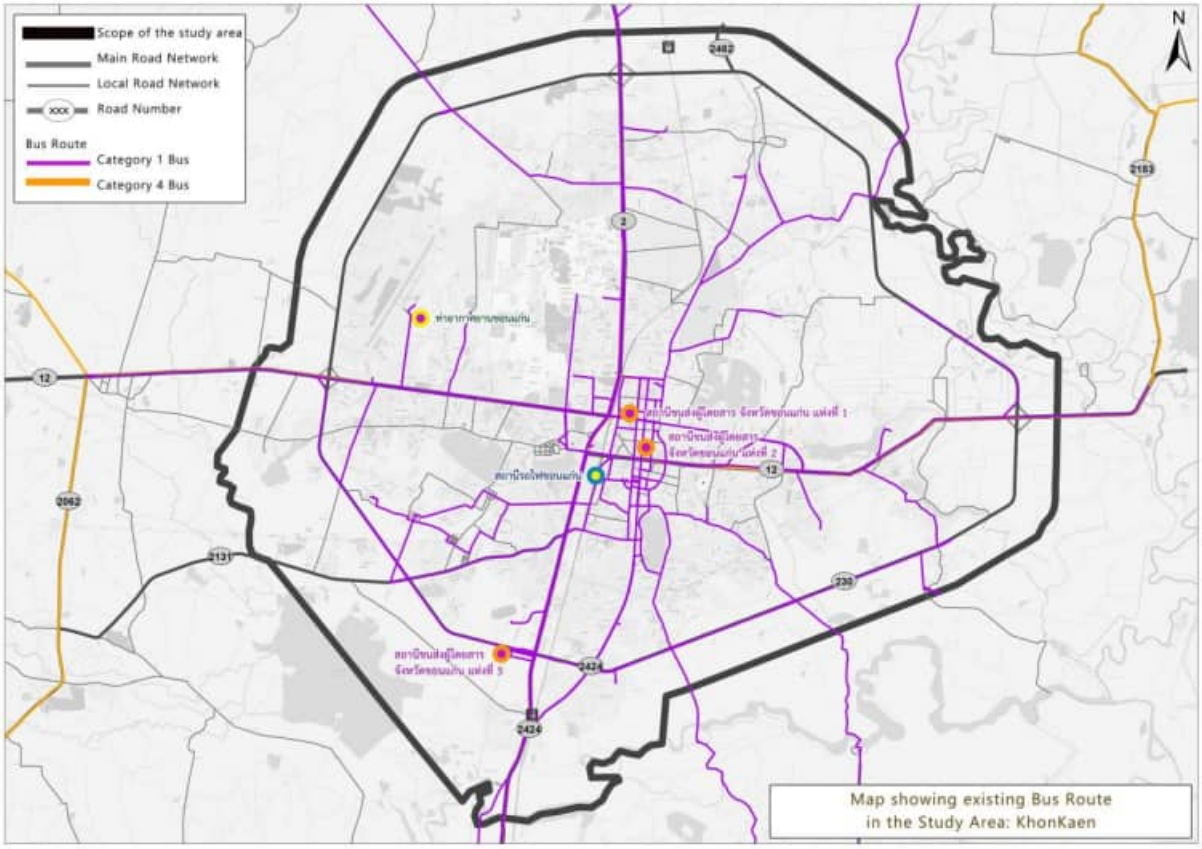


Figure 3.3-23 Map showing Category 1 and Category 4 bus routes in Khon Kaen Province

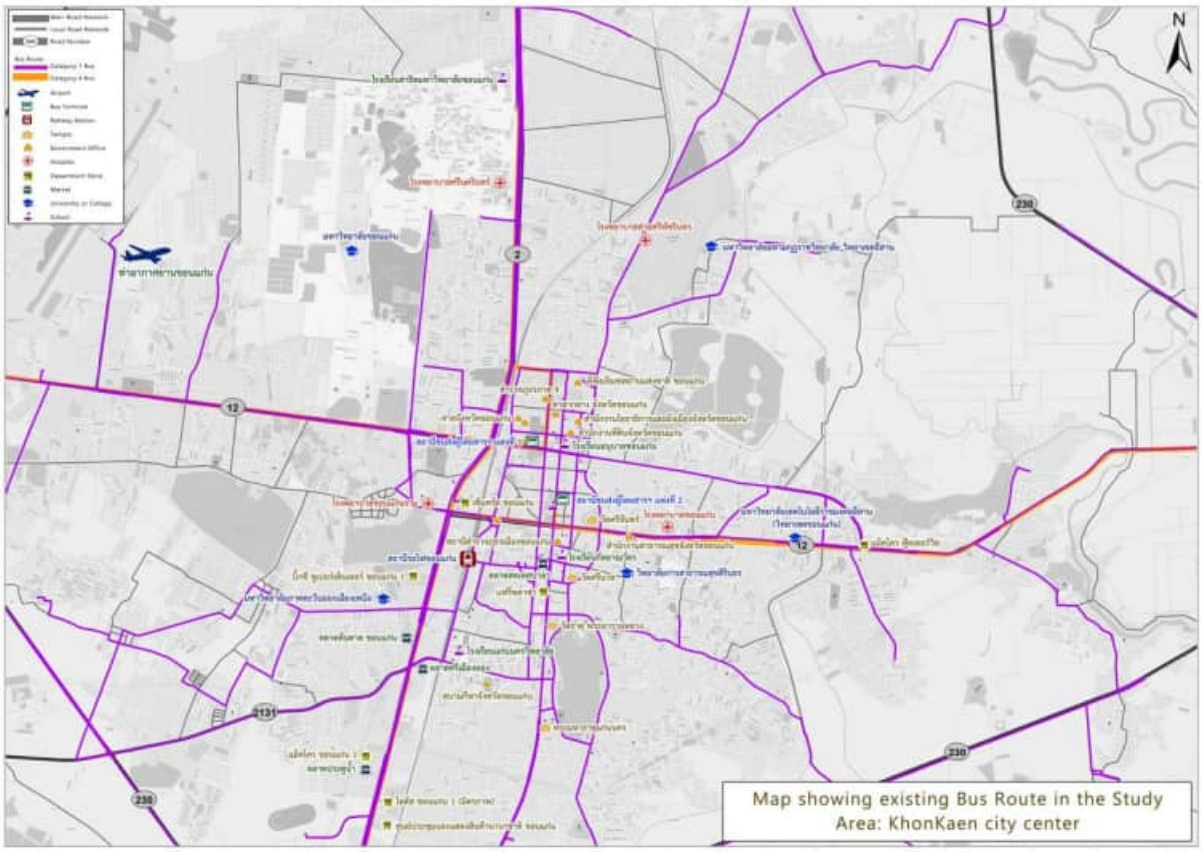


Figure 3.3-24 Map showing Category 1 and Category 4 bus routes in the Khon Kaen city center area

3.3.6 Nakhon Ratchasima Province

1) **Railway network:** The study area of Nakhon Ratchasima Province has 6 railway stations: Khok Kruat, Phukhao Lat, Nakhon Ratchasima, Chum Thang Thanon Jira, Ban Ko, and Ban Phanao, as shown in **Figure 3.3-25**.

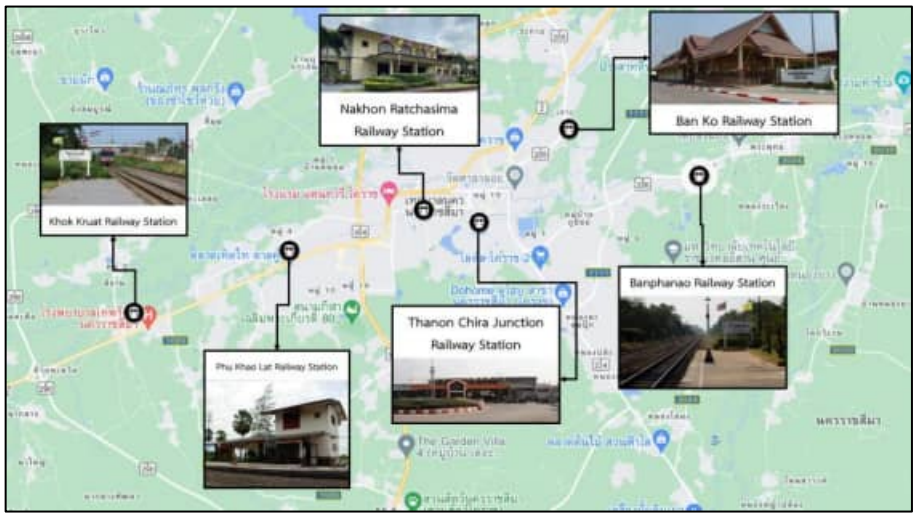


Figure 3.3-25 Railway Stations in the Nakhon Ratchasima Study Area

2) **Airport:** Nakhon Ratchasima Province has 2 airports, as shown in **Figure 3.3-26**, detailed as follows:

(1) **Nakhon Ratchasima Airport:** Located in the Nong Teng Chakkarat National Forest Reserve, at 1 Moo 15, Tha Chang Subdistrict, Chaloem Phra Kiat District, approximately 26 kilometers north of the city center. It covers an area of 4,625 rai. The airport features a runway of 2,100 meters in length and 45 meters in width (1 runway), two taxiways each 23 meters wide and 320 meters long, and an aircraft parking apron 85 meters wide and 323 meters long, capable of accommodating up to four Boeing 737 aircraft. The passenger terminal has an area of 7,200 square meters with a capacity of approximately 300 passengers. It commenced operations on December 5, 1997. Commercial flights operated continuously until 2018.

(2) **1st Wing Nakhon Ratchasima Airport:** Located in the southern part of the Nakhon Ratchasima Municipality. It is the base of 1st Wing Nakhon Ratchasima, which is part of the Royal Thai Air Force. This airport ceased commercial operations after the opening of Nakhon Ratchasima Airport and is currently used for military purposes only.

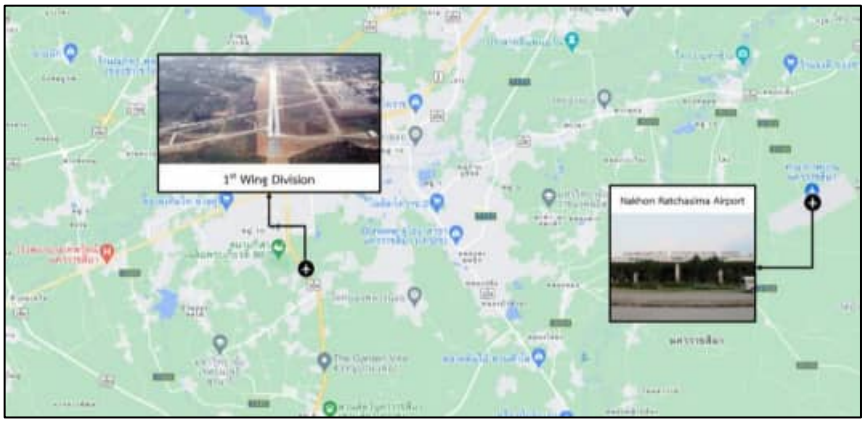


Figure 3.3-26 Location of airports in Nakhon Ratchasima Province

3) **Nakhon Ratchasima Bus Terminal:** There are a total of 2 bus terminals, as shown in **Figure 3.3-27**, detailed as follows:

(1) **Nakhon Ratchasima Bus Terminal 1:** This terminal serves Category 1, Category 2, and Category 4 buses, catering to passengers traveling within Nakhon Ratchasima Province and those traveling only to Bangkok. It has a daily capacity of 30,000 passengers.

(2) **Nakhon Ratchasima Bus Terminal 2:** This terminal serves passengers traveling between Nakhon Ratchasima Province and Bangkok, as well as other provinces. It offers Category 1, 2, 3, and 4 bus services and has a daily capacity of 80,000 passengers.

Figure 3.3-27 Locations of Nakhon Ratchasima Bus Terminals

4) **For-Hire Vehicles**

(1) **Taxis:** In Nakhon Ratchasima city, the Taxi Korat Group 2004 company operates over 100 taxis, based in Chor Ho Subdistrict, Mueang Nakhon Ratchasima District. Regular taxi stands are located at Nakhon Ratchasima Provincial Bus Terminal 2, The Mall Nakhon Ratchasima, and Terminal 21 shopping center. There are two fare systems: a fixed rate based on average distance, starting at 100 baht, and a metered rate starting at 40 baht, depending on the service.

(2) **Motorized Tricycles (Samlor KHRUEANG):** Public motorized tricycles are available throughout major communities and important locations in Nakhon Ratchasima city, particularly at fresh markets and entertainment venues.

(3) **Motorcycle Taxis:** This is the most frequently used public for-hire transport, widely available in major communities and important locations.

(4) **Tricycles (Samlor THIIP):** These are distributed around fresh markets and various intersections. Their numbers are now very few in the urban area, with some presence around the Thao Suranari Monument and Mae Kim Heng Market. Fares are determined by a negotiated fixed rate between the service provider and the passenger.

5) **Category 1 and Category 4 Buses:** The consultant has compiled route information for 40 bus routes (Category 1 and Category 4) in Nakhon Ratchasima Province from the Department of Land Transport (DLT), as shown in **Table 3.3-6, Figure 3.3-28** and **Figure 3.3-29.**

Table 3.3-6 Route Information for Buses (Category 1 and Category 4), Nakhon Ratchasima Province

No.	Category	Route	Route Name	Distance (km)	Fare (Baht)	Number of Trips	Frequency (min)	Number of Vehicles	Timetable	S.2	S.3
1	1	1	Pak Thong Chai Intersection - Rajamangala University of Technology Isan	28	9 - 10	20	80	15 - 30	05:00 - 18:00		✓
2	1	2	Nakhon Ratchasima School of Technology - Boonwattana School	14	9 - 10	10	140	2 - 12	06:00 - 18:00		✓
3	1	3	Ban Due - Wat Sa Kaeo	22	9 - 10	6	240	1 - 3	06:00 - 18:00		✓
4	1	4	Racetrack - Boonjae Wittayanusorn School	14	9 - 10	4	360	2 - 6	06:00 - 18:00		✓
5	1	5	Suranaree Industrial Zone - Nakhon Ratchasima Polytechnic School	16	9 - 10	10	140	5 - 16	06:00 - 18:00		✓
6	1	6	Ban Jo Ho - Preparatory School	28	9 - 11	12	120	25 - 88	05:00 - 18:00		✓
7	1	7	Ban Khok Phai Noi - Ban Hua Talay	13	9 - 10	20	70	10 - 30	06:00 - 18:00		✓
8	1	8	Wat Pa Salawan - Ban Hua Thanon	9.2	9 - 10	8	180	8 - 20	06:00 - 18:00		✓
9	1	10	Suranari Camp - Bus Terminal 2	3	9	10	140	2 - 8	06:00 - 18:00		✓
10	1	11	Friendship Camp - Groundwater Drilling Project	17	9 - 10	10	140	2 - 14	06:00 - 18:00		✓
11	1	12	Ban Phlai - Wat Liab	14	9 - 10	10	140	2 - 12	06:00 - 18:00		✓
12	1	13	Ban Nong Nong Gong - Ban Nong Phai Lom - Vegetable Garden (Value 5)	6.8	9	4	360	8 - 20	06:00 - 18:00		✓
13	1	14	Rajamangala Institute of Technology - Suranaree University of Technology	22	9 - 11	4	360	2 - 10	06:00 - 18:00		✓
14	1	15	Nakhon Ratchasima Provincial Bus Terminal No. 2 - Nakhon Ratchasima Provincial Bus Terminal No. 1 - Thao Suranari Monument (Left Circle, Right Circle)	5.7	9	12	140	2 - 8	05:00 - 19:00		✓
15	1	16	Nakhon Ratchasima Provincial Bus Terminal Circle 2nd - Rajamangala Institute of Technology	16.5	9 - 10	10	170	2 - 8	05:00 - 19:00		✓
16	1	17	Suranaree University of Technology - Ban Talay	21	9 - 11	10	170	2 - 8	05:00 - 19:00		✓
17	1	18	Nakhon Ratchasima Railway Station - Nakhon Ratchasima Commercial Airport	28	9 - 12	2	720	4 - 10	06:00 - 18:00		✓
18	1	19	Nakhon Ratchasima Provincial Bus Terminal No. 1 - Ban Ngong Ta	8.8	9	4	330	1 - 4	06:00 - 17:00		✓
19	1	20	Suranakorn Market - Ban Nong Bua Sala	21	9 - 10	4	360	20 - 40	06:00 - 18:00		✓
20	1	21	Nakhon Ratchasima Provincial Bus Terminal No. 2 - Nakhon Ratchasima Railway Station	3.4	25	10	90	2 - 4	06:00 - 18:00	✓	

origin: Department of Land Transport

Table 3.3-6 Information on Bus Routes Category 1 and Category 4 in Nakhon Ratchasima Province (Continued)

No.	Category	Route	Route Name	Distance (km)	Fare (Baht)	Number of Trips	Frequency (min)	Number of Vehicles	Timetable	S.2	S.3
21	4	1301	Nakhon Ratchasima - Sung Noen	34	11 - 22	20	60	6 - 9	06:00 - 17:00	✓	✓
22	4	1302	Nakhon Ratchasima - Pak Chong	86	17 - 76	12	120	6 - 20	05:30 - 18:30	✓	✓
23	4	1303	Nakhon Ratchasima - Pak Thong Chai	33	9 - 25	6	240	5 - 20	06:00 - 18:00	✓	✓
24	4	1305	Nakhon Ratchasima - Chumphuang	96	27 - 91	6	240	20 - 25	05:30 - 18:30	✓	
25	4	1306	Nakhon Ratchasima - Non Thai - Ban Pakham	48	9 - 19	12	120	4 - 8	06:00 - 18:00	✓	✓
26	4	1307	Nakhon Ratchasima - Chokchai	32	9 - 21	20	70	15 - 30	06:00 - 18:00	✓	✓
27	4	1308	Nakhon Ratchasima - Bua Yai	102	13 - 90	10	140	5 - 10	06:00 - 18:00	✓	
28	4	1310	Nakhon Ratchasima - Sikhio	46	32 - 42	10	150	4 - 12	05:30 - 18:30		✓
29	4	1311	Nakhon Ratchasima - Kham Sakae Saeng	58	13 - 53	4	360	1 - 4	06:00 - 18:00	✓	
30	4	1313	Nakhon Ratchasima - Ban Kut Pla Kheng	30	9 - 20	4	360	10 - 27	06:00 - 18:00		✓
31	4	4129	Nakhon Ratchasima - Ramkhamhaeng University, Nakhon Ratchasima Province	30	9 - 20	2	720	2 - 15	06:00 - 18:00		✓
32	4	4131	Nakhon Ratchasima - Sung Noen (b)	37	9 - 24	10	180	3 - 5	05:00 - 19:30		✓
33	4	4139	Nakhon Ratchasima - Ban Pho	24	9 - 16	4	360	2 - 11	06:00 - 18:00		✓
34	4	4140	Nakhon Ratchasima - Ban Nong Ngu Boam	23	9 - 15	4	360	2 - 8	06:00 - 18:00		✓
35	4	4141	Nakhon Ratchasima - Ban Dan Thonglang	26	9 - 17	2	720	2 - 8	06:00 - 18:00		✓
36	4	4142	Nakhon Ratchasima - Ban Binh	40	9 - 26	20	70	8 - 13	06:00 - 18:00		✓
37	4	4144	Nakhon Ratchasima - Baan Samrit	52	9 - 30	2	720	1 - 9	06:00 - 18:00		✓
38	4	4154	Nakhon Ratchasima - Ban Leem	117	27 - 73	2	720	2 - 4	06:00 - 18:00	✓	✓
39	4	4155	Nakhon Ratchasima - Royal Damri Lam Plai Mas Project (Chom Tawan Beach)	123	13 - 77	10	130	6 - 10	06:00 - 17:00	✓	✓
40	4	4197	Nakhon Ratchasima - Romfa Guru Sabha Village - Khun Tat checkpoint	61.5	21 - 56	4	360	1 - 4	06:00 - 18:00	✓	

origin: Department of Land Transport

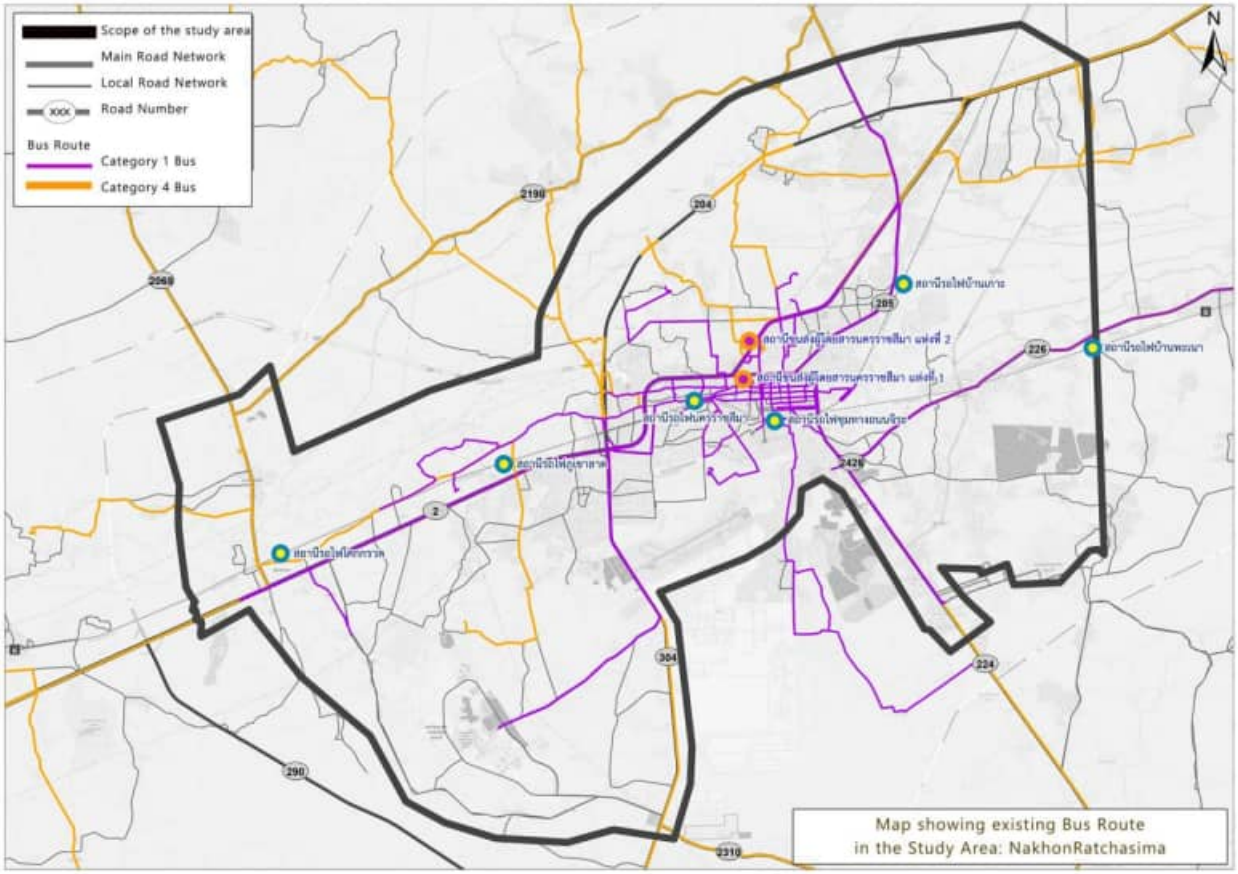


Figure 3.3-28 Map showing Category 1 and Category 4 bus routes in Nakhon Ratchasima Province

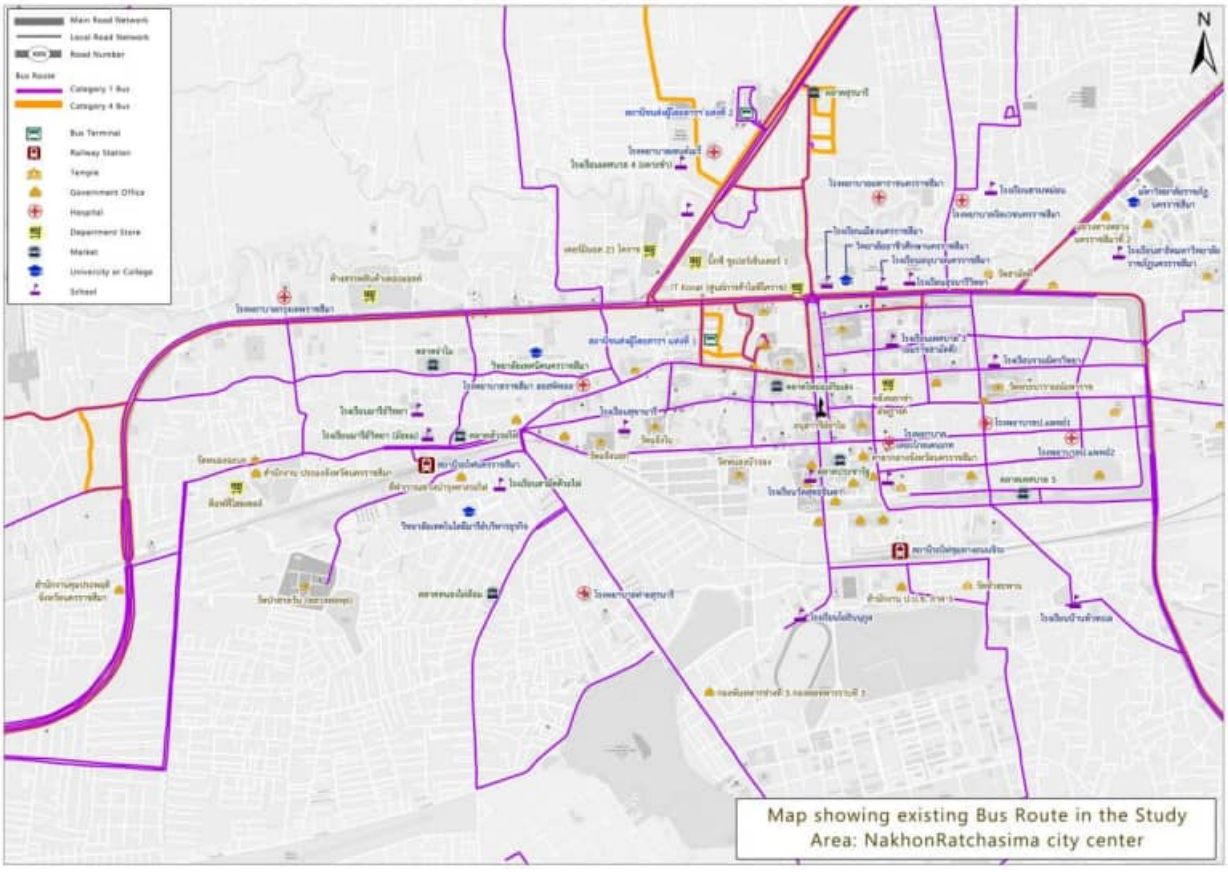


Figure 3.3-29 Map showing Category 1 and Category 4 bus routes in the Nakhon Ratchasima city center area

3.3.7 Ubon Ratchathani Province

1) **Railway network:** The study area of Ubon Ratchathani Province is served by a railway line from Krung Thep Aphiwat Central Terminal, passing through Nakhon Ratchasima, Buriram, Surin, and Sisaket, with the final destination at Warin Chamrap District. Ubon Ratchathani Province has one main railway station, Ubon Ratchathani Station in Warin Chamrap District, and two minor stations, Bung Wai Station and Huai Khayung Station, along with one railway halt, Ban Thon Halt. Within the study area, there is one railway station: Ubon Ratchathani Railway Station, as shown in **Figure 3.3-30**

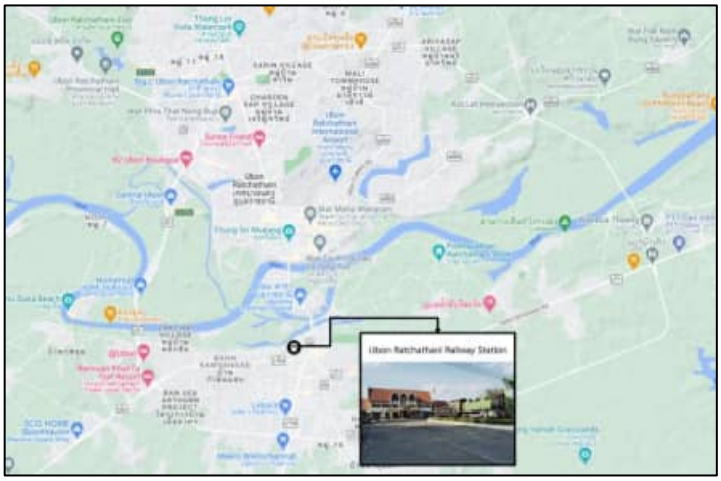


Figure 3.3-30 Railway Stations in the Ubon Ratchathani Study Area

2) **Airport:** "Ubon Ratchathani International Airport, or Ubon Ratchathani Airport, is located at 297 Thepyothi Road, Nai Mueang Subdistrict, Mueang Ubon Ratchathani District, within the Royal Thai Air Force military zone (Wing 21 Ubon Ratchathani), as shown in **Figure 3.3-31**. Five airlines operate at the airport, with 32 flights serving the Bangkok – Ubon Ratchathani route, including Nok Air, Thai Lion Air, Thai AirAsia, and Thai Smile Airways. The Chiang Mai – Ubon Ratchathani route is served by Nok Air. In 2019, the airport served 1.79 million passengers. However, due to the COVID-19 pandemic, passenger numbers decreased to 1.06 million in 2020 and further to 543,704 in 2021.

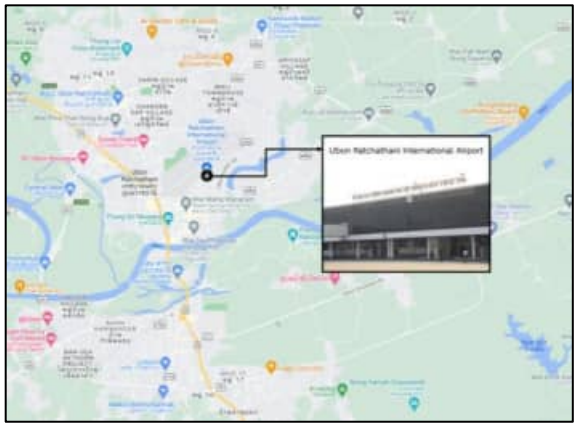


Figure 3.3-31 Location of the Airport in Uon Ratchathani Province

3) **Ubon Ratchathani Bus Terminal:** There is one bus terminal, the Chaloem Phra Kiat Bus Terminal, located on the western ring road of the city in Mueang Ubon Ratchathani District, as shown in **Figure 3.3-32**. There are also other district bus terminals within the province, including the Det

Udom Bus Terminal and the Sirindhorn District Bus Terminal (Chong Mek border crossing). The Ubon Ratchathani Bus Terminal serves buses operating between districts, between provinces, and internationally. Various forms of public transportation are available, including air-conditioned buses, taxis, songthaews, and hired tricycles.

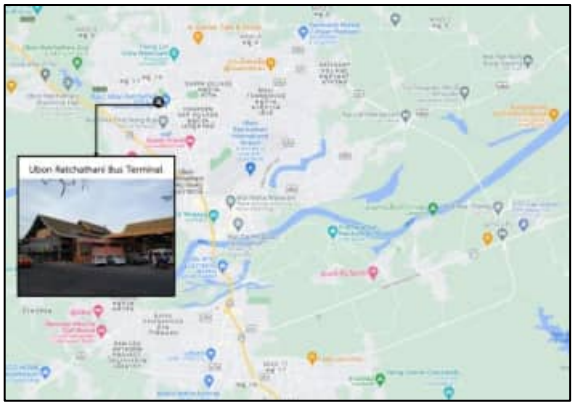


Figure 3.3-32 Locations of Ubon Ratchathani Bus Terminals

4) **Category 1 and Category 4 Buses:** The consultant has compiled route information for 29 bus routes (Category 1 and Category 4) in Ubon Ratchathani Province from the Department of Land Transport (DLT), as shown in **Table 3.3-7, Figure 3.3-33** and **Figure 3.3-34.**

Table 3.3-7 Route Information for Buses (Category 1 and Category 4), Ubon Ratchathani Province

No.	Category	Route	Route Name	Distance (km)	Fare (Baht)	Number of Trips	Frequency (min)	Number of Vehicles	Timetable	S.2	S.3
1	1	1	Ubon Ratchathani University - Three intersections into Nong Kae Village	23.6	10 - 12	394	5	24 - 56	05:04 - 19:55		✓
2	1	2	Train Station - Sripatum Pittayakarn School	13	10 - 11	72	10	12 - 31	05:30 - 18:00		✓
3	1	3	Ban Ko - Ubon Ratchathani School of Technology and Agriculture	16.7	10 - 11	60	10	14 - 33	05:30 - 18:00		✓
4	1	4	Warin Chamrap Municipal Fresh Market - Ban Kud Lat School	12	10 - 11	10	90	3 - 5	05:30 - 20:00		✓
5	1	6	Sampsitprasong Camp - Water Supply	10.5	10	30	30	3 - 14	05:30 - 18:00		✓
6	1	7	Grandfather Chao Khamchan Shrine - Wat Buddha Nikhom Kitiyaram	19	10 - 11	60	25	10 - 24	05:30 - 18:00		✓
7	1	8	Baan Pla Duk - Ubon Ratchathani Telecommunication Station -Golden Catfish House	28.8	10 - 12	8	180	5 - 10	05:30 - 18:00		✓
8	1	9	Warin Chamrap Fresh Market - Ban Non Hong Thong	21.4	10	4	360	5 - 10	05:30 - 18:00		✓
9	1	10	Sala Ban Du - Evacuation Center	14.1	10 - 11	8	180	5 - 15	05:30 - 18:00		✓
10	1	11	Ban Krasaeo - Ban Huai Khum	11	10 - 11	40	40	10 - 23	05:30 - 18:00		✓
11	1	12	Lower Northeast Skill Development Institute, Ubon Ratchathani - Ban Dong	16.4	10 - 11	88	20	10 - 25	05:30 - 18:00		✓
12	1	13	Ban Tha Khong Lek Roundabout - Phra Si Maha Pho Hospital	22	10 - 12	224	10	14 - 17	05:30 - 20:00		✓
13	1	14	Don Pu Ta - Wat Nong Pa Phong - Ban Ko	12	10 - 11	60	25	12 - 34	06:00 - 18:00		✓
14	1	15	Ubon Ratchathani Airport - Commemoration Bus Terminal - Central Plaza Ubon Ratchathani	29.8	30	12	120	2 - 4	07:00 - 21:00	✓	
15	4	1451	Ubon Ratchathani - Purple Thirty	34	10 - 22	20	70	20 - 40	06:00 - 18:00		✓
16	4	1456	Ubon Ratchathani - Dam Nai	38	10 - 25	8	180	8 - 19	05:30 - 18:00		✓
17	4	1459	Ubon Ratchathani - Phibun Mangsahan	49.5	10 - 33	20	140	20 - 50	06:00 - 18:00		✓
18	4	1460	Ubon Ratchathani - Det Udom	51.5	10 - 34	8	180	4 - 12	06:30 - 18:00	✓	✓
19	4	1462	Ubon Ratchathani - Khong Chiam	118	10 - 73	4	420	2 - 15	06:00 - 14:00	✓	✓
20	4	4328	Ubon Ratchathani - Khong Chiam - Sirindhorn District Bus Terminal (Chong Mek)	109	18 - 95	10	140	5 - 16	06:00 - 18:00	✓	✓
21	4	4329	Ubon Ratchathani - Si Mueang Mai - Ban Sawat	110	13 - 68	4	180	2 - 5	06:30 - 15:30	✓	✓

Table 3.3-7 Route Information for Buses (Category 1 and Category 4), Ubon Ratchathani Province (Continued)

No.	Category	Route	Route Name	Distance (km)	Fare (Baht)	Number of Trips	Frequency (min)	Number of Vehicles	Timetable	S.2	S.3
22	4	4365	Ubon Ratchathani - Det Udom - Buntarik	94.5	15 - 53	4	180	2 - 9	06:30 - 15:30	✓	✓
23	4	4388	Ubon Ratchathani - Phibun Mangsahan - Buntarik	115.5	14 - 101	14	100	7 - 21	06:00 - 18:00	✓	
24	4	4389	Ubon Ratchathani - Det Udom - Naja Luai	102.5	29 - 90	4	360	2 - 4	06:30 - 18:00	✓	✓
25	4	4390	Ubon Ratchathani - Det Udom - Nam Standing	115.5	29 - 101	8	180	4 - 8	06:30 - 18:00	✓	✓
26	4	4503	Ubon Ratchathani - Ubon Ratchathani Housing Village - Ban Kham Yai	11.5	10	40 - 50	40	8 - 12	06:00 - 18:00	✓	✓
27	4	4592	Ubon Ratchathani - Ban Chee Thuan - Dam Nai	51	10 - 33	2	540	2 - 5	07:00 - 16:00		✓
28	4	4598	Ubon Ratchathani - The Tigers	27	10 - 18	42	30	6 - 9	06:00 - 18:00		✓
29	4	4618	Ubon Ratchathani - Phibun Mangsahan - Sirindhorn District Bus Terminal (Chong Mek Checkpoint)	87	27 - 77	16	80	7 - 24	07:00 - 18:00	✓	

origin: Department of Land Transport

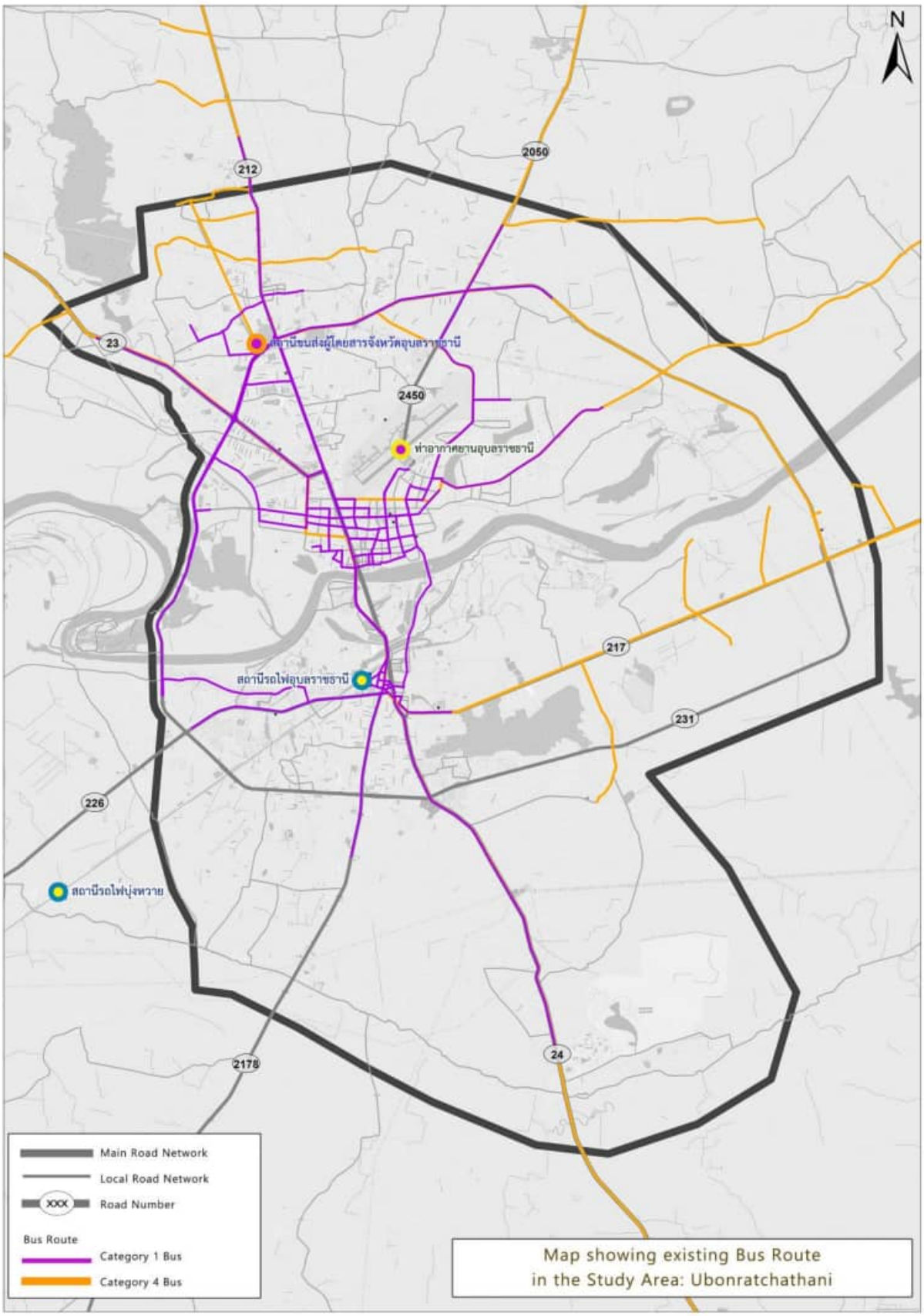


Figure 3.3-33 Map showing Category 1 and Category 4 bus routes in Ubon Ratchathani Province

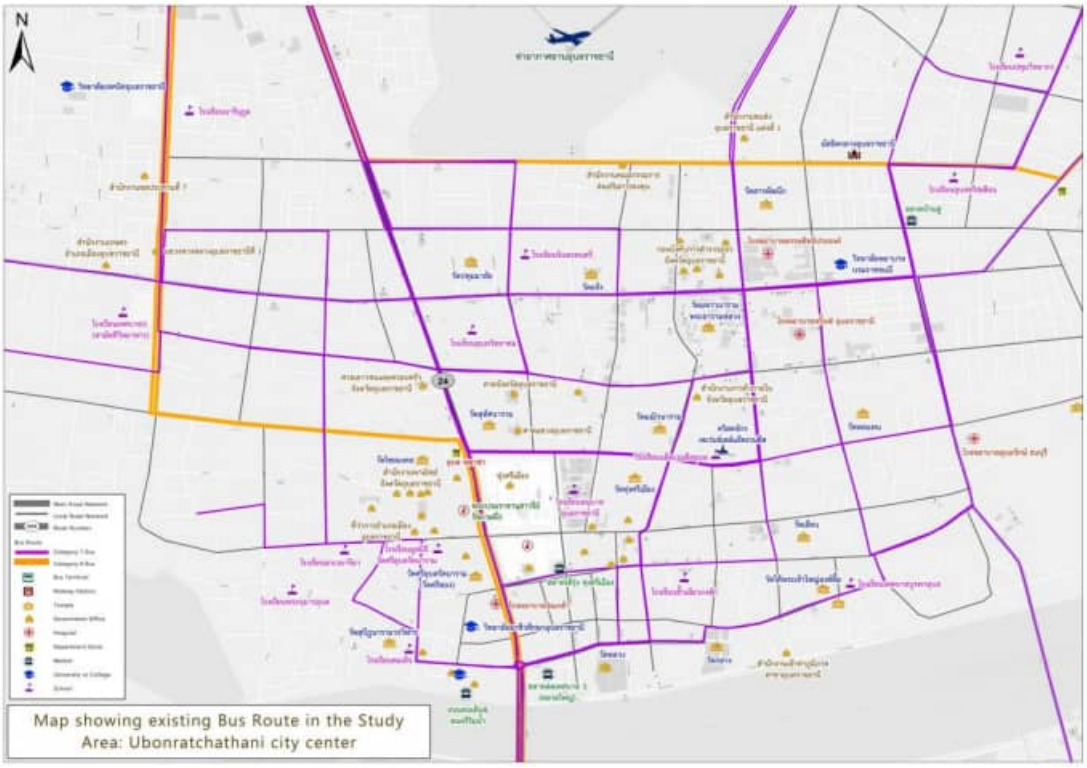


Figure 3.3-34 Map showing Category 1 and Category 4 bus routes in the Chiang Mai city center area

3.3.8 Phra Nakhon Si Ayutthaya Province

1) **Railway network:** Phra Nakhon Si Ayutthaya Province has 10 railway stations. The railway station farthest from Bangkok Railway Station is Tha Ruea Railway Station, located 102 kilometers away. Passengers can use passenger trains heading towards the northern and northeastern regions, with daily services passing through Phra Nakhon Si Ayutthaya Province in Bang Pa-in District, Phra Nakhon Si Ayutthaya District, Phachi District, and Tha Ruea District. The trains then diverge towards the northern and northeastern regions at Ban Phachi Junction Station. Within the study area, there are 2 railway stations: Ayutthaya Railway Station and Ban Ma Railway Station, as shown in **Figure 3.3-35**.

Figure 3.3-35 Railway Stations in the Phra Nakhon Si Ayutthaya Study Area

2) **Phra Nakhon SI Ayutthaya Bus Terminal:** Phra Nakhon Si Ayutthaya Province does not have a dedicated bus terminal within Phra Nakhon Si Ayutthaya District. There is only the office building of the Transport Company Limited (Bor Khor Sor) of Phra Nakhon Si Ayutthaya Province, located on National Highway No. 32 in Uthai District, and various bus stops within Phra Nakhon Si Ayutthaya District, as shown in **Figure 3.3-36**.

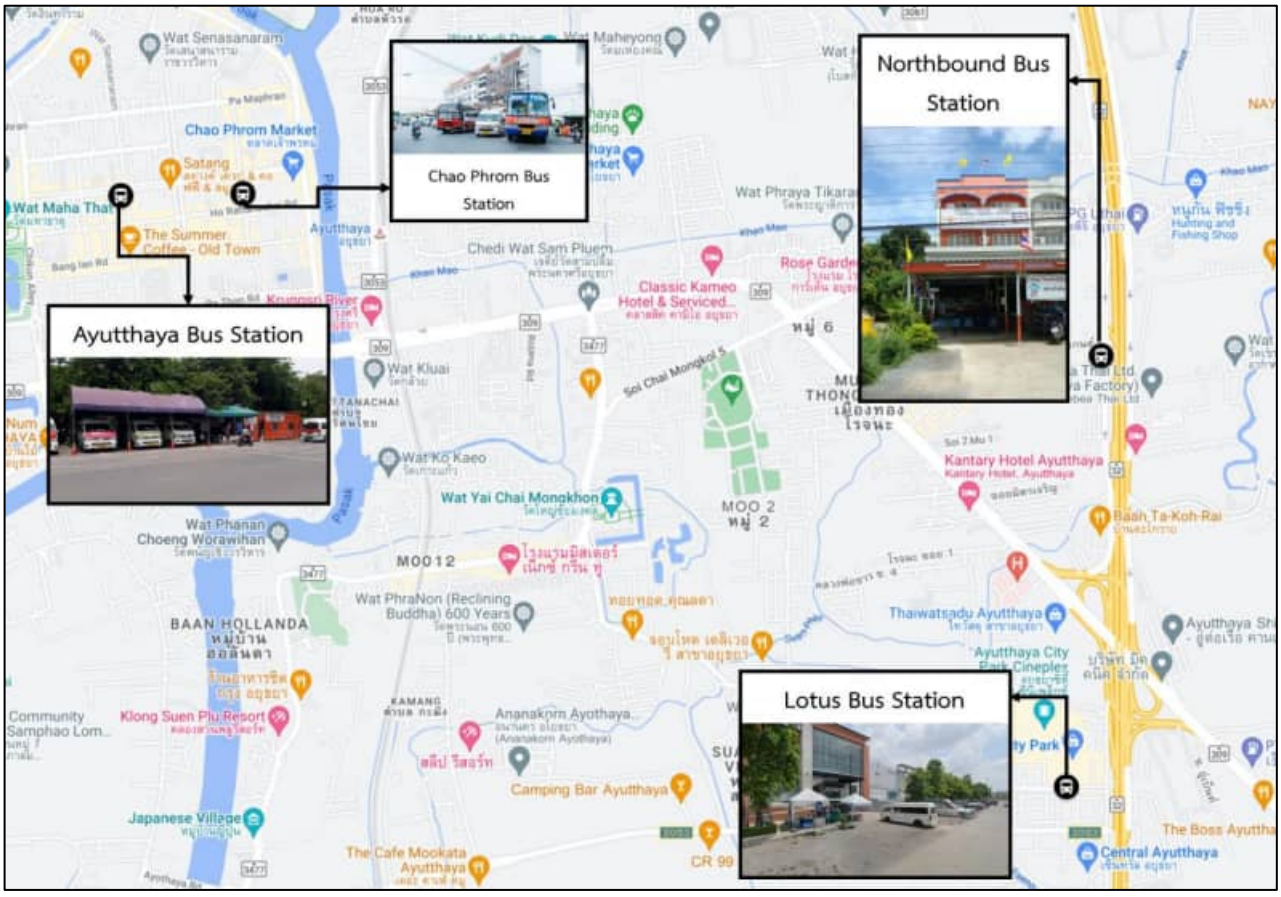


Figure 3.3-36 Locations of Phra Nakhon Si Ayutthaya Bus Stations

3) **Category 1 and Category 4 Buses:** The consultant has compiled route information for 30 bus routes (Category 1 and Category 4) in Phra Nakhon Si Ayutthaya Province from the Department of Land Transport (DLT), as shown in **Table 3.3-8**, **Figure 3.3-37** and **Figure 3.3-38**.

Table 3.3-8 Route Information for Buses (Category 1 and Category 4), Phra Nakhon Si Ayutthaya Province

No.	Category	Route	Route Name	Distance (km)	Fare (Baht)	Number of Trips	Frequency (min)	Number of Vehicles	Timetable	S.2	S.3
1	1	1	Ayutthaya City Hall - Around the Left Circle	24	10	128	10	18 - 20	05:00 - 22:00		✓
2	1	2	Ayutthaya City Hall - Around the right circle	24	10	128	10	18 - 20	05:00 - 22:00		✓
3	1	3	Ayutthaya Railway Station - Ayutthaya Hospital	7.5	10	102	10	8 - 24	05:30 - 19:30		✓
4	1	5	Ayutthaya City Hall - Ayutthaya Municipal Water Supply Authority	16	10 - 14	58	20	10 - 12	05:20 - 20:00	✓	
5	1	6	Ayutthaya City Hall - Ayutthaya Rajabhat Institute	14	10 - 13	88	20	10 - 12	05:00 - 19:00	✓	
6	1	7	Chankasem National Museum - Wat Tongpu	18.5	7 - 8	30	30	17 - 36	06:00 - 19:00		✓
7	1	8	Around the city - Ayutthaya Provincial Bus Terminal	20	10	100 - 120	7	20 - 30	06:00 - 20:00		✓
8	4	1001	Ayutthaya - Wang Noi	25	10 - 17	150 - 180	10	20 - 34	06:00 - 20:00		✓
9	4	1002	Big C Department Store - Bang Pahan	21	14 - 29	65	10	8 - 20	06:00 - 19:30	✓	
10	4	1003	Ayutthaya - Bang Pa-in	30	10 - 24	100	15	10 - 41	06:00 - 18:15	✓	
11	4	1004	Ayutthaya - Uthai - Phachi	31	14 - 43	66	15	8 - 21	05:30 - 18:00		✓
12	4	2174	Ayutthaya -great king	39	14 - 48	38	10	15 - 25	06:00 - 18:30		✓
13	4	2194	Ayutthaya -Sena	46	10 - 36	20 - 24	40	6 - 12	05:30 - 18:00	✓	
14	4	2212	Ayutthaya Circle - Sena	23	14 - 32	90	5	15 - 28	05:30 - 18:00	✓	
15	4	2213	Ayutthaya - Pratunam Tha Luang	50	17 - 69	40	15	8 - 15	05:00 - 18:00		✓
16	4	2288	Ayutthaya - Bang Sai	48	10 - 38	24 - 28	60	8 - 12	06:00 - 18:30		✓
17	4	2297	Ayutthaya - Junction to Bang Sai Fine Arts Center	20	10 - 18	114 - 135	15	13 - 30	04:25 - 20:00	✓	✓
18	4	2307	Ayutthaya - Ban Phlap Ferry Terminal	30	10 - 24	62 - 74	30	9 - 32	05:00 - 17:30		✓
19	4	2323	Ayutthaya - Wat Chomket Pracharat	14	10 - 11	48 - 58	30	8 - 24	05:00 - 19:00		✓
20	4	2333	Ayutthaya - Wat Tha Sutthawat	21	10 - 17	22 - 26	60	6 - 7	05:00 - 18:00		✓
21	4	2368	Ayutthaya - Wat Sam Ruan	15	10 - 12	76 - 79	40	13 - 34	03:00 - 18:00		✓
22	4	2373	Ayutthaya - Wat Dong Wai - Pier	46	10 - 36	72 - 75	20	17 - 31	04:30 - 20:00		✓
23	4	2395	Ayutthaya - Ban Phlap	40	12 - 32	40 - 42	30	7 - 9	05:00 - 17:30		✓
24	4	2397	Ayutthaya - Pak Hai	31	14 - 43	40	15	18 - 20	05:30 - 18:00	✓	✓
25	4	2410	Uthai - Rasom	20	10 - 17	45 - 47	30	5 - 16	05:00 - 17:30		✓
26	4	2417	Ayutthaya - Bang Pa-in	49	10 - 29	30 - 32	60	5 - 8	05:30 - 19:00		✓
27	4	2457	Ayutthaya Provincial Bus Terminal - Wat Kai Tia Treetharam	18	10 - 14	92	25	8 - 65	04:00 - 20:00		✓
28	4	2525	Rojana Industrial Park - Wat Klang Koh Rakam	12.2	10 - 12	50 - 60	15	5 - 15	05:00 - 18:00		✓
29	4	6151	Hua Ro - Uthai	14	10 - 11	71 - 80	20	6 - 18	05:00 - 17:30		✓
30	4	6160	Ayutthaya - Wat Chulamani	17	10 - 14	120 - 124	15	11 - 20	05:00 - 19:00		✓

origin: Department of Land Transport

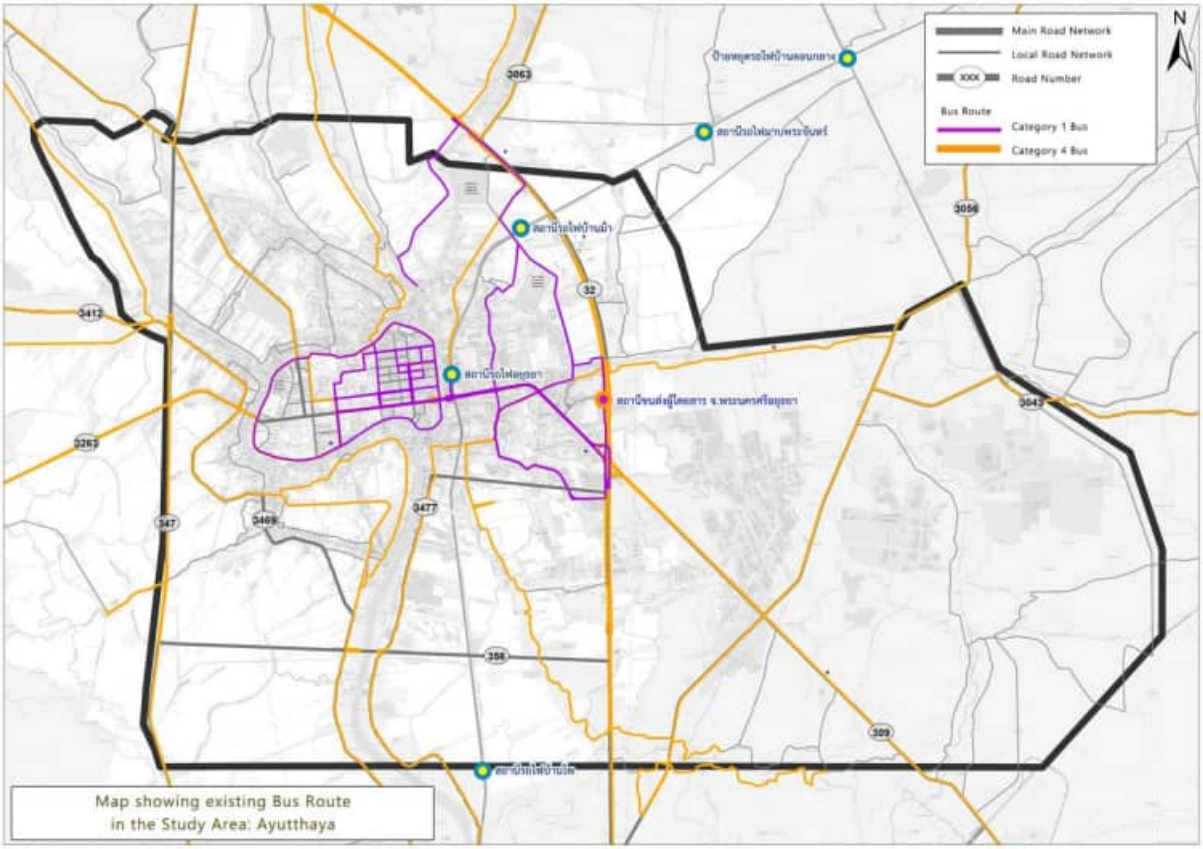


Figure 3.3-37 Map showing Category 1 and Category 4 public bus routes in Ayutthaya Province

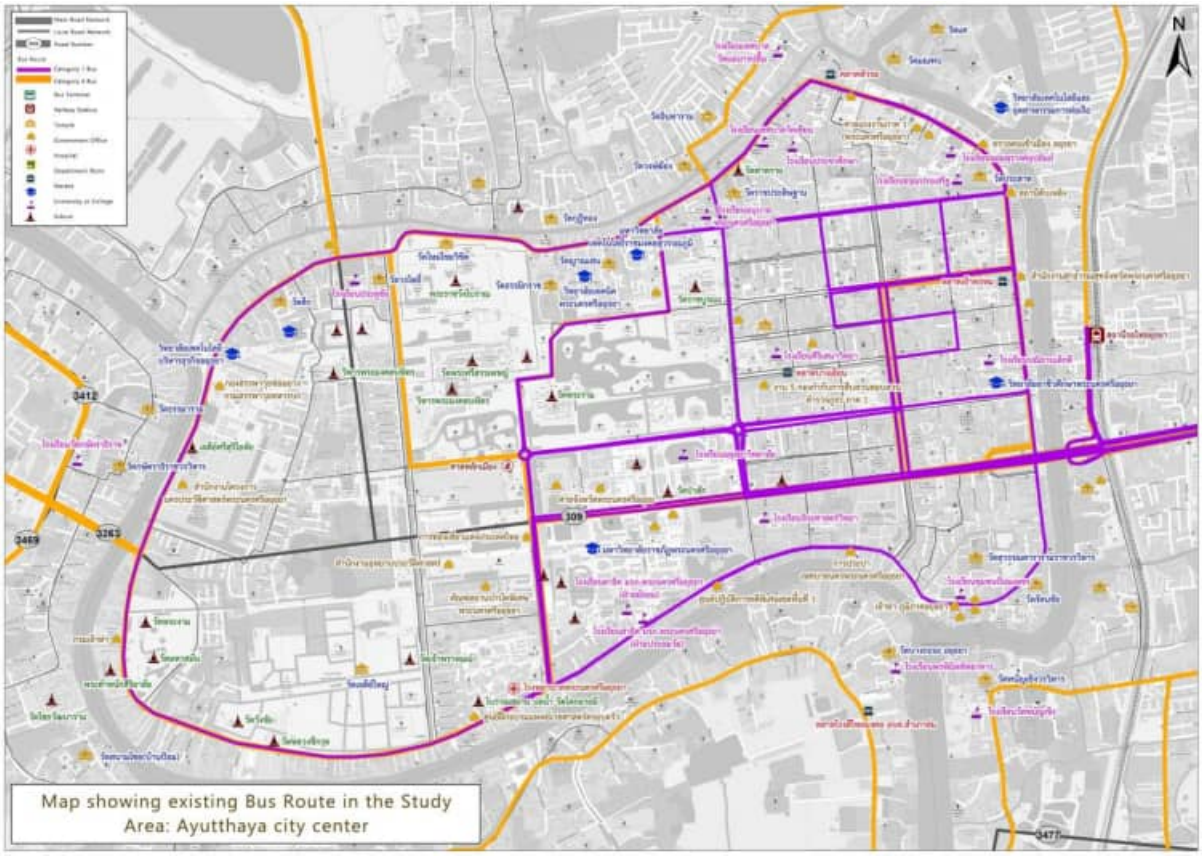


Figure 3.3-38 Map showing Category 1 and Category 4 public bus routes in the Ayutthaya city center area

3.3.9 Surat Thani Province

1) **Railway network:** The study area of Surat Thani Province has 1 railway station: Surat Thani Railway Station, as shown in **Figure 3.3-39**.

   (1) **Surat Thani Railway Station:** All trains on the southern railway line pass through Surat Thani Railway Station. It includes both a passenger terminal and a freight transport yard. Surat Thani Railway Station is located in Phunphin District, approximately 650 kilometers from Bangkok and about 14 kilometers from Surat Thani city center.

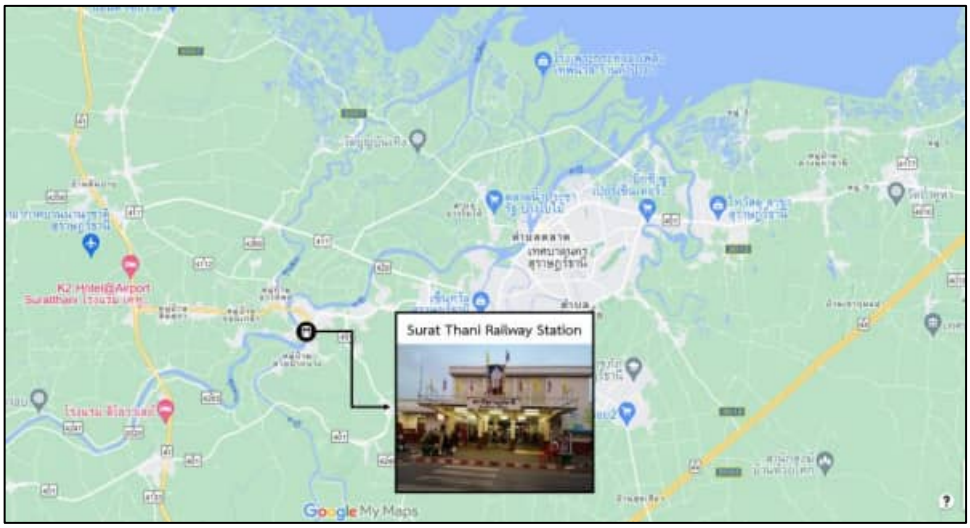


Figure 3.3-39 Railway Stations in the Surat Thani Study Area

2) **Airport:** Surat Thani Province has 1 airport, as shown in **Figure 3.3-40**, detailed as follows:

   (1) **Surat Thani Airport:** Located in Hua Toei Subdistrict, Phunphin District, Surat Thani Province, approximately 26 kilometers from Ban Don. It shares its facilities with the Royal Thai Air Force (Wing 7 Surat Thani) and is under the jurisdiction of the Department of Airports, Ministry of Transport. It serves as an international airport. In 2019, it had 1.87 million passengers. However, due to the COVID-19 pandemic, passenger numbers decreased to 1.09 million in 2020 and 448,295 in 2021.

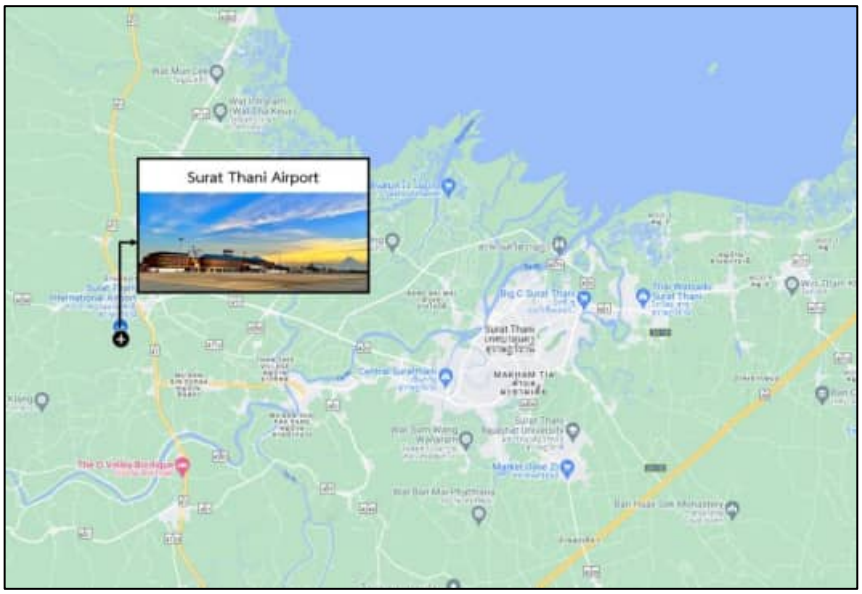


Figure 3.3-40 Location of the Airport in Surat Thani Province

3) **Surat Thani Bus Terminal:** There is a total of one bus terminal, as shown in **Figure 3.3-41**, detailed as follows:

(1) **Surat Thani Provincial Bus Terminal** Located in Wat Pradu Subdistrict, Mueang Surat Thani District, this is the main bus terminal of Surat Thani Province. As Surat Thani is the gateway to three popular islands in Thailand – Koh Samui, Koh Phangan, and Koh Tao – there are daily bus services to and from Surat Thani Bus Terminal.

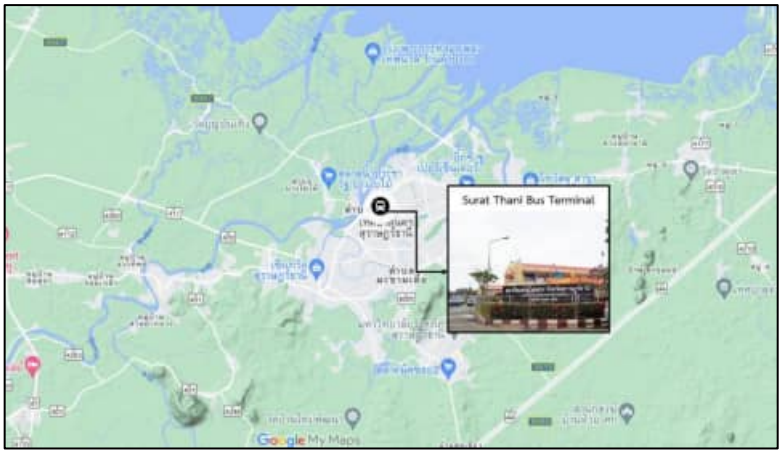


Figure 3.3-41 Location of Surat Thani Bus Terminal

4) **For-hire vehicles**

Within Surat Thani city, various types of vehicles are available for service. Tourists can choose from several transportation options as appropriate. Taxi services are available for charter to various locations both within and outside the city. Taxis are stationed at the Kaset Market and can be called to various points throughout the city. Small songthaews or four-wheeled tuk-tuks operate throughout the city. Tourists can charter these vehicles for sightseeing both within the city and in other districts, with prices depending on distance and negotiation. Tricycles and motorcycle taxis are stationed at various points in the province, such as in front of the Kaset Market and the bus terminal. Fares are either agreed upon based on distance or a fixed rate.

5) **Category 1 and Category 4 Buses:** The consultant has compiled route information for 31 bus routes (Category 1 and Category 4) in Surat Thani Province from the Department of Land Transport (DLT), as shown in **Table 3.3-9, Figure 3.3-42** and **Figure 3.3-43.**

Table 3.3-9 Route Information for Buses (Category 1 and Category 4), Surat Thani Province

No.	Category	Route	Route Name	Distance (km)	Fare (Baht)	Number of Trips	Frequency (min)	Number of Vehicles	Timetable	S.2	S.3
1	1	1	Surat Thani Provincial Bus Terminal - Around the City	24	13 - 28	NA	NA	NA	NA		✓
2	1	2	Agricultural Market 2 - Around the City	26	10 - 32	NA	NA	NA	NA		✓
3	1	3	Kaset Market 1 - Phunphin Railway Station	15	10 - 14	NA	NA	NA	NA		✓
4	1	4	Surat Thani - Ban Soi 10	19	10 - 24	NA	NA	NA	NA		✓
5	1	5	Kaset Market 2 - Khun Talay Pond	11	20	NA	NA	NA	NA		✓
6	1	6	Kaset Market 1 - Ban Bang Yai	6	20	NA	NA	NA	NA		✓
7	1	7	Agricultural Market 2 - Around the City	4.7	20	NA	NA	NA	NA		✓
8	1	8	Agricultural Market 2 - Microclimate	7	20	NA	NA	NA	NA		✓
9	1	9	Around the city - Si Surat Bridge	36	NA	NA	NA	NA	NA		
10	1	10	Kaset Market 2 - Big C Department Store	6	NA	NA	NA	NA	NA		
11	1	11	Agricultural Market Circle 2 - Si Kasem Road - Samet Riang	16	NA	NA	NA	NA	NA		
12	4	8232	Phunphin - Phanom - Khao Sok National Park	104	39 - 136	4	360	2 - 4	06:00 - 18:00	✓	
13	4	8244	Surat Thani Airport - Donsak - Koh Samui	124	14 - 120	6	240	6 - 15	06:00 - 18:00	✓	
14	4	8320	Surat Thani - Ban Bang Phla - Phunphin	33	13 - 39	14	120	2 - 14	06:00 - 18:00		✓
15	4	8337	Surat Thani - Ban Song	78	28 - 111	32	45	8 - 18	06:00 - 18:00	✓	✓
16	4	8350	Ban Song - Phunphin	76	11 - 62	10	140	5 - 23	06:00 - 18:00	✓	✓

origin: Department of Land Transport

Table 3.3-9 Route Information for Buses (Category 1 and Category 4), Surat Thani Province (Continued)

No.	Category	Route	Route Name	Distance (km)	Fare (Baht)	Number of Trips	Frequency (min)	Number of Vehicles	Timetable	S.2	S.3
17	4	8363	Phunphin - Kiri Ratnikhom - Ban Phru Thai	54	42 - 70	16	90	3 - 10	06:00 - 18:00	✓	
18	4	8364	Surat Thani - Ban Khlong Song	114	27 - 148	14	120	8 - 12	07:00 - 17:00	✓	
19	4	8368	Surat Thani - Ban Nong Ya Plong - Ban Na Dom	33	14 - 43	20	90	4 - 6	07:00 - 17:00	✓	✓
20	4	8417	Surat Thani - Ban Bang Sawan	78	102	10	140	4 - 12	06:00 - 18:00	✓	
21	4	8418	Surat Thani Railway Station - Surat Thani Airport - Around Phunphin City	39	10 - 32	4	360	2 - 8	06:00 - 18:00		✓
22	4	8423	Surat Thani - The Lady's House of Vocational Arts Center	69	28 - 90	12 - 14	60	6 - 10	06:00 - 17:00	✓	
23	4	8499	Kaset Market 1 - Surat Thani Airport	27	14 - 27	8 - 10	120	4 - 6	07:00 - 17:30	✓	
24	4	8507	Phra Jun Jomklao Bridge - Kilo Zero Intersection	4.5	10	100	15	10 - 30	06:00 - 18:00	✓	
25	4	8508	Phunphin - Chaiya - Tha Chan	65	10 - 53	4 - 8	90	2 - 6	06:00 - 18:00		✓
26	4	8509	Phunphin - Ban Na San	55	10 - 45	4 - 12	120	2 - 6	06:00 - 18:00		✓
27	4	8511	Phunphin - Kian Sa	49	10 - 40	16 - 36	40	4 - 18	06:00 - 18:00		✓
28	4	8525	Donsak District Pier - Khao Sok National Park	190	NA	NA	NA	NA	NA	NA	NA
29	4	8562	Surat Thani - Donsak - Koh Phangan	110	17 - 69	10	120	6 - 10	04:30 - 16:30	✓	
30	4	8563	Surat Thani - Kiri Ratnikhom	NA	NA	NA	NA	NA	NA	NA	NA
31	4	8592	Surat Thani Airport - Toll 420 - Donsak Ferry Terminal	NA	NA	NA	NA	NA	NA	NA	NA

origin: Department of Land Transport

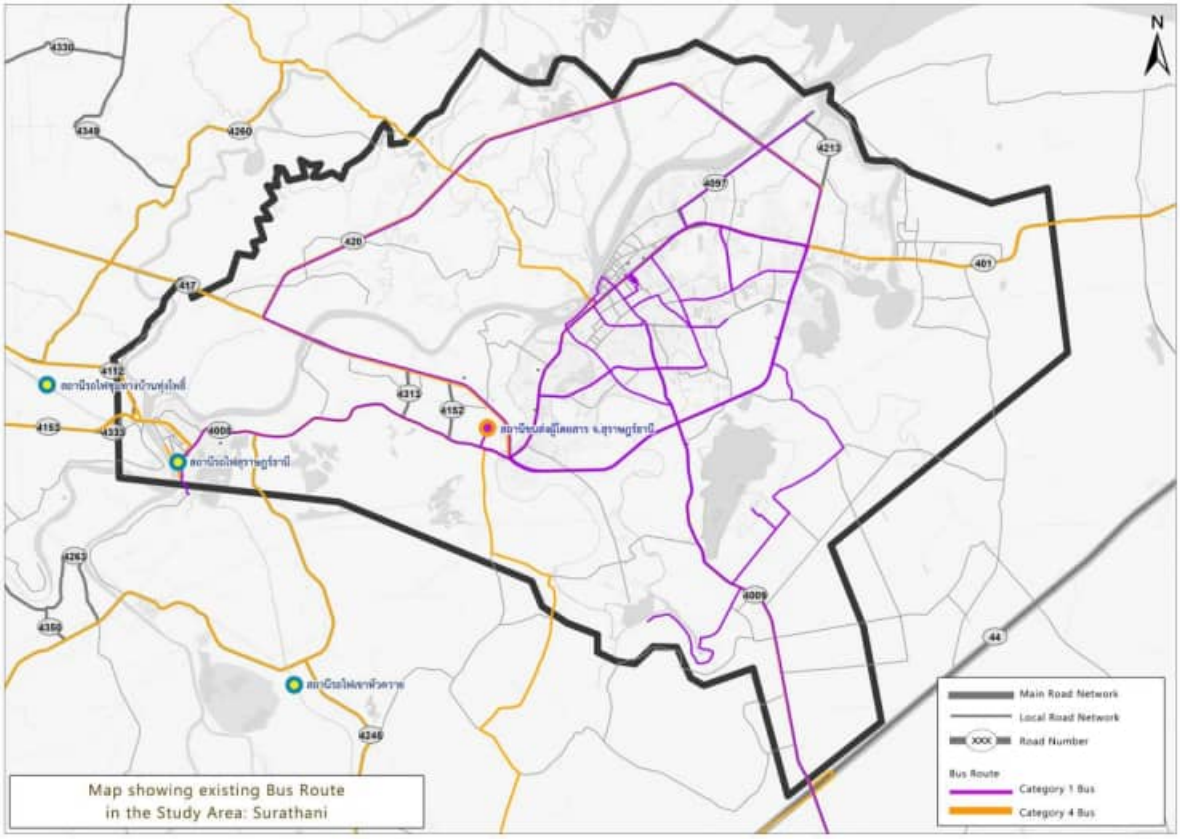


Figure 3.3-42 Map showing Category 1 and Category 4 bus routes in Surat Thani Province

Figure 3.3-43 Map showing Category 1 and Category 4 bus routes in the Surat Thani city center area

3.3.10 Phuket

1) **Airport:** Phuket International Airport is located on Highway No. 4026, Mai Khao Subdistrict, Thalang District, at the northernmost part of Phuket Island, approximately 32 kilometers from Phuket City, as shown in **Figure 3.3-44**. It is under the jurisdiction of Airports of Thailand Public Company Limited (AOT). It has the third-highest flight traffic in the country, after Suvarnabhumi International Airport and Don Mueang International Airport, with both domestic and international flights arriving daily. Phuket is a province with high standards in both tourism and economy and has the capacity to accommodate passengers.

Figure 3.3-44 Location of the Airport in Phuket Province

2) **Phuket Bus Terminal:** There are a total of 2 passenger bus terminals, as shown in **Figure 3.3-45**, detailed as follows:
   (1) **Phuket Bus Terminal 1:** Located on Phang Nga Road, Soi 3.
   (2) **Phuket Bus Terminal 2:** Located on Thepkrasattri Road, Ratsada Subdistrict.

Both bus terminals within Phuket Province serve both intra-provincial and inter-provincial bus routes. Public transportation services available include both scheduled and non-scheduled buses, such as regular buses and air-conditioned vans.

Figure 3.3-45 Locations of Phuket Bus Terminals

3) **Category 1 and Category 4 Buses**: The consultant has compiled route information for 19 bus routes (Category 1 and Category 4) in Phuket Province from the Department of Land Transport (DLT), as shown in **Table 3.3-10**, **Figure 3.3-46** and **Figure 3.3-47**.

Table 3.3-10 Route Information for Buses (Category 1 and Category 4), Phuket Province

No.	Category	Route	Route Name	Distance (km)	Fare (Baht)	Number of Trips	Frequency (min)	Number of Vehicles	Timetable	S.2	S.3
1	1	2	Around Patong City (A) - Blue Line	NA	NA	NA	NA	NA	NA	NA	NA
2	1	3	Around Patong City (B) - Green Line	NA	NA	NA	NA	NA	NA	NA	NA
3	1	1	Saphan Hin - Central Phuket Department Store	11	15	90	10 - 30	10 - 12	06:00 - 20:00	✓	
4	1	2	Chalong Bay Jetty - Supership Shopping Mall	18	15	68	15 - 30	8 - 14	06:00 - 20:00		✓
5	1	3	Rassada Pier - The Mall (Water Park)	10.5	15	92	10 - 30	6 - 8	06:00 - 20:00		✓
6	4	1811	Phuket - Tha Chat Chai	41	10 - 41	42	30	47 - 59	06:20 - 16:10		✓
7	4	1812	Phuket - Kamala	28	10 - 35	12	120	8 - 36	06:00 - 18:00		✓
8	4	1813	Phuket - Bang Rong Bay	22	10 - 25	8	120	9 - 11	06:00 - 14:00		✓
9	4	1814	Phuket - Patong	15	10 - 30	20	60	10 - 12	06:00 - 18:00		✓
10	4	1815	Phuket - Rawai Beach - Nai Harn Beach	21	3 - 11	64 - 76	10	8 - 14	06:15 - 17:35		✓
11	4	1817	Phuket - Siray Island	10	2 - 5	8 - 10	120	5 - 7	06:00 - 16:00		✓
12	4	1818	Phuket - Makham Bay - Marine Biology and Fisheries Research Institute	14	10 - 21	6	160	6 - 8	06:00 - 14:00		✓
13	4	8357	Phuket Airport - Rurin Beach - Patong Beach - Rawai Beach	56	30 - 170	56	60	14 - 18	05:30 - 22:50	✓	
14	4	8359	Phuket - Karon - Kata Noi Beach	28.7	4 - 29	42 - 48	30	6 - 29	05:30 - 18:30		✓
15	4	8360	Phuket - Chalong Bay	14	2 - 7	28 - 36	30	4 - 9	07:00 - 17:20		✓
16	4	8411	Phuket Bus Terminal - Phuket Airport	39	30 - 90	26 - 30	60	5 - 7	07:30 - 20:30	✓	
17	4	8537	Phuket - Patong (b)	18	30 - 50	24	NA	6 - 10	NA	✓	
18	4	8580	Phuket Airport - Chalerm Phra Kiat Road Rama 9 - Ban Rawai	51	18 - 70	NA	NA	NA	NA	NA	NA
19	4	8581	Phuket Airport - Patong - Ban Kata	52	50 - 150	24	NA	8 - 10	NA	✓	

origin: Department of Land Transport

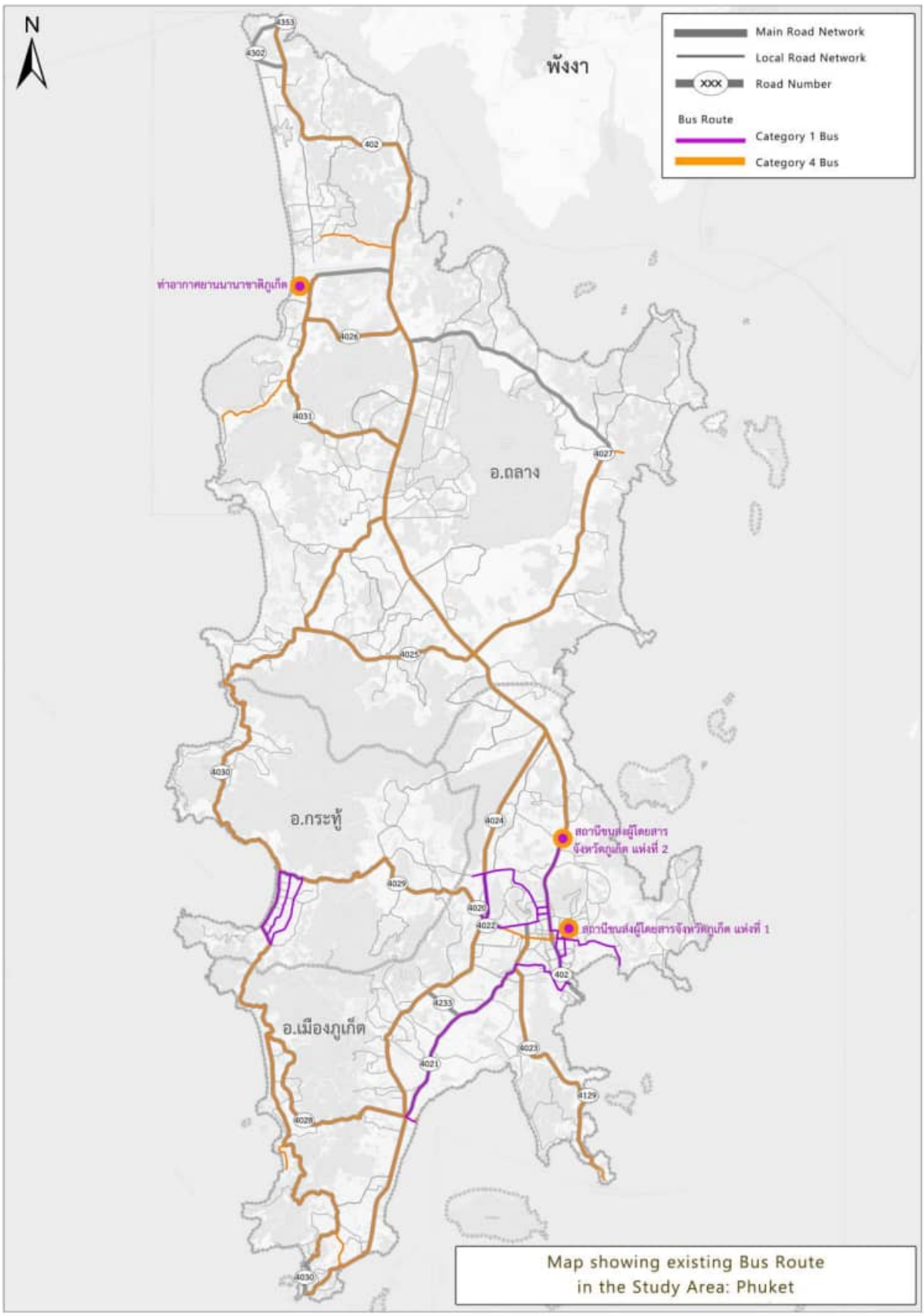


Figure 3.3-46 Map showing Category 1 and Category 4 bus routes in Phuket Province

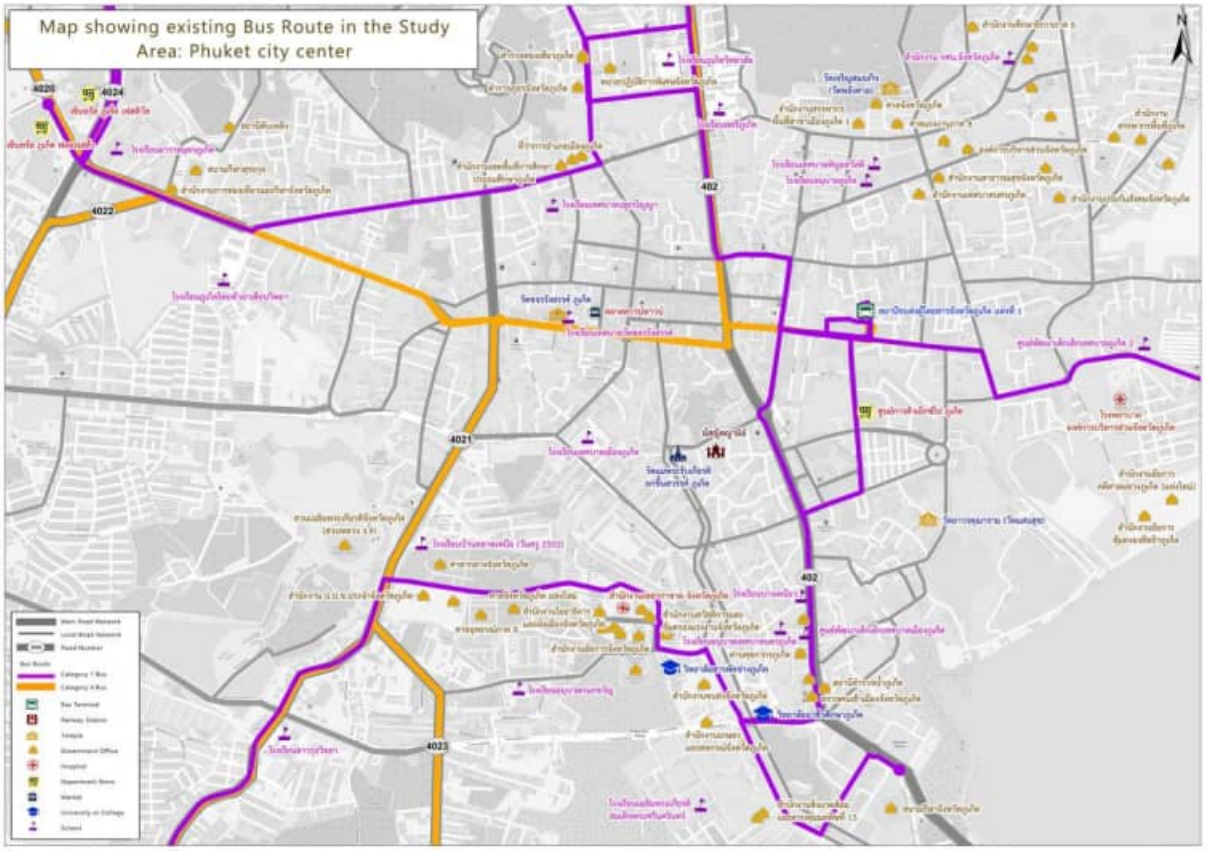


Figure 3.3-47 Map showing Category 1 and Category 4 bus routes in the Phuket city center area

3.3.11 Songkhla Province (Hat Yai District)

1) **Railway network:** The study area of Songkhla Province has 1 railway station: Hat Yai Junction Railway Station, as shown in **Figure 3.3-48**.

Figure 3.3-48 Railway Stations in the Songkhla (Hat Yai) Study Area

2) **Airport:** Hat Yai International Airport is located 12 kilometers southwest of Hat Yai city center (at the Hat Yai District Office). It was upgraded to an international airport on December 7, 1972, as shown in **Figure 3.3-49**. According to Hat Yai International Airport data, in 2019, the total number of passengers using the airport was 3,895,770, consisting of 271,735 international passengers and

3,624,035 domestic passengers. This represents an 8.41% decrease in passenger numbers compared to 2018.

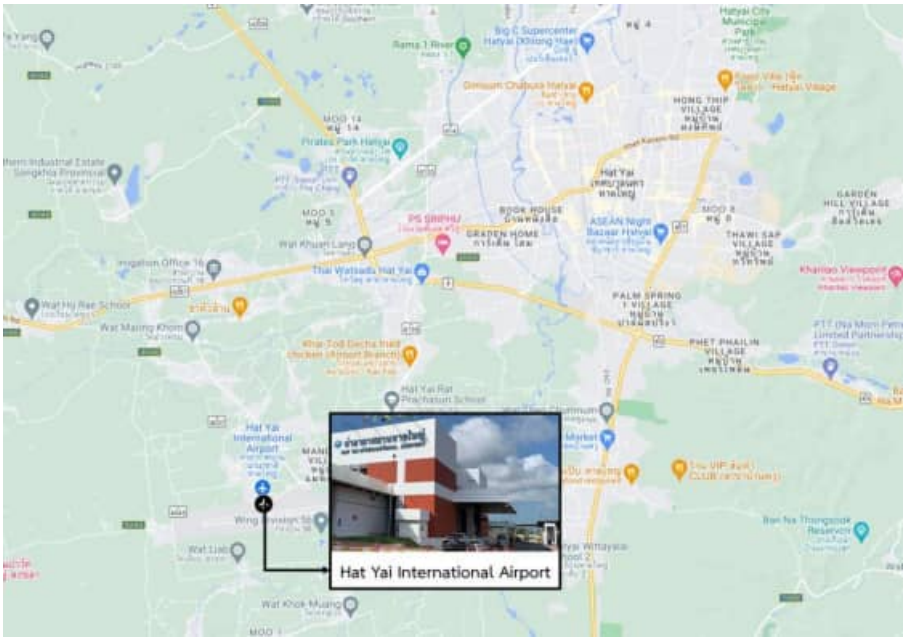


Figure 3.3-49 Location of the Airport in Songkhla Province

3) **Chiang Mai Bus Terminal:** There are a total of 2 bus terminals, detailed as follows:

(1) **Hat Yai Municipal Bus Terminal 1:** Various bus routes operate within this terminal. Category 2 buses, in particular, use this as their main station. Additionally, other categories of buses, serving both within Songkhla Province and neighboring provinces, also operate here, as shown in **Figure 3.3-50**.

(2) **Hat Yai Municipal Bus Terminal 2**

This terminal for smaller buses or vans is located at the (former) Hat Yai Agricultural Market. It serves as the terminal for northbound vans transporting passengers to Satun, Phatthalung, Trang, Nakhon Si Thammarat, Surat Thani, Krabi, Phang Nga, and Phuket provinces. The southbound van services have been relocated to Hat Yai Municipal Bus Terminal 1 due to route suitability, serving passengers traveling to Songkhla city (old route), Padang Besar, Betong, Yala, Pattani, and Narathiwat, as shown in **Figure 3.3-51.**

Figure 3.3-50 Location of Hat Yai Bus Terminal 1

Figure 3.3-51 Location of Hat Yai Bus Terminal 2

4) **Red four-wheeled songthaews** are a form of public transportation within the Hat Yai Municipality. Category 1 public buses (urban buses) are mostly the typical songthaew type with a raised roof to allow standing passengers. Only one route uses air-conditioned buses.
5) **Category 1 and Category 4 Buses:** The consultant has compiled route information for 30 bus routes (Category 1 and Category 4) in Songkhla Province from the Department of Land Transport (DLT), as shown in **Table 3.3-11, Figure 3.3-52** and **Figure 3.3-53.**

Table 3.3-11 Route Information for Buses (Category 1 and Category 4), Songkhla Province

No.	Category	Route	Route Name	Distance (km)	Fare (Baht)	Number of Trips	Frequency (min)	Number of Vehicles	Timetable	S.2	S.3
1	1	4	Ban Noen Pichai - Tha Kham Sub-district Administration Organization	28	10 - 12	420	10	60 - 84	06:00 - 19:30		✓
2	1	5	Hat Yai District Bus Terminal - Ban Koh Me	16	10 - 11	132	10	22 - 36	06:00 - 18:20		✓
3	1	6	Hat Yai Amnuay Wit School of Business Administration - Ban Tha Nang Hom	20	10 - 11	32	45	8 - 15	06:00 - 18:20		✓
4	1	8	Ban Thung Ri - Phom Sap Fresh Market	16	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5	4	1871	Hat Yai - Songkhla	38	28	100	15	10 - 37	06:00 - 19:00	✓	
6	4	1872	Hat Yai - Padang Besar	66	15 - 62	10	90	5 - 10	06:00 - 20:00	✓	
7	4	1874	Hat Yai - Nathawi - Ban Pak checkpoint	60	28 - 56	20	70	10 - 25	06:00 - 18:00		✓
8	4	1881	Songkhla - Chana - Saba Yoi	99	22 - 92	10	140	4 - 10	06:00 - 18:00		✓
9	4	8220	Hat Yai - Southern Songkhla Worker Rehabilitation Center	61	11 - 40	20	60	10 - 15	06:00 - 17:00		✓
10	4	8286	Hat Yai - Ranote	105	22 - 81	64	20	19 - 30	06:00 - 18:00	✓	
11	4	8293	Hat Yai - Ban Ton Pleech	27	11 - 18	24	60	8 - 16	06:00 - 18:00		✓
12	4	8294	Hat Yai - Baan Koh Yai	138	11 - 92	2 - 4	90	2 - 3	09:00 - 15:00		✓
13	4	8296	Hat Yai - Khlong Hae - Songkhla	36	34	20 - 60	30	10 - 30	06:00 - 19:00	✓	
14	4	8299	Hat Yai - Airport	20	11 - 13	324	10	35 - 55	06:00 - 18:00	✓	✓
15	4	8300	Hat Yai - Bang Klum	30	11 - 20	100	15	20 - 40	06:00 - 18:00		✓
16	4	8301	Songkhla - Ban Khlong Ram - Padang Besar	57	11 - 38	90	10	26 - 36	06:00 - 18:00	✓	✓
17	4	8304	Hat Yai - Ban Rong checkpoint - Ban Rong	98	38 - 85	54	15	25 - 46	06:00 - 17:30	✓	
18	4	8433	Songkhla - Ban Khuan Nua	32	11 - 21	20 - 30	44	5 - 7	06:00 - 17:00		✓
19	4	8434	Hat Yai - Ban Nuea - Padang Besar	66	32 - 62	4	330	1 - 3	06:00 - 17:00	✓	✓
20	4	8435	Hat Yai - Ban Ho	25	11 - 17	32	45	8 - 15	05:00 - 17:00		✓
21	4	8436	Hat Yai - Ban Khlong Continuation	33	11 - 17	48	60	12 - 37	06:00 - 17:00		✓
22	4	8437	Hat Yai - Rattaphum Estate	34	11 - 22	60 - 180	10	15 - 45	06:00 - 17:00		✓
23	4	8438	Hat Yai - Ban Din Lan - Bang Klum	33	11 - 19	132	20	35 - 55	06:00 - 17:00		✓
24	4	8439	Hat Yai - Laem Pho - Tha Meru	22	11 - 15	50 - 56	25	10 - 15	06:00 - 17:00		✓
25	4	8440	Hat Yai - Ban Phru - Bang Sala	16	11 - 13	N/A	N/A	N/A	N/A		✓
26	4	8441	Hat Yai - Bang Na Wa	51	11 - 34	40 - 52	30	20 - 26	06:00 - 17:00		✓
27	4	8443	Hat Yai - Wat Saphan Mai Kaen	64	11 - 42	26 - 50	60	13 - 25	05:00 - 18:00		✓
28	4	8444	Hat Yai - Ban Khuan Zhong	18	11 - 12	30 - 36	50	9 - 15	06:00 - 18:00		✓
29	4	8445	Hat Yai - Ban Rai	27	11 - 18	40 - 48	30	8 - 12	06:00 - 17:00		✓
30	4	8446	Hat Yai - Ban Phrao	36	11 - 26	150	10	42 - 58	05:30 - 19:00		✓

origin: Department of Land Transport

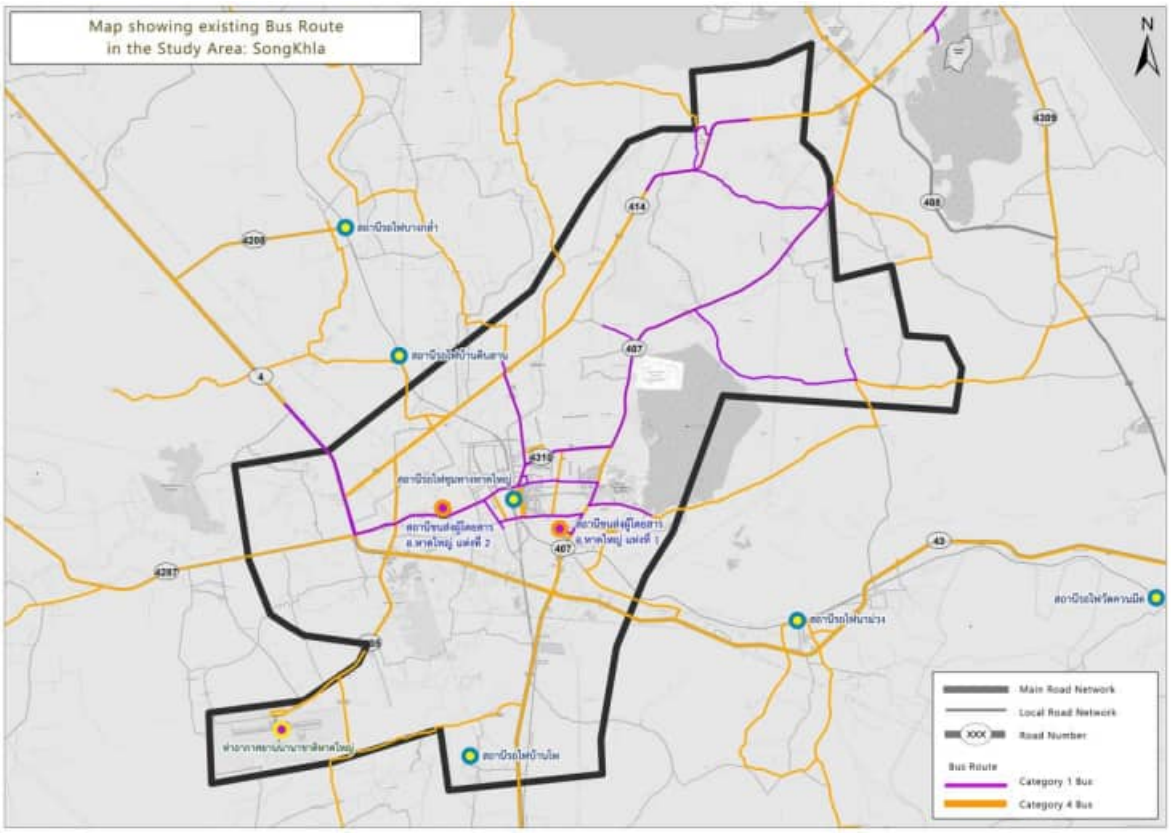


Figure 3.3-52 Map showing Category 1 and Category 4 bus routes in Songkhla (Hat Yai) Province

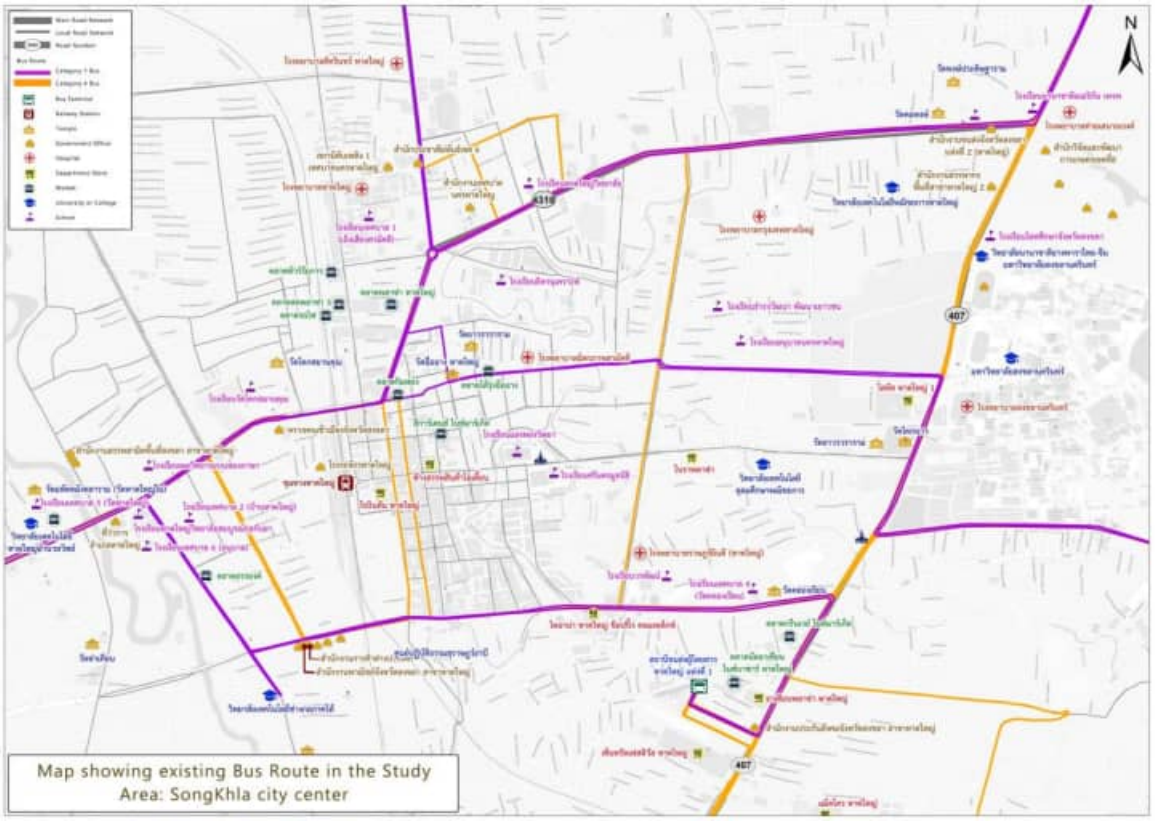


Figure 3.3-53 Map showing Category 1 and Category 4 bus routes in the Songkhla (Hat Yai) city center area

Chapter 4

Traffic Information and People's Travel Behavior

Chapter 4 Traffic information and people's travel behavior

4.1 Chiang Mai Province

4.1.1 Household Interview Survey (HIS)

The results of the survey on household travel data showed that most of the residential characteristics of the sample were single-family houses. Most of the purpose of the trip is to travel to work (Home Base Work, HBW) and for other purposes (Home Base Other, HBO) The average was 49.5 percent and 31.4 percent, respectively. The main mode of transportation is to use a private car (PC) An average of 65.1 percent, followed by motorcycles (MC) An average of 31.2 percent, with the number of trips (Person trips) Equals 1,202,180. The average proportion of public transportation use is 3.7 percent (Household Size) The average income of households was 2.41 people/household and the average household income was 29,959 baht. The average number of trips/number of households is 1.24 trips, as shown in **Table 4.1-1.**

Table 4.1-1 Summary of the results of the survey on household travel data

Household Travel Information	Survey Results
Population (people)	**793,000**[1]
Number of samples	**2,018**
Type of Residence	
Detached House	75.17%
Commercial buildings	11.0%
Townhouse/Semi House	6.05%
Condominium/Apartment/Flat/Dormitory/Condominium	7.73%
Other	0.05%
Trip Purpose	
Home Base Work (HBW)	49.5%
Home Base Education (HBE)	7.9%
Home Base Other (HBO)	31.4%
None Home Base (NHB)	11.3%
Mode Share	
Personal Cars (PC)	65.1%
Motorcycle (MC)	31.2%
Public Transportation (PT)	3.7%
People trips (trips-person/day)	**1,202,180**[2]
Personal Cars (PC)	783,100
Motorcycle (MC)	374,599
Public Transportation (PT)	44,481
Average Household Size	**2.41**
Average household income (Baht)	**29,959**
Number of trips/number of households	**1.24**

note: [1] Sub-district population from the Department of Administration Ministry of Home Affairs only for sub-districts in the project study area.

[2] The trip volume is derived from the model. Trip Generation Model obtained from household travel survey data.

4.1.2 Origin-Destination (OD Survey)

The results of the survey on travel data at the origin and destination point showed that most of the trips were trips for other purposes (Home Base Other, HBO) And to go to work (Home Base Work, HBW) and an average of 48.3 percent and 25.5 percent, respectively. The main mode of transportation is the use of cars/pick-ups/SUVs/personal vans with an average of 68.87 percent, followed by motorcycles with an average of 29.81 percent **Table 4.1-2.**

Table 4.1-2 Summary of the survey results of the survey of travel data from origin to destination

Travel information from origin to destination	Survey Results
Trip Purpose	
Home Base Work (HBW)	25.5%
Home Base Education (HBE)	9.3%
Home Base Other (HBO)	48.3%
None Home Base (NHB)	16.9%
Mode Share	
motorcycle	29.81%
Car/Pickup Truck/SUV/Personal Van	68.87%
Semi-public transport	0.24%
Public Transportation	1.08%

4.1.3 Travel behavior data of tourists and visitors

Survey results on tourist and visitor behavior, It was found that the respondents were Thai nationals 75.9 percent and 24.1 percent are foreigners, with an average age of 30.2 years and an average monthly income of 35,427 baht. Approximately 54.4 percent of the respondents lived in the study area, and the mode of transportation in the study area was mostly public transportation, with an average of 33.4 percent, followed by taxi/app driver and others (motorcycles and cars) in travel, with an average of 27.6 percent and 20.1 percent, respectively. Only 12.2 percent of respondents were aware of the existence of public transportation services in good areas, and the top three factors that respondents paid the most attention to when choosing public transportation were (1) the number of trips, the frequency of service, the waiting time for the bus, and (3) the cost of tickets. It is necessary for the development of this city at the level of 8.8 points (out of 10 points). There is a chance to use public transportation on the level of 8.9 points (out of 10 points) as shown in **Table 4.1-3.**

Table 4.1-3 Summary of the survey on tourist and visitor behavior

Tourist and visitor behavior data	Survey Results
Nationality	
Thailand	75.9%
Foreign	24.1%
Average age	**30.2**
Average Monthly Income (Baht)	**35,427**
Location of Accommodation	
Inside The Study Area	54.4%
Outside The Study Area	45.6%
Transportation patterns in the study area	
Taxi	18.8%
Taxi/App Driver	27.6%
Public Transportation	33.4%
Other	20.1%
Awareness of the existence of public transportation services in the area.	
I don't know any information.	5.9%
I know and have some information.	50.0%
Know and think that there is enough information.	32.0%
Be well informed or have experience in using the service.	12.2%
What are the most important factors in choosing public transport?	
Number of trips, frequency of service, waiting time	22.7%
Ticket price	21.9%
Duration of service	17.3%
The service route covers all the important places.	14.6%
Facilities at the bus stop	10.1%
Quality of service in public transportation (comfortable, clean)	6.9%
Route Information System Schedule and ticket purchase via online/app	3.9%
Safety and Security	2.7%

4.1.4 Mid-Block Traffic Count (MB)

The consultant conducted a survey of the traffic volume on the road (Mid-Block Count: MB) In the Chiang Mai City Study Area between February 9 and 10, 2024, with a total of 8 automated cameras, the results of the traffic volume survey on the road section are shown in **Table 4.1-4.**

Table 4.1-4 Survey results of traffic volume on the road in the Chiang Mai City Study Area

Survey Date	Survey Points	Position	Direction	Morning peak hour (PCU/hr)	Evening peak hour (PCU/hr)	12 hours (PCU)	24 Hours (PCU)
Weekdays	MB1	Highway 1004	To San Sai	979	2,461	14,627	16,090
			Go to Mae Rim	2,391	1,437	15,578	17,136
			Total	**3,370**	**3,898**	**30,206**	**33,226**
	MB2	Huay Kaew Road	Entering the city	1,369	753	11,812	12,994
			Out of town	940	632	8,497	9,347
			Total	**2,309**	**1,385**	**20,310**	**22,341**
	MB3	Suthep Road	Entering the city	842	1,821	13,942	15,336
			Out of town	695	1,563	10,086	11,094
			Total	**1,537**	**3,384**	**24,028**	**26,430**
	MB4	Nakhon Ping Bridge	Entering the city	454	780	6,293	6,922
			Out of town	876	1,150	11,552	12,707
			Total	**1,330**	**1,930**	**17,845**	**19,630**
	MB5	Naowarat Bridge	Entering the city	678	943	10,784	11,863
			Out of town	1,501	2,138	16,193	17,813
			Total	**2,179**	**3,081**	**26,978**	**29,676**
	MB6	Highway 1006	Entering the city	1,596	862	11,981	13,179
			Out of town	644	1,630	10,027	11,030
			Total	**2,240**	**2,492**	**22,008**	**24,209**
	MB7	Highway 108	Entering the city	1,885	1,058	19,806	21,787
			Out of town	942	1,197	13,550	14,905
			Total	**2,827**	**2,255**	**33,356**	**36,691**
	MB8	Highway 121	Go to Hang Dong District.	1,172	1,321	11,340	12,474
			To San Sai	1,302	1,243	12,344	13,578
			Total	**2,474**	**2,564**	**23,684**	**26,052**
Holiday	MB1	Highway 132	To San Sai	1,284	686	9,619	10,581
			Go to Mae Rim	698	1,766	10,868	11,955
			Total	**1,982**	**2,452**	**20,487**	**22,535**
	MB2	Huay Kaew Road	Entering the city	491	1,077	8,192	9,011
			Out of town	409	933	5,972	6,569
			Total	**900**	**2,010**	**14,164**	**15,580**
	MB3	Suthep Road	Entering the city	1,307	716	11,216	12,338
			Out of town	1,005	671	9,040	9,944
			Total	**2,312**	**1,387**	**20,256**	**22,281**
	MB4	Nakhon Ping Bridge	Entering the city	373	523	5,979	6,576
			Out of town	625	894	6,732	7,405
			Total	**998**	**1,417**	**12,710**	**13,981**
	MB5	Naowarat Bridge	Entering the city	623	1,090	8,798	9,678
			Out of town	940	1,238	12,422	13,664
			Total	**1,563**	**2,328**	**21,220**	**23,342**
	MB6	Highway 1006	Entering the city	739	1,874	11,057	12,162
			Out of town	1,557	929	10,040	11,044
			Total	**2,296**	**2,803**	**21,097**	**23,207**
	MB7	Highway 108	Entering the city	1,613	1,596	15,033	16,536
			Out of town	1,164	1,191	11,628	12,791
			Total	**2,777**	**2,787**	**26,660**	**29,326**
	MB8	Highway 121	Go to Hang Dong District.	753	510	8,345	9,180
			To San Sai	708	754	8,901	9,791
			Total	**1,461**	**1,264**	**17,246**	**18,971**

4.1.5 Survey of information obtained from public opinion hearings

From the project introduction seminar and the 1st subgroup meeting, opinions were given on the issues and suggestions that are beneficial to the project in order to lead to the conclusion of the problems and suggestions for the development plan of the public transportation system and the development plan of the traffic system. as follows

1) Current public transportation services

- Problem
  - Changes in people's travel behavior From Covid-19
  - The number of users of public transportation has decreased due to the popularity of application and black-label taxi services because of the pick-up and drop-off from the beginning to the destination.
  - Application for Taxi to run over the route of public transportation
  - The turning point at the irrigation canal road. There are many accidents.
- Suggestion
  - Propose that taxi applications be registered correctly and bid on routes to compete with existing operators in the area correctly.
  - The development of public transportation in the future should consider the expansion of people outside the city.
  - The government should have a budget to help public transportation operators.

2) Opinions on traffic problems in the study area.

- Traffic jams are in the morning and evening and on Saturdays. The local people can adapt, so it is not much of a problem.
- It is proposed to use automatic traffic lights.
- Solve the problem of cars parked on the side of the road during rush hours.
- Currently, the Mahidol Ring area There are schools that encourage parents to drop off students in shopping malls and have feeders to pick up students to school to solve the problem of traffic jams caused by immigration.

4.1.6 Summary of Traffic Problems

According to data from Chiang Mai Province. It is possible to summarize the problems related to the development of public transportation. as follows

1) The urban development of Chiang Mai Province is a development that mainly relies on the road system and private vehicles. Urban Sprawl Development is a development along the road. Inefficient use of space and related resources is not very dense.
2) Although Chiang Mai Province is mainly dependent on personal vehicles. However, because Chiang Mai is an old city. Most of the business centers are surrounded by moats, roads and road zones, most of which are quite narrow, especially in the Mahidol Ring area.
3) Inefficient public transportation It is not possible to compete in personal vehicles because Chiang Mai is a city with a good economy. Most people have enough income to own a private vehicle. Schedule Control costs and quickly. Therefore, most people are increasingly turning to private vehicles, and this is a cycle that causes the proportion of public

transportation services that exist today to continue to decrease. However, Public transportation systems available today There are many services from tourists. Especially within urban areas, some service providers charge different rates than regular service providers. These could also be tourism problems in the future.

4) From the Urban Sprawl Development model combined with the dependence on personal vehicles. This makes the journey of Chiang Mai residents continue to increase the distance. In addition, motorcycle driving in Chiang Mai has relatively little traffic discipline, which causes frequent accidents, which is the leading cause of death in Chiang Mai.

5) Non-standard transportation infrastructure It does not promote very efficient transportation, such as unclear traffic signs. Narrow, rough sidewalks with many obstacles, unsafe bicycle paths, as well as buildings or parts of buildings protruding into the traffic route. These are all ways to reduce the distance on foot and by bicycle, which is a mode of transportation that supports major public transportation.

4.2 Chiang Rai Province

4.2.1 Household Interview Survey (HIS)

The survey of household travel data found that most of the residential characteristics of the sample were single-family houses. Most of the purpose of the trip is to travel to work (Home Base Work, HBW) and for other purposes (Home Base Other, HBO) Average 49.8 percent and 38.6 percent, respectively. The main mode of transportation is the use of motorcycles (MC) Average percentage 69.4 Followed by private cars (PC) Average percentage 28.4 The number of trips (Person trips) This is equivalent to 153,857 trips-person/day, with an average proportion of public transportation use 2.2 percent, The average household size was 2.87. The average monthly household income is 21,161 baht, and the average number of trips/households is equal to 1.51 trips, as shown in **Table 4.2-1.**

Table 4.2-1 Summary of the results of the survey on household travel data

Household Travel Information	Survey Results
Population (people)	**105,000**[1]
Number of samples	**1,208**
Type of Residence	
Detached House	65.48%
Commercial buildings	22.76%
Townhouse/Semi House	3.97%
Condominium/Apartment/Flat/Dormitory/Condominium	7.7%
Other	0.08%
Trip Purpose	
Home Base Work (HBW)	49.8%
Home Base Education (HBE)	6.1%
Home Base Other (HBO)	38.6%
None Home Base (NHB)	5.4%
Mode Share	
Personal Cars (PC)	28.4%
Motorcycle (MC)	69.4%
Public Transportation (PT)	2.2%
People trips (trips-person/day)	**153,857**[2]
Personal Cars (PC)	43,649
Motorcycle (MC)	106,823
Public Transportation (PT)	3,385

Average Household Size	2.87
Average household income (Baht)	21,161.88
Number of trips/number of households	1.51

Note: [1] Sub-district population from the Department of Administration Ministry of Home Affairs only for sub-districts in the project study area.

[2] The trip volume is derived from the model. Trip Generation Model obtained from household travel survey data.

4.2.2 Origin-Destination (OD Survey)

The results of the survey on travel data at the origin and destination point showed that most of the trips were trips for other purposes (Home Base Other, HBO) And to go to work (Home Base Work, HBW) and an average of 41.7 percent and 28.0 percent, respectively. The main mode of transportation is the use of motorcycles with an average of 72.28 percent, followed by cars/pickup trucks/SUVs/private vans with an average of 27.59 percent. **Table 4.2-2.**

Table 4.2-2 Summary of the survey results of the survey of travel data from origin to destination

Travel information from origin to destination	Survey Results
Trip Purpose	
Home Base Work (HBW)	28.0%
Home Base Education (HBE)	8.3%
Home Base Other (HBO)	41.7%
None Home Base (NHB)	22.0%
Mode Share	
Motorcycle	27.59%
Car/Pickup Truck/SUV/Personal Van	72.28%
Semi-public transport	0.12%
Public Transportation	-

4.2.3 Travel behavior data of tourists and visitors

Survey results on tourist and visitor behavior It was found that the respondents were Thai nationals 83.1 percent and 16.9 percent were foreigners, with an average age of 36 years and an average monthly income of 37,176 baht. Approximately 51.0 percent of the respondents lived in the study area, where the majority of the modes of transportation in the study area were other (motorcycles and cars) on average, followed by car rentals, an average of 24.2 percent, followed by taxi/app driver, The average is 21.2 percent, and the least is traveling by public transportation, with an average of 17.7 percent. Only 10.9 percent of respondents were aware of the existence of public transportation services in good areas, and the top three factors that respondents paid the most attention to when choosing public transportation were (1) the service route covered thoroughly through important places, (2) the quality of service in public transportation (comfortable, clean), and (3) the number of trips, frequency of service, and waiting time. It is necessary to develop this city at the level of 9.4 points (out of 10 points). There is a chance to use public transportation on the level of 8.6 points (out of 10 points) as shown in **Table 4.2-3.**

Table 4.2-3 Summary of the survey on tourist and visitor behavior

Tourist and visitor behavior data	Survey Results
Nationality	
Thailand	83.1%
Foreign	16.9%
Average age	36.0
Average Monthly Income (Baht)	37,176.04
Location of Accommodation	
Inside The Study Area	51.0%
Outside The Study Area	49.0%
Transportation patterns in the study area	
Taxi	24.2%
Taxi/App Driver	21.2%
Public Transportation	17.7%
Other	37.0%
Awareness of the existence of public transportation services in the area.	
I don't know any information.	32.7%
I know and have some information.	36.1%
Know and think that there is enough information.	20.3%
Be well informed or have experience in using the service.	10.9%
What are the most important factors in choosing public transport?	9.4
Number of trips, frequency of service, waiting time	8.6
Ticket price	
Duration of service	29.2%
The service route covers all the important places.	20.1%
Facilities at the bus stop	13.3%
Quality of service in public transportation (comfortable, clean)	6.5%
Route Information System Schedule and ticket purchase via online/app	10.8%
Safety and Security	5.9%

4.2.4 Mid-Block Traffic Count (MB)

The consultant conducted a survey of the traffic volume on the road (Mid-Block Count: MB) In the Chiang Rai City Study Area from February 9 to 10, 2024, a total of 7 automated cameras were surveyed. **Table 4.2-4.**

Table 4.2-4 Survey results of traffic volume on roads in the Chiang Rai City Study Area

Survey Date	Survey Points	Position	Direction	Morning peak hour (PCU/hr)	Evening peak hour (PCU/hr)	12 hours (PCU)	24 Hours (PCU)
Weekdays	MB1	Highway 1418	Go to Mae Fah Luang District.	645	851	7,346	8,080
			To the airport	883	917	9,281	10,209
			Total	**1,528**	**1,768**	**16,627**	**18,290**
	MB2	Highway 1	Entering the city	992	1,141	10,457	11,503
			Out of town	850	1,168	9,646	10,611
			Total	**1,842**	**2,309**	**20,104**	**22,114**
	MB3	Highway 1232	Entering the city	910	586	8,889	9,777
			Out of town	1,017	916	9,772	10,750
			Total	**1,927**	**1,502**	**18,661**	**20,527**
	MB4	CRI 5023	To Airport	1,730	1,173	13,082	14,390
			Go to A.Teng	1,245	1,393	13,683	15,052
			Total	**2,975**	**2,566**	**26,765**	**29,441**
	MB5	Highway 131	Go to Phan District.	814	1,243	9,047	9,952
			Go to Mae Fah Luang District.	1,109	1,154	10,125	11,138
			Total	**1,923**	**2,397**	**19,173**	**21,090**
	MB6	Highway 1	Entering the city	1,072	992	13,082	14,390
			Out of town	1,730	1,173	10,108	11,118
			Total	**2,802**	**2,165**	**23,189**	**25,508**
	MB7	CRI 5023	To Airport	1,474	799	12,387	13,625
			Go to A.Teng	1,113	1,061	11,260	12,386
			Total	**2,587**	**1,860**	**23,646**	**26,011**
Holiday	MB1	Highway 1418	Go to Mae Fah Luang District.	851	572	6,383	7,022
			To the airport	672	703	6,856	7,542
			Total	**1,523**	**1,275**	**13,240**	**14,564**
	MB2	Highway 1	Entering the city	796	511	7,757	8,532
			Out of town	871	920	8,591	9,450
			Total	**1,667**	**1,431**	**16,348**	**17,982**
	MB3	Highway 1232	Entering the city	655	755	6,929	7,622
			Out of town	598	825	6,791	7,470
			Total	**1,253**	**1,580**	**13,720**	**15,092**
	MB4	CRI 5023	To Airport	781	1,034	8,903	9,793
			Go to A.Teng	750	783	7,859	8,645
			Total	**1,531**	**1,817**	**16,762**	**18,438**
	MB5	Highway 131	Go to Phan District.	815	433	6,778	7,456
			Go to Mae Fah Luang District.	726	701	7,373	8,110
			Total	**1,541**	**1,134**	**14,151**	**15,566**
	MB6	Highway 1	Entering the city	920	1,396	10,134	11,147
			Out of town	938	959	8,533	9,387
			Total	**1,858**	**2,355**	**18,667**	**20,534**
	MB7	CRI 5023	To Airport	858	1,311	9,515	10,466
			Go to A.Teng	945	987	8,579	9,437
			Total	**1,803**	**2,298**	**18,094**	**19,903**

4.2.5 Survey of information obtained from public opinion hearings

From the project introduction seminar and the 1st subgroup meeting , opinions were given on the issues and suggestions that are beneficial to the project in order to lead to the conclusion of the problems and suggestions for the development plan of the public transportation system and the development plan of the traffic system. as follows

1) Current public transportation services

- **Problem**
  - Changes in people's travel behavior From Covid-19
  - The number of users of public transportation has decreased due to the popularity of application and black-label taxi services because of the pick-up and drop-off from the beginning to the destination.
  - The behavior of the tourist target group has changed, such as renting a self-driving car.
  - The frequency of the bus is uncertain and takes a long time from the source to the destination.
  - Some public transportation routes are unsafe and of poor quality.
- **Suggestion**
  - Chiang Rai Provincial Transport will improve the route to connect to car travel. By rail and by air.
  - We propose a short-term solution by publicizing the VIABUS Application to track the current EV bus routes and routes.
  - It is proposed to increase the number of bus trips such as Doi Lan - Pong Chang, Ban Du Sub-district Municipality and Nalae Sub-district Municipality - Maha Wittayalai Mae Fah Luang.
  - Chiang Rai Municipality is in the process of developing a smart traffic system and a tram to serve intercity tourists from 10:00 a.m. to 3:00 p.m. 1 car in the morning and evening.

1) Opinions on traffic problems in the study area

- Phaholyothin Road (Chiang Rai Kindergarten intersection) There is a traffic jam in the morning and evening due to the parking of student shuttle buses.
- Chiang Rai Police Station There is a problem due to traffic discipline.
- Areas with traffic problems that should be improved include:
  - New Airport (San Ton Pao Intersection)
  - Thanalai Road (Court Junction) Chiang Rai Municipal Market - Harmony
  - Si Sai Mun Junction
  - Separate Government Center (Provincial Administrative Office/ Public School)
  - Chiang Rai Prachanukroh Junction - San Khong Noi Junction – San Khong Luang

4.2.6 Summary of Traffic Problems

According to Chiang Rai Province It is possible to summarize the problems related to the development of public transportation. as follows

1) The public transportation system in Chiang Rai is still limited in providing adequate services to meet the needs of the public. Especially in urban areas with rapid expansion. Most people still rely on personal vehicles such as cars and motorcycles, which causes traffic jams at certain times.
2) Chiang Rai also lacks convenient and efficient public transportation links, such as no links between buses, bus stations, and other areas in the city, making travel within the city inconvenient and time-consuming. This makes users choose to use the shuttle service through the Application even though the price is higher.
3) The expansion of Chiang Rai city has led to a rapid increase in the number of private vehicles. Especially in business districts and tourist attractions. As a result, traffic congestion has occurred, which affects the convenience of travel and sustainable urban development.
4) The transportation infrastructure in Chiang Rai is not yet modern and cannot cope with the increasing demand, such as the lack of development of a bus or BTS system that can effectively connect different areas in the city. Therefore, the development and improvement of public transportation in Chiang Rai is extremely important to reduce traffic congestion. Reduce pollution and create comfort for the people, as well as increase the potential for economic and tourism development of the province in the future.
5) For tourists coming from abroad or other provinces. The lack of public transportation services that can easily travel to various tourist attractions may cause inconvenience in traveling within the city.

4.3 Phitsanulok Province

4.3.1 Household Interview Survey (HIS)

The results of the household travel survey showed that the majority of the sample resided in single-detached houses. The primary purposes of travel were commuting to work (Home Base Work, HBW) and other personal purposes (Home Base Other, HBO), accounting for average proportions of 39.0 percent and 34.8 percent, respectively. The predominant mode of transportation was motorcycles (MC), used by an average of 57.6 percent of travelers, followed by private cars (PC) at 40.1 percent. The total number of person trips was 254,021 trips per day. The average share of public transportation usage was 2.3 percent. The average household size was 2.06 persons per household, with an average household income of 26,027 baht. The average number of trips per household was 1.03, as shown in **Table 4.3-1.**

Table 4.3-1 Summary of the results of the survey on household travel data

Household Travel Information	Survey Results
Population (people)	**164,000**[1]
Number of samples	**1,015**
Type of Residence	
Detached House	57.04%
Commercial buildings	14.19%
Townhouse/Semi House	6.4%
Condominium/Apartment/Flat/Dormitory/Condominium	22.17%
Other	0.2%
Trip Purpose	
Home Base Work (HBW)	39.0%
Home Base Education (HBE)	15.3%
Home Base Other (HBO)	34.8%
None Home Base (NHB)	11.0%
Mode Share	
Personal Cars (PC)	40.1%
Motorcycle (MC)	57.6%
Public Transportation (PT)	2.3%
People trips (trips-person/day)	**254,021**[2]
Personal Cars (PC)	101,888
Motorcycle (MC)	146,341
Public Transportation (PT)	5,792
Average Household Size	**2.06**
Average household income (Baht)	**26,026.95**
Number of trips/number of households	**1.03**

Note: [1] Sub-district population from the Department of Administration Ministry of Home Affairs only for sub-districts in the project study area.

[2] The trip volume is derived from the model. Trip Generation Model obtained from household travel survey data.

4.3.2 Origin-Destination (OD Survey)

The results of the survey on travel data at the origin and destination point showed that most of the trips were trips for other purposes (Home Base Other, HBO) And to go to work (Home Base Work, HBW) and an average of 35.2 percent and 22.8 percent, respectively. The main mode of transportation is the use of cars/pick-ups/SUVs/private vans with an average of 62.88 percent, followed by motorcycles with an average of 33.75 percent. **Table 4.3-2.**

Table 4.3-2 Summary of the survey results of the survey of travel data from origin to destination

Travel information from origin to destination	Survey Results
Trip Purpose	
Home Base Work (HBW)	22.8%
Home Base Education (HBE)	24.9%
Home Base Other (HBO)	35.2%
None Home Base (NHB)	17.2%
Mode Share	
Motorcycle	33.75%
Car/Pickup Truck/SUV/Personal Van	62.88%
Semi-public transport	1.63%
Public Transportation	1.75%

4.3.3 Travel behavior data of tourists and visitors

Survey results on tourist and visitor behavior It was found that the respondents were Thai nationals 93.29 percent and 6.8 percent were foreigners, with an average age of 37.5 years and an average monthly income of 28,931. Approximately 97.8 percent of the respondents lived in the study area, and the mode of transportation in the study area was mostly other modes of transportation (motorcycles and cars), followed by public transportation and taxi/app driver In travel, the average was 24.8 percent and 23.0 percent, respectively. Only 20.5 percent were aware of the existence of public transportation services in good areas, and the top three factors that respondents paid the most attention to when choosing public transportation were (1) the quality of service in public transportation (comfortable, clean), and (2) the quality of service in public transportation (comfortable, clean). and (3) safety and security by the respondents in the opinion that the public transportation system is good. It is necessary for the development of this city at the level of 7.4 points (out of 10 points). There is a chance to use public transportation on the scale of 8.0 points (out of 10 points) as shown in **Table 4.3-3.**

Table 4.3-3 Summary of the survey on tourist and visitor behavior

Tourist and visitor behavior data	Survey Results
Nationality	
Thailand	93.2%
Foreign	6.8%
Average age	**37.5**
Average Monthly Income (Baht)	**28,931.25**
Location of Accommodation	
Inside The Study Area	97.8%
Outside The Study Area	2.2%
Transportation patterns in the study area	
Taxi	12.9%
Taxi/App Driver	23.0%
Public Transportation	24.8%
Other	39.3%
Awareness of the existence of public transportation services in the area.	
I don't know any information.	2.1%
I know and have some information.	35.6%
Know and think that there is enough information.	41.7%
Be well informed or have experience in using the service.	20.5%
What are the most important factors in choosing public transport?	
The service route covers all the important places.	11.2%
Quality of service in public transportation (comfortable, clean)	16.9%
Number of trips, frequency of service, waiting time	12.9%
Duration of service	10.5%
Ticket price	15.3%
Route Information System Schedule and ticket purchase via online/app	11.5%
Facilities at the bus stop	8.7%
Safety and Security	13.0%

4.3.4 Mid-Block Traffic Count (MB)

The consultant conducted a survey of the traffic volume on the road (Mid-Block Count: MB) In the study area of Phitsanulok City. 16 – February 17, 2024 by automated cameras, a total of 8 points, the results of the traffic volume survey on the road section as shown in **Table 4.3-4.**

Table 4.3-4 Survey results of traffic volume on the road in the Phitsanulok City Study Area

Survey Date	Survey Points	Position	Direction	Morning peak hour (PCU/hr)	Evening peak hour (PCU/hr)	12 hours (PCU)	24 Hours (PCU)
Weekdays	MB1	Highway 12	Go to Phitsanulok	1,187	2,368	21,033	23,136
			Go to Sukhothai	1,298	2,897	23,814	26,196
			Total	**2,485**	**5,265**	**44,847**	**49,332**
	MB2	Highway 1086	Go to Phitsanulok	554	1,099	10,243	11,268
			Go to Wat Bot.	601	1,193	11,120	12,232
			Total	**1,155**	**2,292**	**21,363**	**23,500**
	MB3	Highway 117	Entering the city	643	1,535	11,435	12,579
			Out of town	947	1,525	12,192	13,411
			Total	**1,590**	**3,060**	**23,627**	**25,990**
	MB4	Highway 12	Go to Wang Thong District.	1,755	2,931	24,318	26,749
			Go to Phitsanulok	1,977	2,902	26,536	29,189
			Total	**3,732**	**5,833**	**50,853**	**55,939**
	MB5	Highway 11	Go to Phitsanulok	566	1,372	10,989	12,088
			To Uttaradit	956	1,334	14,671	16,138
			Total	**1,522**	**2,706**	**25,660**	**28,226**
	MB6	Highway 12	Go to Wang Thong District.	913	1,837	14,428	15,871
			Go to Phitsanulok	633	1,473	12,083	13,291
			Total	**1,546**	**3,310**	**26,511**	**29,162**
	MB7	Borom Triloknat Road	Entering the city	735	2,060	14,840	16,325
			Out of town	427	734	5,673	6,241
			Total	**1,162**	**2,794**	**20,514**	**22,565**
	MB8	Highway 1065	To Bang Rakam	376	986	7,225	7,947
			Go to Phitsanulok	569	944	7,458	8,204
			Total	**945**	**1,930**	**14,683**	**16,151**
Holiday	MB1	Highway 12	Go to Phitsanulok	733	1,511	11,823	13,006
			Go to Sukhothai	702	1,604	13,261	14,587
			Total	**1,435**	**3,115**	**25,084**	**27,592**
	MB2	Highway 1086	Go to Phitsanulok	300	772	5,692	6,261
			Go to Wat Bot.	436	756	6,033	6,636
			Total	**736**	**1,528**	**11,725**	**12,897**
	MB3	Highway 117	Entering the city	403	784	7,345	8,079
			Out of town	549	807	8,037	8,841
			Total	**952**	**1,591**	**15,382**	**16,920**
	MB4	Highway 12	Go to Wang Thong District.	761	1,510	13,429	14,772
			Go to Phitsanulok	845	1,870	15,423	16,965
			Total	**1,606**	**3,380**	**28,852**	**31,737**
	MB5	Highway 11	Go to Phitsanulok	567	945	7,855	8,641
			To Uttaradit	490	718	6,577	7,235
			Total	**1,057**	**1,663**	**14,432**	**15,875**
	MB6	Highway 12	Go to Wang Thong District.	648	1,533	12,363	13,599
			Go to Phitsanulok	607	844	9,268	10,195
			Total	**1,255**	**2,377**	**21,631**	**23,795**
	MB7	Borom Triloknat Road	Entering the city	426	1,236	9,136	10,050
			Out of town	388	892	7,927	8,720
			Total	814	2,128	17,063	18,769
	MB8	Highway 1065	To Bang Rakam	341	665	5,407	5,947
			Go to Phitsanulok	565	688	5,716	6,287
			Total	**906**	**1,353**	**11,122**	**12,235**

4.3.5 Survey of information obtained from public opinion hearings

1) Opinions on the public transportation routes that have been studied

Phitsanulok City Public Transportation System Feasibility Study and Design Project The meeting was of the opinion that the possible routes could be sorted. as follows

(1) Orange Line (connecting Southwest to Central City)
(2) Blue Line (North-South Connection)
(3) The Red Line (connecting east-west travel) and the purple line (connecting west-south travel)
(4) Pink Line (Connecting City Travel)
(5) The Green Line (a special public transportation system covering the transition point of the transportation system. The city's main interchange and public transportation connections) because there are many taxis and few users.

2) Listening to opinions on the development of the system feeder
   - Participants were of the opinion that the development of complementary services is necessary.
   - Today's entrepreneurs are ready to adapt to become feeders.
   - It is proposed to be a system for hiring buses.
   - Currently, the Phitsanulok Provincial Administration Organization supports service fees, and if the law and the scope of public transportation are amended, it is ready to take action for the people.

3) Opinions on traffic problems in the study area
   - Traffic jams in the area in the morning and evening.
     - The area of Rojanwit Malabiang School, Phitsanulok Wittayakom Naresuan University Demonstration High School and other schools.
     - Around Phutthachinraj Hospital Phitsanulok, Phitsanuwet Hospital
   - Pa Tone Road (Ayutthaya Elephant Camp – Liquor factory community) because the road is bottleneck because there are ancient sites, the route cannot be expanded.
   - Holidays, U-turn points Connecting Asia – Rojana Settlement and Stadium Area, Wat Yai Chai Mongkol Wat Phananchoeng and Ayutthaya Park
   - Schools around the city island Pratunchai School Chomsurang Foster School Kindergarten and Ayutthayanusorn School
   - Separate the airport due to the problem of narrow roads as a bottleneck. Airport Road, at the intersection of Rojanwit Malabiang School to Phitsanulok Airport.

4) Other suggestions
   - There should be a public public transportation system to send students to school and designated parking spots for the convenience of parents without having to enter the city.
   - There should be a public transportation system for hospital users, such as parking at Naresuan University or other private areas, and allowing users to take public transportation to the hospital.
   - There should be a tunnel through the road connecting Phibun Songkram Rajabhat.

4.3.6 Summary of Traffic Problems

According to Phitsanulok Province It is possible to summarize the problems related to the development of public transportation. as follows

1) Traffic congestion in Phitsanulok is caused by many factors. Especially in the morning and evening. Schools and hospitals with a large number of people moving, such as Rojanwit Malabiang School and Buddha Chinraj Hospital. There are also bottlenecks that cannot be expanded, narrow roads at airport intersections, and dense U-turn points such as Asian Road and stadiums, which cause traffic slowdowns at different times.
2) The development of feeder services will help connect communities to the main public transportation system by using minibuses or a system of hiring local operators, which will make travel more convenient and cover more areas. Entrepreneurs are ready to adapt to this form of service to increase efficiency and access to public transportation in all areas.
3) Ease of transportation includes the development of a public transportation system for students by designating convenient parking spots for parents without entering the city, the development of transportation services for hospital users such as parking at Naresuan University and allowing users to take public buses to the hospital, and the construction of a tunnel through the road to connect areas such as Phiboon Songkram Rajabhat. Reduce traffic congestion in key areas.
4) The public transportation routes considered are the Orange Line (Southwest - City Center), Blue Line (North-South Line), Red and Purple Line (East-West Line), Pink Line (within the city) and Green Line (for special services), which will reduce traffic problems and increase transportation efficiency in the city.

4.4 Udon Thani Province

4.4.1 Household Interview Survey (HIS)

The results of the household travel survey indicated that the majority of the sampled residences were single-family houses. The main purposes of travel were for other activities (Home Base Other, HBO) and commuting to work (Home Base Work, HBW), with average shares of 51.3 percent and 36.5 percent, respectively. Motorcycles (MC) were the predominant mode of transportation, accounting for an average of 53.7 percent, followed by private cars (PC) at 39.0 percent. The total number of person trips recorded was 358,204 trips per day. The average share of public transportation usage was 7.3 percent. The average household size was 1.04 persons per household, and the average monthly household income was 21,209 baht. The average number of trips per household was 1.05 trips, as shown in **Table 4.4-1.**

Table 4.4-1 Summary of the results of the survey on household travel data

Household Travel Information	Survey Results
Population (people)	**235,000**[1]
Number of samples	**1,201**
Type of Residence	
Detached House	33.14%
Commercial buildings	26.81%
Townhouse/Semi House	2.16%
Condominium/Apartment/Flat/Dormitory/Condominium	22.73%
Other	15.15%
Trip Purpose	
Home Base Work (HBW)	36.5%
Home Base Education (HBE)	4.8%
Home Base Other (HBO)	51.3%
None Home Base (NHB)	7.4%
Mode Share	
Personal Cars (PC)	39.0%
Motorcycle (MC)	53.7%
Public Transportation (PT)	7.3%
People trips (trips-person/day)	**358,204**[2]
Personal Cars (PC)	139,664
Motorcycle (MC)	192,391
Public Transportation (PT)	26,149
Average Household Size	**1.04**
Average household income (Baht)	**21,209.00**
Number of trips/number of households	**1.05**

note: [1] Sub-district population from the Department of Administration Ministry of Home Affairs only for sub-districts in the project study area.

[2] The trip volume is derived from the model. Trip Generation Model obtained from household travel survey data.

4.4.2 Origin-Destination (OD Survey)

The results of the survey on travel data at the origin and destination point showed that most of the trips were trips for other purposes (Home Base Other, HBO) And to go to work (Home Base Work, HBW) and an average of 38.3 percent and 34.8 percent, respectively. The main mode of transportation is the use of cars/pick-ups/SUVs/personal vans with an average of 70.47 percent, followed by motorcycles with an average of 29.53 percent. **Table 4.4-2.**

Table 4.4-2 Summary of the survey results of the survey of travel data from origin to destination

Travel information from origin to destination	Survey Results
Trip Purpose	
Home Base Work (HBW)	34.8%
Home Base Education (HBE)	15.3%
Home Base Other (HBO)	38.3%
None Home Base (NHB)	11.6%
Mode Share	
Motorcycle	29.53%
Car/Pickup Truck/SUV/Personal Van	70.47%
Semi-public transport	-
Public Transportation	-

4.4.3 Travel behavior data of tourists and visitors

Survey results on tourist and visitor behavior It was found that the respondents were Thai nationals 98.89 percent and 1.2 percent were foreigners, with an average age of 32.8 years and an average monthly income of 24,766 baht. Approximately 50.2 percent of the respondents lived outside the study area, and the mode of transportation in the study area was mostly other modes of transportation (motorcycles and cars) on average, followed by public transportation and taxi/app driver In travel, the average was 23.1 percent and 17.0 percent, respectively. Only 12.2 percent of respondents were aware of the existence of public transportation services in good areas, and the top three factors that respondents paid the most attention to when choosing public transportation were (1) the number of trips, the frequency of service, and the waiting time, (2) the quality of service in public transportation (comfortable and clean), and (3) the service route covered thoroughly through important places. It is necessary to develop this city at the level of 9.5 points (out of 10 points). There is a chance to use public transportation on the level of 8.8 points (out of 10 points) as shown in **Table 4.4-3.**

Table 4.4-3 Summary of the survey on tourist and visitor behavior

Tourist and visitor behavior data	Survey Results
Nationality	
Thailand	98.8%
Foreign	1.2%
Average age	32.8
Average Monthly Income (Baht)	24,766
Location of Accommodation	
Inside The Study Area	49.8%
Outside The Study Area	50.2%
Transportation patterns in the study area	
Taxi	6.9%
Taxi/App Driver	17.0%
Public Transportation	23.1%
Other	53.1%
Awareness of the existence of public transportation services in the area.	
I don't know any information.	9.6%
I know and have some information.	67.5%
Know and think that there is enough information.	15.8%
Be well informed or have experience in using the service.	7.1%
What are the most important factors in choosing public transport?	
The service route covers all the important places.	17.2%
Quality of service in public transportation (comfortable, clean)	26.4%
Number of trips, frequency of service, waiting time	23.3%
Duration of service	14.0%
Ticket price	8.1%
Route Information System Schedule and ticket purchase via online/app	4.9%
Facilities at the bus stop	1.6%
Safety and Security	4.4%

4.4.4 Mid-Block Traffic Count (MB)

The consultant conducted a survey of the traffic volume on the road (Mid-Block Count: MB) In the Udon Thani City Study Area from February 23 to 24, 2024, a total of 6 automated cameras were conducted. **Table 4.4-4.**

Table 4.4-4 Survey results of traffic volume on roads in the Udon Thani City Study Area

Survey Date	Survey Points	Position	Direction	Morning peak hour (PCU/hr)	Evening peak hour (PCU/hr)	12 hours (PCU)	24 Hours (PCU)
Weekdays	MB1	Highway 2	Entering the city	914	1,656	11,172	12,290
			Out of town	1,010	1,191	9,920	10,912
			Total	**1,924**	**2,847**	**21,092**	**23,201**
	MB2	Pho Si Road	Entering the city	1,096	349	8,789	9,668
			Out of town	985	581	10,658	11,723
			Total	**2,081**	**930**	**19,446**	**21,391**
	MB3	Highway 216	To Airport	1,586	1,344	13,714	15,085
			Go to Nong Khai	1,313	1,731	13,751	15,126
			Total	**2,899**	**3,075**	**27,465**	**30,212**
	MB4	Highway 2423	Go to Nong Khai	736	968	7,686	8,455
			To Airport	753	1,014	8,648	9,512
			Total	**1,489**	**1,982**	**16,334**	**17,967**
	MB5	Highway 2	Go to Nong Khai	1,768	2,276	17,656	19,422
			To Airport	2,073	2,302	21,322	23,454
			Total	**3,841**	**4,578**	**38,978**	**42,876**
	MB6	Highway 22	Entering the city	2,451	1,408	18,479	20,326
			Out of town	1,351	2,215	17,828	19,611
			Total	**3,802**	**3,623**	**36,307**	**39,938**
Holiday	MB1	Highway 2	Entering the city	787	1,019	8,218	9,040
			Out of town	596	794	6,819	7,501
			Total	**1,383**	**1,813**	**15,038**	**16,542**
	MB2	Pho Si Road	Entering the city	778	446	5,856	6,442
			Out of town	549	886	6,846	7,530
			Total	**1,327**	**1,332**	**12,702**	**13,972**
	MB3	Highway 216	To Airport	1,140	1,464	12,307	13,537
			Go to Nong Khai	1,242	1,374	12,777	14,055
			Total	**2,382**	**2,838**	**25,084**	**27,592**
	MB4	Highway 2423	Go to Nong Khai	596	1,079	7,292	8,022
			To Airport	720	853	7,137	7,850
			Total	**1,316**	**1,932**	**14,429**	**15,872**
	MB5	Highway 2	Go to Nong Khai	1,379	1,167	11,950	13,145
			To Airport	1,358	1,775	14,244	15,669
			Total	**2,737**	**2,942**	**26,194**	**28,813**
	MB6	Highway 22	Entering the city	2,121	683	17,369	19,106
			Out of town	1,349	784	14,992	16,491
			Total	**3,470**	**1,467**	**32,361**	**35,597**

4.4.5 Survey of information obtained from public opinion hearings

The 1st Small Group Meeting was attended by interested parties to listen to the details of the project and share their opinions and suggestions on the project development guidelines. The summary of the results of the comments can be summarized as follows:

1) Current public transportation services

- Problem
  - Changes in people's travel behavior From Covid-19
  - The number of users of public transportation has decreased due to the popularity of application and black-label taxi services because of the pick-up and drop-off from the beginning to the destination.
- Suggestion
  - We propose to adjust the fare.
  - It is proposed to have measures to help entrepreneurs, such as fuel coupons for entrepreneurs and low-interest loans.
  - Proposed to hire a car to run the car.

2) Opinions on the public transportation routes that have been studied
   - The Red and Orange Public Transportation Routes are in the process of being auctioned off, which is planned to be opened by the end of 2024.
   - The line of public transportation on the blue, green, pink and yellow lines It is currently under investigation.
3) Listening to opinions on the development of the system feeder
   - Participants were of the opinion that the development of complementary services is necessary.
   - Today's entrepreneurs are ready to adapt to become feeders by proposing them to be minibuses because they do not want to invest more.
4) Opinions on traffic problems in the study area
   - Traffic jams throughout the day, Nittayo Road. Nong Bua Market area because there are no traffic lights.
   - Traffic jams throughout the day on Wattananuwong Road and Prajaksilpakhom Road - Sai Uthit Road because there are shopping malls.
   - It is proposed that parents park their cars at Thung Si Mueang and have a public transportation system to drop off students at school.
5) Other issues
   - Udon Thani Municipality
     - Applying for permission to operate public transportation is problematic.
     - The municipality used to operate an EV BUS, but no one used it. There is no support for pick-up and drop-off stops and GPS, so users do not know where the car is currently.
     - The bus station (formerly) has been transferred to the municipality to take care of it.
     - Currently, the municipality has to take care of 105 communities, so it is in the process of requesting 2 EV BUSES to use public services and 4 trams , but they are very old.
     - It is proposed that in the long term, there will be an elevated ring to reduce traffic congestion around the city.

4.4.6 Summary of Traffic Problems

According to Udon Thani Province It is possible to summarize the problems related to the development of public transportation. as follows

1) Decline in Public Transport Users: Changes in People's Travel Habits After COVID-19 This has led to a decrease in the number of public transportation users because people turn to taxi services through applications and black-labeled buses that can pick up and drop off from origin to destination more conveniently. This makes existing public transportation systems uncompetitive on par with personal vehicles or services through applications.
2) Fare issues and operator support: Currently, public transport fares cannot cover the cost of operation. While public transport operators lack support from the government, such as the provision of fuel coupons or low-interest loans to help their businesses, it is proposed to adjust fares to suit the actual cost and take measures to help entrepreneurs improve service quality.
3) Traffic jams: Nittayo Road and Wattananuwong Road There is a traffic jam throughout the day, especially during holidays and when shopping malls are open. In addition, it was found that some areas, such as Nong Bua Market, did not have traffic lights, making traffic jams. Parking on the side of the road is also a problem that causes traffic to be unresponsive in many areas.
4) Problems with obtaining permits and using EV buses: Although EV buses have been introduced in some areas, the application for permits for public transportation has been hampered by complicated permits, and the use of EV buses is not popular due to the lack of good publicity. There is no pick-up and drop-off stop and no GPS system so that users can track the location of the car. This makes people rarely use the service.
5) Suggestions for the development and improvement of the transportation system: There are proposals to expand public transportation routes and develop ancillary services, such as minibuses, to serve as a feeder to reduce additional investment from operators and respond to the needs of the public. In the long term, it is proposed to build an elevated ring to reduce traffic congestion. By developing both short-term and long-term transportation systems for convenient and safe travel.

4.5 Khon Kaen Province

4.5.1 Household Interview Survey (HIS)

The results of the survey on household travel data showed that most of the residential characteristics of the sample were single-family houses. Most of the purpose of the trip is to travel to work (Home Base Work, HBW) and for other purposes (Home Base Other, HBO) Average percentage 42.0 and 35.4 respectively. The main mode of transportation is to use a private car (PC) Average percentage 51.4 Followed by motorcycles (MC) Average percentage 40.5 The number of trips (Person trips) Equals 498,526 trips-person/day, with an average public transportation usage of 8.1percent. The average household size was 2.16 people per household, and the average household income was 34,252 baht. The average number of trips per household was 1.71, as shown in **Table 4.5-1.**

Table 4.5-1 Summary of the results of the survey on household travel data

Household Travel Information	Survey Results
Population (people)	**332,000**[1]
Number of samples	**1,001**
Type of Residence	
Detached House	63.06%
Commercial buildings	14.0%
Townhouse/Semi House	7.15%
Condominium/Apartment/Flat/Dormitory/Condominium	15.79%
Other	-
Trip Purpose	
Home Base Work (HBW)	42.0%
Home Base Education (HBE)	12.5%
Home Base Other (HBO)	35.4%
None Home Base (NHB)	10.1%
Mode Share	
Personal Cars (PC)	51.4%
Motorcycle (MC)	40.5%
Public Transportation (PT)	8.1%
People trips (trips-person/day)	**498,526**[2]
Personal Cars (PC)	256,093
Motorcycle (MC)	202,052
Public Transportation (PT)	40,381
Average Household Size	**2.16**
Average household income (Baht)	**34,251.50**
Number of trips/number of households	**1.71**

Note: [1]Sub-district population from the Department of Administration Ministry of Home Affairs only for sub-districts in the project study area.

[2] The trip volume is derived from the model. Trip Generation Model Derived from household travel survey data, travel data between origin and destination (Origin-Destination: OD Survey)

4.5.2 Origin-Destination (OD Survey)

The results of the survey on travel data at the origin and destination point showed that most of the trips were trips for other purposes (Home Base Other, HBO) And to go to work (Home Base Work, HBW) and an average of 34.2 percent and 31.4 percent, respectively. The main mode of transportation is the use of cars/pickup trucks/SUVs/personal vans. 74.25 Followed by motorcycles with an average of 22.76 percent, as shown in **Table 4.5-2.**

Table 4.5-2 Summary of the survey results of the survey of travel data from origin to destination

Travel information from origin to destination	Survey Results
Trip Purpose	
Home Base Work (HBW)	31.4%
Home Base Education (HBE)	7.2%
Home Base Other (HBO)	34.2%
None Home Base (NHB)	27.2%
Mode Share	
Motorcycle	22.76%
Car/Pickup Truck/SUV/Personal Van	74.25%
Semi-public transport	0.25%
Public Transportation	2.74%

4.5.3 Travel behavior data of tourists and visitors

Survey results on tourist and visitor behavior It was found that the respondents were Thai nationals 97.6 percent and foreigners 2.4 percent, with an average age of 35.4 years and an average monthly income 25,073 baht. Approximate Percentage 75.1 of respondents residing in the study area, where most of the transportation modes in the study area are taxi/app driver, Average percentage 48.1, Followed by others (motorcycles and cars) and public transportation, with an average percentage 37.9 and 9.9 In order of travel. There is awareness of the existence of public transportation services in good areas 29.3 percent. The top 3 factors that respondents valued most when choosing public transportation were: (1) Route information system; Schedule and purchase tickets online/App (2) The number of trips, the frequency of service, the waiting time for buses, and (3) the service routes are covered through all important places. It is necessary for the development of this city at the level of 9.2 points (out of 10 points) and if there is good public transportation. There is a chance to use public transportation at level 9.4 Points (out of 10 points) as shown in **Table 4.5-3.**

Table 4.5-3 Summary of the survey on tourist and visitor behavior

Tourist and visitor behavior data	Survey Results
Nationality	
Thailand	97.6%
Foreign	2.4%
Average age	**35.4**
Average Monthly Income (Baht)	**25,073.35**
Location of Accommodation	
Inside The Study Area	75.1%
Outside The Study Area	24.9%
Transportation patterns in the study area	
Taxi	4.1%
Taxi/App Driver	48.1%
Public Transportation	9.9%
Other	37.9%
Awareness of the existence of public transportation services in the area.	
I don't know any information.	4.2%
I know and have some information.	28.6%
Know and think that there is enough information.	37.9%
Be well informed or have experience in using the service.	29.3%
What are the most important factors in choosing public transport?	**9.2**
Number of trips, frequency of service, waiting time	**9.4**
Ticket price	
Duration of service	15.6%
The service route covers all the important places.	12.8%
Facilities at the bus stop	15.7%
Quality of service in public transportation (comfortable, clean)	11.8%
Route Information System Schedule and ticket purchase via online/app	13.0%
Safety and Security	19.7%

4.5.4 Mid-Block Traffic Count (MB)

The consultant conducted a survey of the traffic volume on the road (Mid-Block Count: MB) In the Khon Kaen City Study Area between February 25 and 26, 2024, with a total of 6 automated cameras, the results of the traffic volume survey on the road section are shown in **Table 4.5-4.**

Table 4.5-4 Survey results of traffic volume on the road in the Khon Kaen City Study Area

Survey Date	Survey Points	Position	Direction	Morning peak hour (PCU/hr	Evening peak hour (PCU/hr)	12 hours (PCU)	24 Hours (PCU)
Weekdays	MB1	Highway 2	Entering the city	2,762	3,294	29,283	32,211
			Out of town	1,806	3,407	27,128	29,841
			Total	**4,568**	**6,701**	**56,411**	**62,052**
	MB2	Highway 12	Entering the city	3,895	964	23,114	25,425
			Out of town	1,764	2,338	21,154	23,270
			Total	**5,659**	**3,302**	**44,268**	**48,695**
	MB3	Highway 230	To Udon Thani	1,330	815	10,383	11,421
			Go to Tha Phra	991	1,184	9,737	10,711
			Total	**2,321**	**1,999**	**20,119**	**22,131**
	MB4	Highway 12	Entering the city	1,576	995	13,945	15,340
			Out of town	1,933	1,514	13,002	14,302
			Total	**3,509**	**2,509**	**26,947**	**29,641**
	MB5	Highway 230	Entering the city	754	1,476	10,495	11,545
			Out of town	631	1,367	8,804	9,684
			Total	**1,385**	**2,843**	**19,299**	**21,229**
	MB6	Highway 2	To Udon Thani	1,641	1,957	17,395	19,134
			Go to Tha Phra	1,933	1,858	17,852	19,638
			Total	**3,574**	**3,815**	**35,247**	**38,772**
Holiday	MB1	Highway 2	Entering the city	2,611	2,231	24,638	27,101
			Out of town	2,369	2,281	21,940	24,134
			Total	**4,980**	**4,512**	**46,577**	**51,235**
	MB2	Highway 12	Entering the city	1,450	1,108	12,454	13,699
			Out of town	1,640	2,506	19,030	20,933
			Total	**3,090**	**3,614**	**31,484**	**34,632**
	MB3	Highway 230	To Udon Thani	544	1,054	7,551	8,306
			Go to Tha Phra	422	907	5,867	6,453
			Total	**966**	**1,961**	**13,418**	**14,759**
	MB4	Highway 12	Entering the city	1,063	656	8,353	9,188
			Out of town	853	1,015	8,398	9,237
			Total	**1,916**	**1,671**	**16,750**	**18,426**
	MB5	Highway 230	Entering the city	657	421	5,852	6,437
			Out of town	811	638	5,508	6,059
			Total	**1,468**	**1,059**	**11,360**	**12,496**
	MB6	Highway 2	To Udon Thani	946	1,128	10,044	11,049
			Go to Tha Phra	991	1,864	14,871	16,358
			Total	**1,937**	**2,992**	**24,915**	**27,407**

4.5.5 Survey of information obtained from public opinion hearings

From the project introduction seminar and the 1st subgroup meeting , opinions were given on the issues and suggestions that are beneficial to the project in order to lead to the conclusion of the problems and suggestions for the development plan of the public transportation system and the development plan of the traffic system. as follows

1) **Current public transportation services**
   - **Problem**
     - The connection of each bus line used to be centered at the old bus station, but when it moved to the bus station 3. Therefore, the travel connection of each public transportation line is inconvenient.
     - The growth of the city is expanding, so people rarely enter the city.
   - **Suggestion**
     - The government should support public transport operators.
     - It is proposed that the construction of the main public transportation system be raised higher than the road.
     - The development of public transportation should be accelerated.
     - There should be a parking spot.
2) **Opinions on traffic problems in the study area**
   - Traffic jams in commercial areas include:
     - Mittraphap Road (Central Intersection – Charoen Si Intersection)
     - Si Chan Road (Mittraphap Road, Khon Kaen Municipality)
   - Traffic jams in school areas In the morning and evening hours, because there are problems with transporting students and parking on the street, including:
     - Pracha Samosorn Road (District Office Triangle)
     - Maliwan Road (Triangle-Intersection Rama 8)
     - Lao Nadi Road (behind the Government Center) In front of Kaen Nakhon School and in front of the market (Si Muang Thong)
     - Klang Muang Road (Si Chan Tat Rd, Klang Muang Rd)
     - Na Muang Road (city center and special school area)
     - Chatapadung Road

4.5.6 Summary of Traffic Problems

Based on the data of Khon Kaen Province, it is possible to summarize the problems related to the development of the public transportation system. as follows

1) The public transportation system in Khon Kaen has not been able to fully meet the needs of the people because the center of the public transportation system has been moved from the city center to the outskirts of the city (the old bus has been moved to the bus station 3). This makes it inconvenient to travel within urban areas. In addition, the connection between public transportation routes is not good enough. The existing public transportation system is not yet

able to connect seamlessly with different areas of the city. This caused passengers to waste time changing vehicles many times.

2) The growth of Khon Kaen city is characterized by expansion. The impact on traffic is that the expansion of the city has led to an increase in the number of private vehicles, which has resulted in traffic congestion in various areas, especially in the city center where real estate development is increasing. In addition, urban expansion has not been able to support efficient public transportation. As a result, people still rely mainly on private cars.
3) Khon Kaen city will expand in some areas, but some parts of the city are still congested, especially in the old city with high population density. The expansion of the city, regardless of the balanced distribution of the population, causes congestion at some points. This makes it difficult to develop the expansion of traffic routes so that the population can travel more conveniently due to the limitations of road expansion.
4) Khon Kaen still lacks investment in public transportation infrastructure such as skytrains, bus stations, or bus routes that are convenient and safe for users, so feeder services should be developed to help connect communities with the main public transportation system by using minibuses or a system hired by local operators, which will make travel more convenient and cover more areas. Entrepreneurs are ready to adapt to this form of service to increase efficiency and access to public transportation in all areas.
5) Non-standard transportation infrastructure It does not promote very efficient transportation, such as unclear traffic signs. Narrow, rough sidewalks with many obstacles, unsafe bicycle paths, as well as buildings or parts of buildings protruding into the traffic route. These are all ways to reduce the distance on foot and by bicycle, which is a mode of transportation that supports major public transportation.

4.6 Nakhon Ratchasima Province

4.6.1 Household Interview Survey (HIS)

The results of the survey on household travel data showed that most of the residential characteristics of the sample were single-family houses. Most of the purpose of the trip is to travel to work (Home Base Work, HBW) and for other purposes (Home Base Other, HBO), The average was 44.5 percent and 29.8 percent, respectively. The main mode of transportation is the use of motorcycles (MC) The average is 54.8 percent, followed by private cars (PC) An average of 40.5 percent, with the volume of trips (Person trips) Equals 677,616. The average proportion of public transportation use is 4.7 percent (Household Size), The average income of the household was 2.40 people/household and the average income of the household was 20,846.93 baht.The average number of trips/number of households is 1.02 trips, as shown in **Table 4.6-1.**

Table 4.6-1 Summary of the results of the survey on household travel data

Household Travel Information	Survey Results
Population (people)	**452,000**[1]
Number of samples	**1,003**
Type of Residence	
Detached House	49.75%
Commercial buildings	10.07%
Townhouse/Semi House	7.38%
Condominium/Apartment/Flat/Dormitory/Condominium	32.6%
Other	0.2%
Trip Purpose	
Home Base Work (HBW)	44.5%
Home Base Education (HBE)	15.2%
Home Base Other (HBO)	29.8%
None Home Base (NHB)	10.5%
Mode Share	
Personal Cars (PC)	40.5%
Motorcycle (MC)	54.8%
Public Transportation (PT)	4.7%
People trips (trips-person/day)	**677,616**[2]
Personal Cars (PC)	274,502
Motorcycle (MC)	371,401
Public Transportation (PT)	31,712
Average Household Size	**2.40**
Average household income (Baht)	**20,846.93**
Number of trips/number of households	**1.02**

Note: [1] Sub-district population from the Department of Administration Ministry of Home Affairs only for sub-districts in the project study area.

[2] The trip volume is derived from the model. Trip Generation Model obtained from household travel survey data.

4.6.2 Origin-Destination (OD Survey)

The results of the survey on travel data at the origin and destination point showed that most of the trips were trips for other purposes (Home Base Other, HBO) And to go to work (Home Base Work, HBW) and an average of 34.2 percent and 30.2 percent, respectively. The main mode of transportation is the use of cars/pick-ups/SUVs/private vans with an average of 64.86 percent, followed by motorcycles with an average of 33.94 percent. **Table 4.6-2.**

Table 4.6-2 Summary of the survey results of the survey of travel data from origin to destination

Travel information from origin to destination	Survey Results
Trip Purpose	
Home Base Work (HBW)	30.2%
Home Base Education (HBE)	14.0%
Home Base Other (HBO)	34.2%
None Home Base (NHB)	21.6%
Mode Share	
Motorcycle	33.94%
Car/Pickup Truck/SUV/Personal Van	64.86%
Semi-public transport	0.97%
Public Transportation	0.24%

4.6.3 Travel behavior data of tourists and visitors

Survey results on tourist and visitor behavior It was found that the respondents were Thai nationals 99.5 percent and 0.5 percent were foreigners, with an average age of 31.8 years and an average monthly income of 15 ,762 baht, Approximately 58.3 percent of the respondents lived in the study area taxi/app driver , The average was 33.8 percent, followed by the use of public transportation and other services (motorcycles and cars) for travel, with an average of 32.6 percent and 30.7 percent, respectively. Only 39.8 percent of respondents were aware of the existence of public transportation services in good areas, and the top three factors that respondents paid the most attention to when choosing public transportation were (1) safety and security, (2) service quality in public transportation vehicles (comfortable and clean), and (3) route information system. Schedule and purchase tickets online/App The respondents were of the opinion that the public transportation system is good. It is necessary to develop this city at the level of 9.5 points (out of 10 points). There is a chance to use public transportation on the level of 9.6 points (out of 10 points) as shown in **Table 4.6-3.**

Table 4.6-3 Summary of the survey on tourist and visitor behavior

Tourist and visitor behavior data	Survey Results
Nationality	
Thailand	99.5%
Foreign	0.5%
Average age	**31.8**
Average Monthly Income (Baht)	**15,762.20**
Location of Accommodation	
Inside The Study Area	58.3%
Outside The Study Area	41.7%
Transportation patterns in the study area	
Taxi	2.9%
Taxi/App Driver	33.8%
Public Transportation	32.6%
Other	30.7%
Awareness of the existence of public transportation services in the area.	
I don't know any information.	3.2%
I know and have some information.	38.5%
Know and think that there is enough information.	18.5%
Be well informed or have experience in using the service.	39.8%
What are the most important factors in choosing public transport?	
The service route covers all the important places.	10.5%
Quality of service in public transportation (comfortable, clean)	15.9%
Number of trips, frequency of service, waiting time	10.8%
Duration of service	10.8%
Ticket price	7.1%
Route Information System Schedule and ticket purchase via online/app	12.9%
Facilities at the bus stop	10.5%
Safety and Security	21.5%

4.6.4 Mid-Block Traffic Count (MB)

The consultant conducted a survey of the traffic volume on the road (Mid-Block Count: MB) In the Nakhon Ratchasima City Study Area between March 1 and 2, 2024, by automatic cameras, a total of 8 points, the results of the traffic volume survey on the road as shown in **Table 4.6-4.**

Table 4.6-4 Survey results of traffic volume on the road in the Nakhon Ratchasima City Study Area

Survey Date	Survey Points	Position	Direction	Morning peak hour (PCU/hr)	Evening peak hour (PCU/hr)	12 hours (PCU)	24 Hours (PCU)
Weekdays	MB1	Mukhmontri Road	Entering the city	1,597	1,535	16,131	17,744
			Out of town	1,194	2,040	16,826	18,508
			Total	**2,791**	**3,575**	**32,957**	**36,252**
	MB2	Ratchadamnoen Road	Go to Lanyamo	714	764	8,081	8,889
			Go to camp	916	1,085	10,895	11,984
			Total	**1,630**	**1,849**	**18,976**	**20,873**
	MB3	NTC Nom.1111	Go to Khon Kaen	760	1,089	10,060	11,066
			To Hua Talay	680	1,061	9,226	10,149
			Total	**1,440**	**2,150**	**19,286**	**21,215**
	MB4	Highway 224	Entering the city	1,956	1,506	17,371	19,108
			Out of town	1,849	1,408	17,173	18,890
			Total	**3,805**	**2,914**	**34,544**	**37,999**
	MB5	NTC Nom.1111	To Hua Talay	1,057	1,351	13,072	14,379
			Go to Khon Kaen	483	671	6,264	6,891
			Total	**1,540**	**2,022**	**19,336**	**21,269**
	MB6	Highway 2	To Nakhon Ratchasima	2,956	1,421	24,278	26,706
			Go to Pak Chong	2,408	2,230	24,326	26,759
			Total	**5,364**	**3,651**	**48,604**	**53,465**
	MB7	Highway 2068	Go to Kham Talay So District.	499	509	5,591	6,150
			To Nakhon Ratchasima	509	857	7,340	8,074
			Total	**1,008**	**1,366**	**12,931**	**14,224**
	MB8	University Road	To Nakhon Ratchasima	584	554	6,090	6,699
			Go to MIT.	468	712	6,680	7,348
			Total	**1,052**	**1,266**	**12,770**	**14,047**
Holiday	MB1	Mukhmontri Road	Entering the city	1,063	851	9,118	10,030
			Out of town	1,084	810	9,812	10,793
			Total	**2,147**	**1,661**	**18,931**	**20,824**
	MB2	Ratchadamnoen Road	Go to Lanyamo	564	529	5,644	6,209
			Go to camp	428	667	5,927	6,519
			Total	**992**	**1,196**	**11,571**	**12,728**
	MB3	NTC Nom.1111	Go to Khon Kaen	458	581	5,634	6,197
			To Hua Talay	483	671	6,264	6,891
			Total	**941**	**1,252**	**11,898**	**13,088**
	MB4	Highway 224	Entering the city	1,397	1,416	15,633	17,197
			Out of town	932	1,555	13,381	14,720
			Total	**2,329**	**2,971**	**29,015**	**31,916**
	MB5	NTC Nom.1111	To Hua Talay	449	641	5,929	6,522
			Go to Khon Kaen	524	808	7,089	7,798
			Total	**973**	**1,449**	**13,018**	**14,320**
	MB6	Highway 2	To Nakhon Ratchasima	1,571	1,722	19,277	21,205
			Go to Pak Chong	1,228	1,476	13,574	14,931
			Total	**2,799**	**3,198**	**32,851**	**36,136**
	MB7	Highway 2068	Go to Kham Talay So District.	283	546	4,419	4,861
			To Nakhon Ratchasima	219	381	3,681	4,049
			Total	**502**	**927**	**8,100**	**8,910**
	MB1	Mukhmontri Road	Entering the city	1,063	851	9,118	10,030
			Out of town	1,084	810	9,812	10,793
			Total	**2,147**	**1,661**	**18,931**	**20,824**

4.6.5 Survey of information obtained from public opinion hearings

From the project introduction seminar and the 1st subgroup meeting, opinions were given on the issues and suggestions that are beneficial to the project in order to lead to the conclusion of the problems and suggestions for the development plan of the public transportation system and the development plan of the traffic system. as follows

1) Current public transportation services

- Problem
  - Changes in people's travel behavior From Covid-19
  - The route does not cover the entire area.
  - Laws and government policies, such as modifying the quality of buses.
  - There are public transportation services in categories 1 and 4 overlapping routes.
- Suggestion
  - I propose that the government has support for public transportation operators.

2) Opinions on the public transportation routes that have been studied

- The participants were of the opinion that the route they had studied was appropriate.

3) Listening to opinions on the development of the system feeder

- Participants were of the opinion that the development of complementary services is necessary.
- Today's entrepreneurs are ready to adapt to become feeders.
- The meeting proposed to hire bus operators to operate.
- The development of feeder systems should be diversified and access to each sub-road network according to the suitability of the traffic route.
- There is infrastructure to support feeder bus operation and support pedestrian, bicycle, and motorcycle use in terms of safety, lighting, traffic surfaces, traffic lanes, and comfort.
- The formulation of the feeder format should be considered in a policy form that is consistent with the main transportation from the beginning, and the implementation phase should be systematized. There is a continuous network because it affects the development of the Government infrastructure to support

4) Opinions on traffic problems in the study area

- Traffic jams in the school area in the morning and evening because there are problems with transporting students and parking on the street.
- Traffic jams in the hospital area.

5) Other suggestions

- The government should support public transport operators.

4.6.6 Summary of Traffic Problems

According to Nakhon Ratchasima Province It is possible to summarize the problems related to the development of public transportation. as follows

1) The current problem in public transportation services is caused by routes that do not cover all areas, coupled with the provision of Category 1 and 4 transportation services with overlapping

routes. As a result, the service is inefficient. In addition, changes in people's travel behavior caused by the impact of COVID-19 In addition, laws and government policies such as improving the quality of buses. It also creates restrictions on the operation of entrepreneurs.

2) The route that has been studied is considered appropriate, but it is still necessary to develop complementary services (feeder) that are comprehensive and connect to the main transportation system effectively. Operators are ready to adapt to become feeders if they receive support, such as hiring buses and developing appropriate infrastructure, which should take into account lighting, traffic surfaces, and safety. In addition, the feeder system should be designed in accordance with the main transportation system. There is a clear action plan for each phase and continuously establish network connectivity to increase service efficiency.
3) Traffic problems Traffic jams around schools and hospitals during rush hour due to shuttle parking.
4) The government should support public transport operators and publicize the project transparently, by developing the project should focus on the benefits to the people rather than profits. In addition, the existing transportation system should be upgraded to be efficient and the city should be developed in a low-carbon way. It should also divide the authority and duties of local authorities to manage traffic in the area to increase efficiency and reduce the burden on police officers.

4.7 Ubon Ratchathani Province

4.7.1 Household Interview Survey (HIS)

The results of the survey on household travel data showed that most of the residential characteristics of the sample were single-family houses. Most of the purpose of the trip is to travel to work (Home Base Work, HBW) and for other purposes (Home Base Other, HBO) Average percentage 40.5 and 31.0 respectively. The main mode of transportation is the use of motorcycles (MC) Average percentage 61.7 Followed by private cars (PC) Average percentage 33.3 The number of trips (Person trips) equal 376,765 The average proportion of public transportation use 5.1 percent The household size Average 2.01 and the average income of the average household 15,508.38 baht. The average number of trips/number of households is equal to 2.01 trips, as shown in **Table 4.7-1.**

Table 4.7-1 Summary of the results of the survey on household travel data

Household Travel Information	Survey Results
Population (people)	**249,000**[1]
Number of samples	**1,201**
Type of Residence	
Detached House	84.18%
Commercial buildings	3.83%
Townhouse/Semi House	1.08%
Condominium/Apartment/Flat/Dormitory/Condominium	10.24%
Other	0.67%
Trip Purpose	
Home Base Work (HBW)	40.5%
Home Base Education (HBE)	17.8%
Home Base Other (HBO)	31.0%
None Home Base (NHB)	10.7%
Mode Share	
Personal Cars (PC)	33.3%
Motorcycle (MC)	61.7%
Public Transportation (PT)	5.1%
People trips (trips-person/day)	**376,765**[2]
Personal Cars (PC)	125,312
Motorcycle (MC)	232,389
Public Transportation (PT)	19,064
Average Household Size	**2.01**
Average household income (Baht)	**15,508.38**
Number of trips/number of households	**2.01**

note: [1] Sub-district population from the Department of Administration Ministry of Home Affairs only for sub-districts in the project study area.

[2] The trip volume is derived from the model. Trip Generation Model obtained from household travel survey data.

4.7.2 Origin-Destination (OD Survey)

The results of the survey on travel data at the origin and destination point showed that most of the trips were trips for other purposes (Home Base Other, HBO) And to go to work (Home Base Work, HBW) and an average of 36.1 percent and 34.5 percent, respectively. The main mode of transportation is the use of cars/pick-up trucks/SUVs/private vans with an average of 70.38 percent, followed by motorcycles with an average of 28.13 percent, as shown in **Table 4.7-2.**

Table 4.7-2 Summary of the survey results of the survey of travel data from origin to destination

Travel information from origin to destination	Survey Results
Trip Purpose	
Home Base Work (HBW)	34.5%
Home Base Education (HBE)	8.7%
Home Base Other (HBO)	36.1%
None Home Base (NHB)	20.6%
Mode Share	
Motorcycle	28.13%
Car/Pickup Truck/SUV/Personal Van	70.38%
Semi-public transport	1.13%
Public Transportation	0.38%

4.7.3 Travel behavior data of tourists and visitors

Survey results on tourist and visitor behavior found that 100.0 percent of respondents were Thai nationals and 0.0 percent were foreigners. The average age of respondents was 31.6 years, and the average monthly income was 24,124.69 baht. Approximately 75.1 percent of respondents resided within the study area. The most common modes of transportation in the study area were categorized as "other" (motorcycles and cars), accounting for an average of 49.5 percent, followed by public transportation and taxi/app driver services at 23.6 percent and 19.2 percent, respectively. Awareness of the existence of good public transportation services in the area was relatively low, at only 5.9 percent. The top three factors that respondents considered most important when choosing public transportation were: (1) ticket price, (2) service hours, and (3) number of trips, service frequency, and waiting time. Respondents rated the necessity of a good public transportation system for the city's development at 7.7 out of 10 points and expressed an intention to use good public transportation at 7.9 out of 10 pointas shown in **Table 4.7-3.**

Table 4.7-3 Summary of the survey on tourist and visitor behavior

Tourist and visitor behavior data	Survey Results
Nationality	
Thailand	100.0%
Foreign	0.0%
Average age	31.6
Average Monthly Income (Baht)	24,124.69
Location of Accommodation	
Inside The Study Area	75.1%
Outside The Study Area	24.9%
Transportation patterns in the study area	
Taxi	7.7%
Taxi/App Driver	19.2%
Public Transportation	23.6%
Other	49.5%
Awareness of the existence of public transportation services in the area.	
I don't know any information.	11.7%
I know and have some information.	59.0%
Know and think that there is enough information.	23.4%
Be well informed or have experience in using the service.	5.9%
What are the most important factors in choosing public transport?	
Number of trips, frequency of service, waiting time	17.2%
Ticket price	19.5%
Duration of service	15.8%
The service route covers all the important places.	12.4%
Facilities at the bus stop	7.5%
Quality of service in public transportation (comfortable, clean)	12.4%
Route Information System Schedule and ticket purchase via online/app	4.8%
Safety and Security	10.6%

4.7.4 Mid-Block Traffic Count (MB)

The consultant conducted a survey of the traffic volume on the road (Mid-Block Count: MB) In the study area of Ubon Ratchathani city during the 23 -24 February 2024 by automatic cameras, a total of 8 points, the results of the traffic volume survey on the road as shown in **Table 4.7-4.**

Table 4.7-4 Survey results of traffic volume on the road in the Ubon Ratchathani City Study Area

Survey Date	Survey Points	Position	Direction	Morning peak hour (PCU/hr)	Evening peak hour (PCU/hr)	12 hours (PCU)	24 Hours (PCU)
Weekdays	MB1	Highway 2050	Entering the city	870	817	9,630	10,593
			Out of town	743	957	10,711	11,782
			Total	**1,613**	**1,774**	**20,341**	**22,375**
	MB2	Highway 212	To Airport	1,152	1,769	17,680	19,448
			Go to Amit Charoen	1,096	2,098	19,877	21,865
			Total	**2,248**	**3,867**	**37,557**	**41,313**
	MB3	Highway 23	Go to Dam Nai District.	1,784	2,150	22,943	25,238
			Go to Warin Chamrap	1,623	2,396	23,798	26,178
			Total	**3,407**	**4,546**	**46,742**	**51,416**
	MB4	UBN 3058	Entering the city	539	696	7,148	7,862
			Out of town	420	584	6,029	6,632
			Total	**959**	**1,280**	**13,177**	**14,495**
	MB5	Highway 212	Entering the city	958	1,411	13,866	15,253
			Out of town	1,060	1,513	13,966	15,362
			Total	**2,018**	**2,924**	**27,832**	**30,615**
	MB6	UBN 4005	Entering the city	237	351	3,447	3,792
			Out of town	360	511	4,725	5,198
			Total	**597**	**862**	**8,172**	**8,989**
	MB7	Highway 2176	Entering the city	682	930	9,325	10,257
			Out of town	428	1,097	10,131	11,144
			Total	**1,110**	**2,027**	**19,456**	**21,401**
	MB8	Highway 226	Entering the city	421	1,548	10,944	12,039
			Out of town	549	1,400	10,674	11,742
			Total	**970**	**2,948**	**21,619**	**23,780**
Holiday	MB1	Highway 2050	Entering the city	478	703	6,914	7,605
			Out of town	570	810	7,495	8,245
			Total	**1,048**	**1,513**	**14,409**	**15,850**
	MB2	Highway 212	To Airport	1,586	1,344	13,714	15,085
			Go to Amit Charoen	1,313	1,731	13,751	15,126
			Total	**2,899**	**3,075**	**27,465**	**30,212**
	MB3	Highway.23	Go to Dam Nai District.	1,768	2,276	17,656	19,422
			Go to Warin Chamrap	2,073	2,302	21,322	23,454
			Total	**3,841**	**4,578**	**38,978**	**42,876**
	MB4	UBN 3058	Entering the city	1,096	349	8,789	9,668
			Out of town	985	581	10,658	11,723
			Total	**2,081**	**930**	**19,446**	**21,391**
	MB5	Highway 212	Entering the city	736	968	7,686	8,455
			Out of town	753	1,014	8,648	9,512
			Total	**1,489**	**1,982**	**16,334**	**17,967**
	MB6	UBN 4005	Entering the city	237	351	3,447	3,792
			Out of town	360	511	4,725	5,198
			Total	**597**	**862**	**8,172**	**8,989**
	MB7	Highway 2176	Entering the city	2,451	1,408	18,479	20,326
			Out of town	1,351	2,215	17,828	19,611
			Total	**3,802**	**3,623**	**36,307**	**39,938**
	MB8	Highway 226	Entering the city	914	1,656	11,172	12,290
			Out of town	1,010	1,191	9,920	10,912
			Total	**1,924**	**2,847**	**21,092**	**23,201**

4.7.5 Survey of information obtained from public opinion hearings

From the project introduction seminar and the 1st subgroup meeting, opinions were given on the issues and suggestions that are beneficial to the project in order to lead to the conclusion of the problems and suggestions for the development plan of the public transportation system and the development plan of the traffic system. as follows

1) Current public transportation services

- Problem
  - Changes in people's travel behavior From Covid-19
  - The number of users of public transportation has decreased due to the popularity of application and black-label taxi services because of the pick-up and drop-off from the beginning to the destination.
  - The local government organization has transferred to take care of the bus station, but there is no budget to pay the floor rent.
- Suggestion
  - It is proposed to improve the frequency of bus operation because there are very few users during the day.
  - It is proposed to improve the service route suitable for the current situation.
  - Proposed to consider improving the fare.
  - It is proposed to add parking spaces for users to use public transportation.
  - It is proposed to accelerate measures to help entrepreneurs, such as fuel coupons. Spare parts and costs so that entrepreneurs who invest in improving the quality of vehicles are profitable and operational.
  - It is proposed to have a train from Mueang Khon Kaen District - Mueang Ubon Ratchathani District.

2) Opinions on traffic problems in the study area

- Chayangkul Road, at the intersection of Wanarom and Don Klang Market, due to the traffic light, which proposes that the left lane can be passed through. In the long run, there should be underpasses or tunnels.
- Uplisan Road Cut off Chayangkul Road in the area of the 21st Air Division because of the traffic light and the Sansit Hospital.
- Sisaket Road The area of Warin Chamrap School and Warin Chamrap Hospital because it is a bottleneck.

4.7.6 Summary of Traffic Problems

According to data from Ubon Ratchathani Province. It is possible to summarize the problems related to the development of public transportation. as follows

1) The urban development of Ubon Ratchathani Province is a development that mainly relies on the road system and private vehicles. Urban Sprawl Development is a development along the road. It is not very dense growth.
2) Although Ubon Ratchathani Province is mainly dependent on personal vehicles. Most of the roads and roads in the city are quite narrow, especially in the area of Chayangkul Road.

In addition, these roads are a two-way road that connects the two sides of the road, which can be observed by the large number of intersections and turning points with a distance between intersections/turning points every 200 – 400 m.

3) Inefficient public transportation Ubon Ratchathani Province is a city with a good economy that mainly relies on agriculture, along with border trade and services that expand with infrastructure development. Most people have enough income to own a private vehicle. Schedule Control costs and quickly. Therefore, most people are increasingly turning to private vehicles, and this is a cycle that causes the proportion of public transportation services that exist today to continue to decrease. However, Public transportation systems available today There are many services from tourists. Especially within urban areas, some service providers charge different rates than regular service providers. These could also be tourism problems in the future.
4) From the Urban Sprawl Development model combined with the dependence on personal vehicles. This makes the journey continuously longer distances. In addition, motorcycle driving has relatively little traffic discipline, which causes frequent accidents, which is the leading cause of death.
5) Non-standard transportation infrastructure It does not promote very efficient transportation, such as unclear traffic signs. Narrow, rough sidewalks with many obstacles, unsafe bicycle paths, as well as buildings or parts of buildings protruding into the traffic route. These are all ways to reduce the distance on foot and by bicycle, which is a mode of transportation that supports major public transportation.

4.8 Ayutthaya Province

4.8.1 Household Interview Survey (HIS)

The results of the household travel survey indicated that most of the sampled residences were single-family houses. The primary purposes of travel were commuting to work (Home Based Work, HBW) and other personal activities (Home Based Other, HBO), accounting for average proportions of 40.5 percent and 31.0 percent, respectively. The main mode of transportation was private cars (PC), used by an average of 51.7 percent of travelers, followed by motorcycles (MC) at 44.4 percent. The total number of person trips was 215,442 per day. The average share of public transportation usage was 4.0 percent. The average household size was 3.5 persons, and the average household income was 31,950 baht. The average number of trips per household was 1.82, as shown in **Table 4.8-1.**

Table 4.8-1 Summary of the results of the survey on household travel data

Household Travel Information	Survey Results
Population (people)	**142,000**[1]
Number of samples	1,200
Type of Residence	
Detached House	77.0%
Commercial buildings	10.33%
Townhouse/Semi House	8.75%
Condominium/Apartment/Flat/Dormitory/Condominium	3.17%
Other	0.75%
Trip Purpose	
Home Base Work (HBW)	35.9%
Home Base Education (HBE)	3.8%
Home Base Other (HBO)	43.3%
None Home Base (NHB)	16.9%
Mode Share	
Personal Cars (PC)	51.7%
Motorcycle (MC)	44.4%
Public Transportation (PT)	4.0%
People trips (trips-person/day)	**215,442**[2]
Personal Cars (PC)	111,341
Motorcycle (MC)	95,549
Public Transportation (PT)	8,553
Average Household Size	3.50
Average household income (Baht)	31,950.25
Number of trips/number of households	1.82

note: [1] Sub-district population from the Department of Administration Ministry of Home Affairs only for sub-districts in the project study area.

[2] The trip volume is derived from the model. Trip Generation Model obtained from household travel survey data.

4.8.2 Origin-Destination (OD Survey)

The results of the origin-destination travel survey found that most trips were for other purposes (Home Based Other, HBO) and for commuting to work (Home Based Work, HBW) and an average of 38.1 percent and 36.8 percent, respectively. The main mode of transportation was private vehicles, including cars, pickup trucks, SUVs, and vans, with an average of 62.5 percent, followed by motorcycles at an average of 35.1 percent, as shown in **Table 4.8-2.**

Table 4.8-2 Summary of the survey results of the survey of travel data from origin to destination

Travel information from origin to destination	Survey Results
Trip Purpose	
Home Base Work (HBW)	36.8%
Home Base Education (HBE)	2.0%
Home Base Other (HBO)	38.1%
None Home Base (NHB)	23.2%
Mode Share	
Motorcycle	35.13%
Car/Pickup Truck/SUV/Personal Van	62.5%
Semi-public transport	2.38%
Public Transportation	-

4.8.3 Travel behavior data of tourists and visitors

The survey results on tourist and visitor behavior found that 84.5 percent of respondents were Thai nationals and 15.5 percent were foreigners, with an average age of 34.6 years and an average monthly income of 24,774 baht. Approximately 59.6 percent of respondents lived outside the study area. The most common modes of travel within the study area were categorized as other modes, with an average of 34.4 percent, followed by taxi/app driver services and car rentals, at 25.0 and 21.8 percent, respectively. Awareness of the existence of good public transportation services in the area was only 0.7 percent. The top three factors that respondents prioritized when choosing public transportation were (1) coverage of service routes that include all important locations, (2) quality of service within public transport vehicles (comfort and cleanliness), number of trips, frequency of service, and waiting time, and (3) ticket fares. Respondents rated the necessity of a good public transportation system for the development of the city at 8.2 points out of 10, and the likelihood of using good public transportation at 9.5 points out of 10, as shown in **Table 4.8-3.**

Table 4.8-3 Summary of the survey on tourist and visitor behavior

Tourist and visitor behavior data	Survey Results
Nationality	
Thailand	84.5%
Foreign	15.5%
Average age	34.6
Average Monthly Income (Baht)	24,774.44
Location of Accommodation	
Inside The Study Area	40.4%
Outside The Study Area	59.6%
Transportation patterns in the study area	
Taxi	21.8%
Taxi/App Driver	25.0%
Public Transportation	18.8%
Other	34.4%
Awareness of the existence of public transportation services in the area.	
I don't know any information.	30.2%
I know and have some information.	59.7%
Know and think that there is enough information.	9.4%
Be well informed or have experience in using the service.	0.7%
What are the most important factors in choosing public transport?	
Number of trips, frequency of service, waiting time	16.8%
Ticket price	13.2%
Duration of service	11.1%
The service route covers all the important places.	21.9%
Facilities at the bus stop	5.9%
Quality of service in public transportation (comfortable, clean)	16.8%
Route Information System Schedule and ticket purchase via online/app	3.5%
Safety and Security	10.7%

4.8.4 Mid-Block Traffic Count (MB)

The consultant conducted a survey of the traffic volume on the road (Mid-Block Count: MB) In the study area of Ayutthaya City. During the 23 – 24 February 2024 by automatic cameras, a total of 8 points, the results of the traffic volume survey on the road as shown in **Table 4.8-4.**

Table 4.8-4 Survey results of traffic volume on the road in the study area of Phra Nakhon Si Ayutthaya

Survey Date	Survey Points	Position	Direction	Morning peak hour (PCU/hr)	Evening peak hour (PCU/hr)	12 Hours (PCU)	24 Hours (PCU)
Weekdays	MB1	Highway 309	inbound	765	516	7,315	8,047
			Departure	884	662	8,133	8,946
			Total	**1,649**	**1,178**	**15,448**	**16,993**
	MB2	Highway 3477	inbound	874	792	8,817	9,698
			Departure	1,041	792	9,500	10,450
			Total	**1,915**	**1,584**	**18,317**	**20,148**
	MB3	Wat Phraya Tikaram - Wat Krasang Road	inbound	708	641	7,122	7,834
			Departure	823	642	7,637	8,401
			Total	**1,531**	**1,283**	**14,759**	**16,235**
	MB4	Highway 347	inbound	1,152	960	11,687	12,855
			Departure	1,219	1,053	12,194	13,413
			Total	**2,371**	**2,013**	**23,881**	**26,269**
	MB5	Highway 3263	inbound	1,066	1,290	11,199	12,319
			Departure	1,210	915	9,055	9,961
			Total	**2,276**	**2,205**	**20,254**	**22,279**
	MB6	Highway.3053	inbound	590	507	4,216	4,637
			Departure	356	487	3,425	3,768
			Total	**946**	**994**	**7,641**	**8,405**
	MB7	Highway 309	inbound	5,889	3,160	34,675	38,142
			Departure	3,571	3,190	29,400	32,339
			Total	**9,460**	**6,350**	**64,074**	**70,482**
	MB8	Highway 3477	inbound	814	746	8,228	9,051
			Departure	957	750	8,931	9,824
			Total	**1,771**	**1,496**	**17,159**	**18,875**
	MB9	AYA 2053	inbound	966	861	9,528	10,480
			Departure	905	849	8,461	9,308
			Total	**1,871**	**1,710**	**17,989**	**19,788**
	MB10	Highway 309	inbound	1,640	1,357	16,683	18,351
			Departure	1,664	1,324	16,175	17,793
			Total	**3,304**	**2,681**	**32,858**	**36,144**
	MB11	Highway 309	inbound	1,998	1,876	22,684	24,952
			Departure	1,892	1,711	20,980	23,078
			Total	**3,890**	**3,587**	**43,664**	**48,031**
	MB12	Highway 3469	inbound	341	318	3,321	3,653
			Departure	387	290	3,101	3,412
			Total	**728**	**608**	**6,422**	**7,065**
	MB13	Highway 3056	inbound	2,630	2,323	25,292	27,822
			Departure	2,332	2,125	23,449	25,794
			Total	**4,962**	**4,448**	**48,741**	**53,615**

Table 4.8 4 Survey results of traffic volume on roads in the study area of Phra Nakhon Si Ayutthaya (Continued)

Survey Date	Survey Points	Position	Direction	Morning peak hour (PCU/hr)	Evening peak hour (PCU/hr)	12 Hours (PCU)	24 Hours (PCU)
Holiday	MB1	Highway 309	inbound	842	563	7,987	8,786
			Departure	975	717	8,849	9,734
			Total	**1,817**	**1,280**	**16,836**	**18,520**
	MB2	Highway 3477	inbound	974	885	9,800	10,780
			Departure	1,131	878	10,559	11,615
			Total	**2,105**	**1,763**	**20,360**	**22,396**
	MB3	Wat Phraya Tikaram - Wat Krasang Road	inbound	785	710	7,903	8,693
			Departure	918	710	8,487	9,336
			Total	**1,703**	**1,420**	**16,390**	**18,029**
	MB4	Highway 347	inbound	1,311	1,100	13,328	14,660
			Departure	1,381	1,193	13,823	15,206
			Total	**2,692**	**2,293**	**27,151**	**29,866**
	MB5	Highway 3263	inbound	1,066	1,290	11,199	12,319
			Departure	1,210	915	9,055	9,961
			Total	**2,276**	**2,205**	**20,254**	**22,279**
	MB6	Highway.3053	inbound	590	507	4,216	4,637
			Departure	356	487	3,425	3,768
			Total	**946**	**994**	**7,641**	**8,405**
	MB7	Highway 309	inbound	3,885	3,160	31,675	34,842
			Departure	3,571	3,190	29,400	32,339
			Total	**7,456**	**6,350**	**61,074**	**67,182**
	MB8	Highway 3477	inbound	909	828	9,140	10,054
			Departure	1,053	826	9,868	10,855
			Total	**1,962**	**1,654**	**19,008**	**20,909**
	MB9	AYA 2053	inbound	1,071	953	10,584	11,642
			Departure	1,006	948	9,434	10,377
			Total	**2,077**	**1,901**	**20,018**	**22,019**
	MB10	Highway 309	inbound	1,819	1,507	18,496	20,346
			Departure	1,849	1,473	17,968	19,765
			Total	**3,668**	**2,980**	**36,464**	**40,110**
	MB11	Highway 309	inbound	2,223	2,084	25,198	27,717
			Departure	2,107	1,897	23,298	25,627
			Total	**4,330**	**3,981**	**48,495**	**53,345**
	MB12	Highway 3469	inbound	341	319	3,310	3,641
			Departure	387	290	3,106	3,416
			Total	**728**	**609**	**6,416**	**7,058**
	MB13	Highway 3056	inbound	2,630	2,323	25,292	27,822
			Departure	2,332	2,125	23,449	25,794
			Total	**4,962**	**4,448**	**48,741**	**53,615**

4.8.5 Survey of information obtained from public opinion hearings

From the project introduction seminar and the 1st subgroup meeting, opinions were given on the issues and suggestions that are beneficial to the project in order to lead to the conclusion of the problems and suggestions for the development plan of the public transportation system and the development plan of the traffic system. as follows

1) Current public transportation services

- Problem
  - Changes in people's travel behavior From Covid-19
  - The number of users of public transportation has decreased due to the popularity of application and black-label taxi services because of the pick-up and drop-off from the beginning to the destination.
  - Application for Taxi to run over the route of public transportation
  - The turning point at the irrigation canal road. There are many accidents.
- Suggestion
  - Propose that taxi applications be registered correctly and bid on routes to compete with existing operators in the area correctly.
  - The development of public transportation in the future should consider the expansion of people outside the city.
  - The government should have a budget to help public transportation operators.

2) Opinions on traffic problems in the study area

- Traffic jams are in the morning and evening and on Saturdays. The local people can adapt, so it is not much of a problem.
- It is proposed to use automatic traffic lights.
- Solve the problem of cars parked on the side of the road during rush hours.
- Currently, the Mahidol Ring area There are schools that encourage parents to drop off students in shopping malls and have feeders to pick up students to school to solve the problem of traffic jams caused by immigration.

4.8.6 Summary of Traffic Problems

According to data from Ayutthaya Province. It is possible to summarize the problems related to the development of public transportation. as follows

1) The urban development of Ayutthaya Province is a development that mainly relies on the road system and private vehicles. Urban Sprawl Development is a development along the road. Inefficient use of space and related resources is not very dense.
2) Although Ayutthaya Province is mainly dependent on personal vehicles. However, because Ayutthaya is an old city. Most of the business centers are surrounded by moats, roads and road zones, most of which are quite narrow, especially in the Mahidol Ring area.
3) Inefficient public transportation It is not possible to compete in personal vehicles because Ayutthaya is a city with a good economy. Most people have enough income to own a private vehicle. Schedule Control costs and quickly. Therefore, most people are increasingly turning to private vehicles, and this is a cycle that causes the proportion of public transportation

services that exist today to continue to decrease. However, Public transportation systems available today There are many services from tourists. Especially within urban areas, some service providers charge different rates than regular service providers. These could also be tourism problems in the future.

4) From the Urban Sprawl Development model combined with the dependence on personal vehicles. As a result, the journey of Ayutthaya residents has continued to increase the distance. In addition, motorcycle driving in Ayutthaya has relatively little traffic discipline, which causes frequent accidents, which is the leading cause of death in Ayutthaya.
5) Non-standard transportation infrastructure It does not promote very efficient transportation, such as unclear traffic signs. Narrow, rough sidewalks with many obstacles, unsafe bicycle paths, as well as buildings or parts of buildings protruding into the traffic route. These are all ways to reduce the distance on foot and by bicycle, which is a mode of transportation that supports major public transportation.

4.9 Surat Thani Province

4.9.1 Household Interview Survey (HIS)

The survey results on household travel data showed that most of the respondents resided in single-family houses. The primary purposes of travel were commuting to work (Home Base Work, HBW) and other purposes (Home Base Other, HBO), with an average of 51.7 percent and 34.8 percent, respectively. The main mode of transportation was motorcycles (MC), with an average usage of 67.6 percent, followed by private cars (PC) at 32.3 percent. The total volume of trips was 289,110 person-trips per day, with an average public transportation usage of 0.2 percent. The average household size was 3.04 persons per household, and the average household income was 39,758.38 baht. The average number of trips per household was 2.26, as shown in **Table 4.9-1.**

Table 4.9-1 Summary of the results of the survey on household travel data

Household Travel Information	Survey Results
Population (people)	**189,000**[1]
Number of samples	**2,107**
Type of Residence	
Detached House	64.78%
Commercial buildings	23.49%
Townhouse/Semi House	2.71%
Condominium/Apartment/Flat/Dormitory/Condominium	1.28%
Other	7.74%
Trip Purpose	
Home Base Work (HBW)	51.7%
Home Base Education (HBE)	7.6%
Home Base Other (HBO)	34.8%
None Home Base (NHB)	5.9%
Mode Share	
Personal Cars (PC)	32.3%
Motorcycle (MC)	67.6%
Public Transportation (PT)	0.2%
People trips (trips-person/day)	**289,110** [2]
Personal Cars (PC)	93,325
Motorcycle (MC)	195,294
Public Transportation (PT)	491
Average Household Size	**3.04**
Average household income (Baht)	**39,758.38**
Number of trips/number of households	**2.26**

Note: [1] Sub-district population from the Department of Administration Ministry of Home Affairs only for sub-districts in the project study area.

[2] The trip volume is derived from the model. Trip Generation Model obtained from household travel survey data.

4.9.2 Origin-Destination (OD Survey)

The results of the survey on travel data at the origin and destination point showed that most of the trips were trips for other purposes (Home Base Other, HBO) And not a return home or accommodation (None Home Base, NHB) and an average of 40.4 percent and 30.8 percent, respectively. The main mode of transportation is the use of cars/pick-ups/SUVs/personal vans, an average of 68.38 percent. Followed by motorcycles with an average of 26.38 percent. As shown in **Table 4.9-2.**

Table 4.9-2 Summary of the survey results of the survey of travel data from origin to destination

Travel information from origin to destination	Survey Results
Trip Purpose	
Home Base Work (HBW)	22.7%
Home Base Education (HBE)	6.1%
Home Base Other (HBO)	40.4%
None Home Base (NHB)	30.8%
Mode Share	
Motorcycle	26.38%
Car/Pickup Truck/SUV/Personal Van	68.38%
Semi-public transport	4.38%
Public Transportation	0.88%

4.9.3 Travel behavior data of tourists and visitors

Survey results on tourist and visitor behavior found that 53.5 percent of respondents were Thai nationals and 46.5 percent were foreigners. The average age was 36.9 years, and the average monthly income was 44,287 baht. Approximately 87.1 percent of respondents resided within the study area. The most common mode of transportation in the study area was public transportation, with an average of 38.7 percent, followed by taxi/app driver services and car rentals at 37.7 percent and 16.8 percent, respectively. The top three factors that respondents prioritized most when choosing public transportation were: (1) route information systems, schedules, and the ability to purchase tickets online or via an app; (2) facilities at bus stops; and (3) ticket fares. Respondents rated the necessity of a good public transportation system for the city's development at 8.6 out of 10 points, and the likelihood of using public transportation if it were improved at 8.8 out of 10 points, as shown in **Table 4.9-3.**

Table 4.9-3 Summary of the survey on tourist and visitor behavior

Tourist and visitor behavior data	Survey Results
Nationality	
Thailand	53.5%
Foreign	46.5%
Average age	**36.9**
Average Monthly Income (Baht)	**44,287.50**
Location of Accommodation	
Inside The Study Area	87.1%
Outside The Study Area	12.9%
Transportation patterns in the study area	
Taxi	16.8%
Taxi/App Driver	37.7%
Public Transportation	38.7%
Other	6.7%
Awareness of the existence of public transportation services in the area.	
I don't know any information.	0.3%
I know and have some information.	45.5%
Know and think that there is enough information.	54.2%
Be well informed or have experience in using the service.	-
What are the most important factors in choosing public transport?	
The service route covers all the important places.	3.0%
Quality of service in public transportation (comfortable, clean)	7.2%
Number of trips, frequency of service, waiting time	8.0%
Duration of service	11.8%
Ticket price	16.5%
Route Information System Schedule and ticket purchase via online/app	19.1%
Facilities at the bus stop	18.8%
Safety and Security	15.7%

4.9.4 Mid-Block Traffic Count (MB)

The consultant conducted a traffic volume survey on the road (Mid-Block Count: MB) in the Surat Thani City Study Area from February 16 to 17, 2024, using a total of 17 automated cameras. The results of the traffic volume survey for the road sections are shown in **Table 4.9-4.**

Table 4.9-4 Survey results of traffic volume on roads in the Surat Thani City Study Area

Survey Date	Survey Points	Position	Direction	Morning peak hour (PCU/hr)	Evening peak hour (PCU/hr)	12 hours (PCU)	24 Hours (PCU)
Weekdays	MB1	Highway 401	Entering the city	862	852	10,069	11076
			Out of town	929	886	10,466	11512
			Total	**1,791**	**1,738**	**20,535**	**22,588**
	MB2	Highway 420	Entering the city	1,212	1,140	12,275	13503
			Out of town	1,158	1,095	12,214	13436
			Total	**2,370**	**2,235**	**24,490**	**26,939**
	MB3	Highway 401	Entering the city	1,372	1,389	15,110	16621
			Out of town	1,318	1,241	13,861	15247
			Total	**2,690**	**2,630**	**28,971**	**31,868**
	MB4	Highway 401	Entering the city	1,045	1,020	11,288	12416
			Out of town	1,090	982	11,662	12829
			Total	**2,135**	**2,002**	**22,950**	**25,245**
	MB5	Highway 417	Entering the city	1,077	1,024	12,115	13326
			Out of town	1,052	1,041	11,857	13043
			Total	**2,129**	**2,065**	**23,972**	**26,370**
	MB6	Highway 4009	Entering the city	1,424	1,258	15,005	16505
			Out of town	1,157	1,278	13,110	14421
			Total	**2,581**	**2,536**	**28,115**	**30,926**
	MB7	Highway 4009	Entering the city	1,542	1,362	16,206	17827
			Out of town	1,247	1,385	14,162	15578
			Total	**2,789**	**2,747**	**30,368**	**33,405**
	MB8	Pho Khun Talay Road	Entering the city	349	300	3,564	3920
			Out of town	282	311	3,183	3502
			Total	**631**	**611**	**6,747**	**7,422**

Survey Date	Survey Points	Position	Direction	Morning peak hour (PCU/hr)	Evening peak hour (PCU/hr)	12 hours (PCU)	24 Hours (PCU)
Weekdays (Continued)	MB9	Highway 4009	Entering the city	606	614	7,008	7708
			Out of town	704	670	7,812	8594
			Total	**1,310**	**1,284**	**14,820**	**16,302**
	MB10	Si Kasem Road	Entering the city	559	564	6,370	7007
			Out of town	635	617	7,147	7861
			Total	**1,194**	**1,181**	**13,516**	**14,868**
	MB11	Chon Kasem Road	Entering the city	707	729	8,282	9110
			Out of town	827	808	9,265	10191
			Total	**1,534**	**1,537**	**17,547**	**19,301**
	MB12	Talat Mai Road	Entering the city	1,484	1,505	16,485	18133
			Out of town	1,433	1,343	15,072	16579
			Total	**2,917**	**2,848**	**31,557**	**34,712**
	MB13	Kanchanavithi Road	Entering the city	1,152	1,179	13,617	14978
			Out of town	1,212	1,158	13,815	15196
			Total	**2,364**	**2,337**	**27,432**	**30,175**
	MB14	Highway 401	Entering the city	965	976	11,331	12464
			Out of town	1,031	980	11,632	12795
			Total	**1,996**	**1,956**	**22,963**	**25,260**
	MB15	Highway 420	Entering the city	1,176	1,139	13,431	14775
			Out of town	1,150	1,140	13,040	14344
			Total	**2,326**	**2,279**	**26,472**	**29,119**
	MB16	Highway 420	Entering the city	463	534	5,318	5849
			Out of town	616	533	5,749	6324
			Total	**1,079**	**1,067**	**11,067**	**12,173**
	MB17	SNI 2007	Entering the city	353	375	4,140	4554
			Out of town	394	376	4,426	4869
			Total	**747**	**751**	**8,566**	**9,423**
Holiday	MB1	Highway 401	Entering the city	988	992	11,585	12743
			Out of town	1,063	1,015	12,018	13220
			Total	**2,051**	**2,007**	**23,603**	**25,963**
	MB2	Highway 420	Entering the city	1,389	1,329	14,089	15498
			Out of town	1,320	1,254	14,041	15446
			Total	**2,709**	**2,583**	**28,130**	**30,943**
	MB3	Highway 401	Entering the city	1,572	1,593	17,365	19101
			Out of town	1,505	1,429	15,928	17521
			Total	**3,077**	**3,022**	**33,293**	**36,622**
	MB4	Highway 401	Entering the city	1,202	1,181	12,992	14291
			Out of town	1,246	1,134	13,422	14765
			Total	**2,448**	**2,315**	**26,415**	**29,056**

Survey Date	Survey Points	Position	Direction	Morning peak hour (PCU/hr)	Evening peak hour (PCU/hr)	12 hours (PCU)	24 Hours (PCU)
	MB5	Highway 417	Entering the city	1,230	1,181	13,965	15362
			Out of town	1,201	1,204	13,638	15002
			Total	**2,431**	**2,385**	**27,603**	**30,364**
	MB6	Highway 4009	Entering the city	1,641	1,452	17,270	18997
			Out of town	1,325	1,472	15,081	16589
			Total	**2,966**	**2,924**	**32,351**	**35,586**
	MB7	Highway 4009	Entering the city	1,846	1,596	18,739	20612
			Out of town	1,437	1,593	16,349	17984
			Total	**3,283**	**3,189**	**35,088**	**38,597**
	MB8	Pho Khun Talay Road	Entering the city	406	349	4,121	4533
			Out of town	320	355	3,669	4035
			Total	**726**	**704**	**7,790**	**8,569**

Survey Date	Survey Points	Position	Direction	Morning peak hour (PCU/hr)	Evening peak hour (PCU/hr)	12 hours (PCU)	24 Hours (PCU)
Holidays (continued)	MB9	Highway 4009	Entering the city	696	713	8,062	8868
			Out of town	809	790	9,037	9941
			Total	**1,505**	**1,503**	**17,099**	**18,809**
	MB10	Si Kasem Road	Entering the city	631	646	7,311	8043
			Out of town	733	698	8,163	8979
			Total	**1,364**	**1,344**	**15,474**	**17,022**
	MB11	Chon Kasem Road	Entering the city	819	828	9,422	10365
			Out of town	949	914	10,556	11612
			Total	**1,768**	**1,742**	**19,979**	**21,977**
	MB12	Talat Mai Road	Entering the city	1,723	1,743	19,101	21011
			Out of town	1,658	1,555	17,485	19234
			Total	**3,381**	**3,298**	**36,586**	**40,245**
	MB13	Kanchanavithi Road	Entering the city	1,344	1,365	15,804	17385
			Out of town	1,404	1,345	16,005	17606
			Total	**2,748**	**2,710**	**31,810**	**34,991**
	MB14	Highway 401	Entering the city	1,125	1,123	13,102	14412
			Out of town	1,187	1,145	13,473	14821
			Total	**2,312**	**2,268**	**26,575**	**29,233**
	MB15	Highway 420	Entering the city	1,136	1,315	15,535	17089
			Out of town	1,338	1,323	15,121	16633
			Total	**2,474**	**2,638**	**30,656**	**33,721**
	MB16	Highway 420	Entering the city	545	615	6,171	6788
			Out of town	716	615	6,654	7320
			Total	**1,261**	**1,230**	**12,825**	**14,108**
	MB17	SNI 2007	Entering the city	418	434	4,810	5291
			Out of town	459	440	5,166	5682
			Total	**877**	**874**	**9,975**	**10,973**

4.9.5 Survey of information obtained from public opinion hearings

From the project introduction seminar and the 1st subgroup meeting, opinions were given on the issues and suggestions that are beneficial to the project in order to lead to the conclusion of the problems and suggestions for the development plan of the public transportation system and the development plan of the traffic system. as follows

1) Current public transportation services

- Problem
  - Public transportation bus users have more choices from taxis.
  - The number of tourists using the service has decreased because tour companies and boat service providers are their own operators, such as Pantip Phangan Tour, Citran. Raja Ferry and Lompraya
  - Changes in people's travel behavior From Covid-19
  - Changes in car quality cost a lot of money.
  - The current fare is not cost-effective.
- Suggestion
  - Proposed to hire a taxi Application Register correctly.
  - Provincial transport should adjust the route to suit the current trip.
  - Integrated car, rail, boat and air travel

2) Opinions on the public transportation routes that have been studied

- Participants were of the opinion that the development of complementary services is necessary.
- Today's entrepreneurs are ready to adapt to become feeders.
- It is proposed that the municipality be hired to operate the bus.
- Currently, tuk-tuks do not run along the route because the number of service users has decreased.

3) Opinions on traffic problems in the study area

- Talat Mai Road The area of Thepnimit School, Thaksin Hospital and Surat Thani Vocational College.
- Na Muang Road The area of Po Wai School - Po Wai Market because the road is narrow and there are cars parked on the side of the road.

4.9.6 Summary of Traffic Problems

According to Surat Thani Province It is possible to summarize the problems related to the development of public transportation. as follows

1) More travel options: More public transport users are turning to taxi services through applications. This has reduced the number of public transportation users. In addition, tourists turn to the services of tour companies and boat operators who arrange their own trips. This has led to a decrease in bus users.

2) High cost of improving vehicle quality: Improving bus quality to a high standard requires a large budget. Meanwhile, the current fare collected from passengers is not enough to cover the cost of service.
3) Traffic jams: In some areas such as Talat Mai Road, Thepnimit School area, Thaksin Hospital, and Surat Thani Vocational College. The road is narrow and there is parking on the side of the road. This causes traffic jams and inconveniences in travel.
4) The fact that local people do not use the GO Surat Thani application makes it inconvenient to access travel information, including changes in travel behavior where people turn to taxi services through the application instead of using public transportation. As a result, the number of public transportation users has decreased. In addition, the forecast of an increasing aging population will also affect the planning of future transportation services. There is also the problem of high costs in improving the quality of transportation services. Meanwhile, the fare is not enough to cover the cost. At the same time, traffic congestion due to narrow roads and parking on the side of the road is another important problem that needs to be solved, including the lack of effective public relations channels to access information on public transportation services.

4.10 Phuket

4.10.1 Household Interview Survey (HIS)

The survey results on household travel data showed that most of the respondents lived in single-family houses. The primary purposes of travel were commuting to work (Home Base Work, HBW) and other purposes (Home Base Other, HBO), with an average of 37.1 percent and 48.5 percent, respectively. The main modes of transportation were motorcycles (MC) at an average of 61.5 percent, followed by private cars (PC) at 37.9 percent. The total travel volume was 1,288,937 person-trips per day, with an average public transportation usage rate of 0.6 percent. The average household size was 2.42 persons per household, and the average household income was 26,767.78 baht. The average number of trips per household was 1.00, as shown in **Table 4.10-1.**

Table 4.10-1 Summary of the results of the survey on household travel data

Household Travel Information	Survey Results
Population (people)	**818,000**[1]
Number of samples	**1,200**
Type of Residence	
Detached House	57.08%
Commercial buildings	32.42%
Townhouse/Semi House	8.5%
Condominium/Apartment/Flat/Dormitory/Condominium	1.0%
Other	1.0%
Trip Purpose	
Home Base Work (HBW)	37.1%
Home Base Education (HBE)	2.3%
Home Base Other (HBO)	48.5%
None Home Base (NHB)	12.2%
Mode Share	
Personal Cars (PC)	37.9%
Motorcycle (MC)	61.5%
Public Transportation (PT)	0.6%
People trips (trips-person/day)	**1,288,937** [2]
Personal Cars (PC)	489,023
Motorcycle (MC)	792,825
Public Transportation (PT)	7,089
Average Household Size	**2.42**
Average household income (Baht)	**26,767.78**
Number of trips/number of households	**1.00**

note: [1] The population in the study area of Phuket Province is a figure that includes latent population estimates.

[2] The trip volume is derived from the model. Trip Generation Model obtained from household travel survey data.

4.10.2 Origin-Destination (OD Survey)

The results of the survey on travel data from origin to destination points showed that most trips were for other purposes (Home Base Other, HBO) and for commuting to work (Home Base Work, HBW) and an average of 36.1 percent and 43.8 percent, respectively. The main modes of transportation were cars, pickup trucks, SUVs, and personal vans, an average of 87.75 percent, followed by motorcycles at an average of 10.88 percent, as shown in **Table 4.10-2.**

Table 4.10-2 Summary of the survey results of the survey of travel data from origin to destination

Travel information from origin to destination	Survey Results
Trip Purpose	
Home Base Work (HBW)	43.8%
Home Base Education (HBE)	1.8%
Home Base Other (HBO)	36.1%
None Home Base (NHB)	18.3%
Mode Share	
Motorcycle	10.88%
Car/Pickup Truck/SUV/Personal Van	87.75%
Semi-public transport	1.0%
Public Transportation	0.38%

4.10.3 Travel behavior data of tourists and visitors

Survey results on tourist and visitor behavior found that 54.0 percent of respondents were Thai nationals and 46.0 percent were foreigners. The average age was 38.6 years, and the average monthly income was 73,631.25 Baht. Approximately 97.0 percent of respondents resided in the study area. The main modes of transportation in the study area were categorized as other modes (motorcycles and cars) at an average of 34.4 percent, followed by taxi/app driver services and rental cars at averages of 25.0 percent and 21.8 percent, respectively. Awareness of the existence of good public transportation services in the area was unknown. The top three factors that respondents considered most important when choosing public transportation were: (1) number of trips, service frequency, and waiting time; (2) ticket fares; and (3) hours of operation. Respondents rated the necessity of having a good public transportation system for the development of this city at 8.5 points out of 10, and the likelihood of using public transportation if it were good at 8.3 points out of 10, as shown in **Table 4.10-3.**

Table 4.10-3 Summary of the survey on tourist and visitor behavior

Tourist and visitor behavior data	Survey Results
Nationality	
Thailand	54.0%
Foreign	46.0%
Average age	38.6
Average Monthly Income (Baht)	73,631.25
Location of Accommodation	
Inside The Study Area	97.0%
Outside The Study Area	3.0%
Transportation patterns in the study area	
Taxi	21.8%
Taxi/App Driver	25.0%
Public Transportation	18.8%
Other	34.4%
Awareness of the existence of public transportation services in the area.	
I don't know any information.	26.2%
I know and have some information.	52.7%
Know and think that there is enough information.	21.0%
Be well informed or have experience in using the service.	-
Good public transport To what extent is it necessary for the development of this city?	8.5
If there is good public transportation. What level of public transport is likely to be used?	8.3
What are the most important factors in choosing public transport?	
Number of trips, frequency of service, waiting time	21.9%
Ticket price	16.8%
Duration of service	16.8%
The service route covers all the important places.	11.1%
Facilities at the bus stop	13.2%
Quality of service in public transportation (comfortable, clean)	3.5%
Route Information System Schedule and ticket purchase via online/app	5.9%
Safety and Security	10.7%

4.10.4 Mid-Block Traffic Count (MB)

The consultant conducted a traffic volume survey on road sections (Mid-Block Count: MB) in the Phuket City study area during 9–10 February 2024, using a total of 21 automated camera points. The results of the traffic volume survey on these road sections are shown in **Table 4.10-4.**

Table 4.10-4 Survey results of traffic volume on roads in the Phuket Town Study Area

Survey Date	Survey Points	Position	Direction	Morning peak hour (PCU/hr)	Evening peak hour (PCU/hr)	12 Hours (PCU)	24 Hours (PCU)
Weekdays	MB1	Highway 402	inbound	1,044	1,018	10,481	11529
			Departure	949	1,159	10,191	11211
			Total	**1,993**	**2,177**	**20,672**	**22,739**
	MB2	Highway 402	inbound	1,199	1,142	13,809	15190
			Departure	1,179	1,234	13,787	15166
			Total	**2,378**	**2,376**	**27,596**	**30,356**
	MB4	Highway 402	inbound	1,112	1,064	12,791	14070
			Departure	1,071	1,118	12,522	13774
			Total	**2,183**	**2,182**	**25,313**	**27,844**
	MB5	Highway 4031	inbound	300	232	2,701	2971
			Departure	280	301	2,844	3129
			Total	**580**	**533**	**5,545**	**6,100**
	MB8	Highway 402	inbound	1,838	2,197	17,953	19748
			Departure	2,021	1,905	18,658	20524
			Total	**3,859**	**4,102**	**36,611**	**40,272**
	MB9	Highway 4027	inbound	684	683	6,745	7420
			Departure	608	670	6,277	6905
			Total	**1,292**	**1,353**	**13,022**	**14,325**
	MB10	Highway 4030	inbound	316	320	3,649	4014
			Departure	315	286	3,250	3575
			Total	**631**	**606**	**6,900**	**7,590**
	MB11	Highway 402	inbound	1,483	1,768	14,440	15884
			Departure	1,627	1,533	15,012	16513
			Total	**3,110**	**3,301**	**29,453**	**32,398**
	MB12	Highway 4027	inbound	997	975	9,658	10624
			Departure	870	979	9,005	9905
			Total	**1,867**	**1,954**	**18,663**	**20,529**
	MB13	Highway 4025	inbound	480	516	5,854	6439
			Departure	486	494	5,537	6090
			Total	**966**	**1,010**	**11,390**	**12,530**
	MB14	PKT 4018	inbound	440	478	4,554	5010
			Departure	432	402	4,037	4441
			Total	**872**	**880**	**8,592**	**9,451**
	MB15	Highway 4030	inbound	278	286	3,061	3367
			Departure	279	252	2,896	3186
			Total	**557**	**538**	**5,957**	**6,553**

Table 4.10-5 Survey Results of Traffic Volume on the Road in the Phuket Town Study Area (Continued)

Survey Date	Survey Points	Position	Direction	Morning peak hour (PCU/hr)	Evening peak hour (PCU/hr)	12 Hours (PCU)	24 Hours (PCU)
Weekdays (Continued)	MB16	Highway 4024	inbound	1,460	1,380	12,040	13244
			Departure	1,436	1,501	12,858	14144
			Total	**2,896**	**2,881**	**24,898**	**27,388**
	MB17	Highway 4020	inbound	1,050	977	10,759	11835
			Departure	971	1,046	10,731	11804
			Total	**2,021**	**2,023**	**21,490**	**23,639**
	MB18	Highway 4021	inbound	832	1,061	10,080	11088
			Departure	825	813	9,250	10175
			Total	**1,657**	**1,874**	**19,330**	**21,263**
	MB19	Highway 4024	inbound	1,945	1,938	19,768	21745
			Departure	1,833	1,901	19,356	21291
			Total	**3,778**	**3,839**	**39,124**	**43,036**
	MB20	Highway 4030	inbound	661	610	7,092	7801
			Departure	712	654	7,563	8319
			Total	**1,373**	**1,264**	**14,655**	**16,121**
	MB21	Highway 4028	inbound	479	468	5,207	5727
			Departure	544	362	4,828	5311
			Total	**1,023**	**830**	**10,035**	**11,039**
	MB22	Highway 402	inbound	775	675	7,920	8712
			Departure	786	639	8,108	8919
			Total	**1,561**	**1,314**	**16,028**	**17,630**
	MB23	Highway 402	inbound	943	891	10,755	11831
			Departure	917	955	10,651	11716
			Total	**1,860**	**1,846**	**21,406**	**23,547**
	MB24	PKT 3033	inbound	135	151	1,449	1594
			Departure	138	141	1,330	1463
			Total	**273**	**292**	**2,779**	**3,057**
Holiday	MB1	Highway 402	inbound	1,191	1,165	11,957	13153
			Departure	1,080	1,321	11,623	12786
			Total	**2,271**	**2,486**	**23,580**	**25,938**
	MB2	Highway 402	inbound	1,383	1,311	15,888	17476
			Departure	1,360	1,423	15,874	17462
			Total	**2,743**	**2,734**	**31,762**	**34,938**
	MB4	Highway 402	inbound	1,281	1,216	14,715	16186
			Departure	1,229	1,288	14,399	15839
			Total	**2,510**	**2,504**	**29,114**	**32,025**
	MB5	Highway 4031	inbound	347	270	3,133	3446
			Departure	325	348	3,297	3627
			Total	**672**	**618**	**6,430**	**7,073**

Table 4.10-6 Survey Results of Traffic Volume on the Road in the Phuket Town Study Area (Continued)

Survey Date	Survey Points	Position	Direction	Morning peak hour (PCU/hr)	Evening peak hour (PCU/hr)	12 Hours (PCU)	24 Hours (PCU)
Holidays (Continued)	MB8	Highway 402	inbound	2,044	2,442	19,936	21930
			Departure	2,287	2,151	21,113	23225
			Total	**4,331**	**4,593**	**41,049**	**45,154**
	MB9	Highway 4027	inbound	790	783	7,757	8533
			Departure	694	773	7,211	7932
			Total	**1,484**	**1,556**	**14,968**	**16,465**
	MB10	Highway 4030	inbound	364	373	4,200	4620
			Departure	355	328	3,706	4076
			Total	**719**	**701**	**7,906**	**8,696**
	MB11	Highway 402	inbound	1,702	2,036	16,615	18276
			Departure	1,867	1,763	17,249	18973
			Total	**3,569**	**3,799**	**33,863**	**37,249**
	MB12	Highway 4027	inbound	1,154	1,131	11,203	12323
			Departure	1,013	1,127	10,463	11509
			Total	**2,167**	**2,258**	**21,665**	**23,832**
	MB13	Highway 4025	inbound	556	614	6,790	7469
			Departure	565	580	6,408	7049
			Total	**1,121**	**1,194**	**13,198**	**14,518**
	MB14	PKT 4018	inbound	504	550	5,216	5738
			Departure	500	461	4,654	5119
			Total	**1,004**	**1,011**	**9,870**	**10,857**
	MB15	Highway 4030	inbound	319	338	3,554	3909
			Departure	326	297	3,377	3715
			Total	**645**	**635**	**6,931**	**7,624**
	MB16	Highway 4024	inbound	1,674	1,588	13,839	15223
			Departure	1,651	1,722	14,781	16259
			Total	**3,325**	**3,310**	**28,620**	**31,482**
	MB17	Highway 4020	inbound	1,198	1,107	12,234	13458
			Departure	1,105	1,189	12,216	13438
			Total	**2,303**	**2,296**	**24,451**	**26,896**
	MB18	Highway 4021	inbound	964	1,233	11,699	12868
			Departure	953	948	10,724	11797
			Total	**1,917**	**2,181**	**22,423**	**24,665**
	MB19	Highway 4024	inbound	2,259	2,212	22,590	24849
			Departure	2,089	2,170	22,049	24254
			Total	**4,348**	**4,382**	**44,639**	**49,103**
	MB20	Highway 4030	inbound	755	699	8,190	9010
			Departure	815	757	8,692	9561
			Total	**1,570**	**1,456**	**16,883**	**18,571**

Table 4.10-7 Survey Results of Traffic Volume on the Road in the Phuket Town Study Area (Continued)

Survey Date	Survey Points	Position	Direction	Morning peak hour (PCU/hr)	Evening peak hour (PCU/hr)	12 Hours (PCU)	24 Hours (PCU)
Holidays (Continued)	MB21	Highway 4028	inbound	555	545	6,046	6651
			Departure	631	422	5,608	6169
			Total	**1,186**	**967**	**11,654**	**12,820**
	MB22	Highway 402	inbound	899	785	9,176	10094
			Departure	912	745	9,406	10346
			Total	**1,811**	**1,530**	**18,582**	**20,440**
	MB23	Highway 402	inbound	1,063	958	12,379	13617
			Departure	1,061	1,104	12,353	13588
			Total	**2,124**	**2,062**	**24,732**	**27,205**
	MB24	PKT 3033	inbound	155	175	1,677	1844
			Departure	159	162	1,533	1686
			Total	**314**	**337**	**3,210**	**3,531**

4.10.5 Survey of information obtained from public opinion hearings

From the project introduction seminar and the 1st subgroup meeting, opinions were given on the issues and suggestions that are beneficial to the project in order to lead to the conclusion of the problems and suggestions for the development plan of the public transportation system and the development plan of the traffic system. as follows

1) Current public transportation services

- Problem
  - Changes in people's travel behavior From Covid-19
  - The number of users of public transportation has decreased due to the popularity of application and black-label taxi services because of the pick-up and drop-off from the beginning to the destination.
  - Currently, there is a capital group that has opened a travel service business for foreign tourists from Russia and China.
- Puggestion
  - It is proposed that there be a group of Phuket mass transportation systems by the private sector to jointly develop transportation, such as private bus cooperatives, to oversee the public transportation system of the whole island.
  - We propose to have an EV Bus in Phuket.
  - I propose a law to control application vehicles from running in service.

2) Opinions on traffic problems in the study area

- Feasibility Study and Design of Phuket Mass Transit System on International Aircraft Route – Five intersections
- We propose to add a route to Rawai Beach.

- It is proposed to amend the law so that public transportation operators in the city can operate along the international airport route. – Five intersections

4.10.6 Summary of Traffic Problems

According to Phuket Province It is possible to summarize the problems related to the development of public transportation. as follows

1) Changes in travel behavior after COVID-19: COVID-19 Pandemic As a result, people's travel behavior has changed. More people are turning to taxi services through applications and personal vehicles. Due to its convenience and ability to control time. This change has caused the number of public transportation users to continue to decrease.
2) Limitations of public transportation: The public transportation system that exists today cannot compete with private vehicles. Because of the lack of convenience and flexibility in use, such as scheduling travel schedules that cannot be adjusted as needed. This makes people choose to use personal vehicles more.
3) Traffic congestion: Heavy traffic problems on major routes, such as the route from the international airport to Chalong intersection and other areas in urban areas, cause slower travel and inconvenience in using public transportation. This traffic jam is also an obstacle that prevents passengers from choosing to use public transportation.
4) Suggestions for the development of public transportation in Phuket include private cooperation in the development of public transportation systems. To increase convenience and streamlining of management. By building cooperation between various operators such as private bus cooperatives to provide efficient and comprehensive services in all areas. In addition, the use of electric buses (EV buses) should be encouraged, which will reduce travel pollution and support sustainable tourism in Phuket. Expanding transportation routes to major tourist destinations such as Rawai Beach and improving existing routes to cover more areas. It will help the public transportation system to better support the travel of the public and tourists. In addition, laws related to public transportation services should be updated and regulated. In particular, the control of taxi services through applications so that the public transportation system can compete effectively with other services.

4.11 Songkhla Province (Hat Yai District)

4.11.1 Household Interview Survey (HIS)

The results of the household travel survey showed that most of the sampled residences were townhouses or shophouses. The main travel purposes were commuting to work (Home Base Work, HBW) and for other purposes (Home Base Other, HBO), with average proportions of 50.2 percent and 34.3 percent, respectively. The primary modes of transportation were private cars (PC), with an average of 50.0 percent, followed by motorcycles (MC) at 48.9 percent. The total number of person trips was 626,154 trips/person/day. The average proportion of public transportation usage was 1.1 percent. The average household size was 1.76 persons per household, with an average household income of 26,164 Baht. The average number of trips per household was 5.32 trips, as shown in **Table 4.11-1.**

Table 4.11-1 Summary of the results of the survey on household travel data

Household Travel Information	Survey Results
Population (people)	**404,000**[1]
Number of samples	**1,724**
Type of Residence	
Detached House	36.14%
Commercial buildings	49.19%
Townhouse/Semi House	14.27%
Condominium/Apartment/Flat/Dormitory/Condominium	0.11%
other	0.29%
Trip Purpose	
Home Base Work (HBW)	50.2%
Home Base Education (HBE)	6.8%
Home Base Other (HBO)	34.3%
None Home Base (NHB)	8.8%
Mode Share	
Personal Cars (PC)	50.0%
Motorcycle (MC)	48.9%
Public Transportation (PT)	1.1%
People trips (trips-person/day)	**626,154** [2]
Personal Cars (PC)	313,077
Motorcycle (MC)	306,064
Public Transportation (PT)	7,013
Average Household Size	**1.76**
Average household income (Baht)	**26,193.65**
Number of trips/number of households	**5.32**

note: [1] Sub-district population from the Department of Administration Ministry of Home Affairs only for sub-districts in the project study area.

[2] The trip volume is derived from the model. Trip Generation Model obtained from household travel survey data.

4.11.2 Origin-Destination (OD Survey)

The results of the origin–destination travel survey showed that most trips were made for other purposes (Home Base Other, HBO) and commuting to work (Home Base Work, HBW), with average percentages of 48.4 percent and 20.1 percent, respectively. The main mode of transportation was private vehicles—including cars, pick-up trucks, SUVs, and personal vans—accounting for an average of 81.99 percent, followed by motorcycles at 17.64 percent, as shown in **Table 4.11-2.**

Table 4.11-2 Summary of the survey results of the survey of travel data from origin to destination

Travel information from origin to destination	Survey Results
Trip Purpose	
Home Base Work (HBW)	20.1%
Home Base Education (HBE)	2.4%
Home Base Other (HBO)	48.4%
None Home Base (NHB)	29.1%
Mode Share	
Motorcycle	17.64%
Car/Pickup Truck/SUV/Personal Van	81.99%
Semi-public transport	0.37%
Public Transportation	-

4.11.3 Travel behavior data of tourists and visitors

Survey results on tourist and visitor behavior found that 77.5 percent of respondents were Thai nationals and 22.5 percent were foreigners. The average age was 40.2 years and the average monthly income was 49,238 Baht. Approximately 73.4 percent of respondents lived in the study area. The main modes of transportation used in the study area were taxi/app driver services at 38.7 percent, other private modes (motorcycles and cars) at 37.7 percent, and public transportation at 22.5 percent. Respondents generally lacked awareness of the existence of public transportation services in the area. The top three factors influencing the choice of public transportation were comprehensive service routes covering key locations, quality of service such as comfort and cleanliness, and ticket fares. Respondents rated the importance of a good public transportation system for city development at 8.8 out of 10, and the likelihood of using public transportation if it were improved at 8.3 out of 10, as shown in **Table 4.11-3.**

Table 4.11-3 Summary of the survey on tourist and visitor behavior

Tourist and visitor behavior data	Survey Results
Nationality	
Thailand	77.5%
Foreign	22.5%
Average age	**40.2**
Average Monthly Income (Baht)	**49,237.50**
Location of Accommodation	
Inside The Study Area	73.4%
Outside The Study Area	26.6%
Transportation patterns in the study area	
Taxi	16.8%
Taxi/App Driver	37.7%
Public Transportation	38.7%
Other	6.7%
Awareness of the existence of public transportation services in the area.	
I don't know any information.	11.0%
I know and have some information.	55.5%
Know and think that there is enough information.	60.6%
Be well informed or have experience in using the service.	-
What are the most important factors in choosing public transport?	
Number of trips, frequency of service, waiting time	10.2%
Ticket price	12.5%
Duration of service	5.7%
The service route covers all the important places.	34.6%
Facilities at the bus stop	4.1%
Quality of service in public transportation (comfortable, clean)	21.5%
Route Information System Schedule and ticket purchase via online/app	0.0%
Safety and Security	11.4%

4.11.4 Mid-Block Traffic Count (MB)

The consultant conducted a traffic volume survey on road sections (Mid-Block Count: MB) in the study area of Hat Yai city from February 9 to 10, 2024, using a total of 7 automated cameras. The results of the traffic volume survey on the road sections are shown in **Table 4.11-4.**

Table 4.11-4 Survey results of traffic volume on the road in the Songkhla City Study Area

Survey Date	Survey Points	Position	Direction	Morning peak hour (PCU/hr)	Evening peak hour (PCU/hr)	12 hours (PCU)	24 Hours (PCU)
Weekdays	MB1	Highway 4135	inbound	1,622	1,522	15,015	16,516
			Departure	1,410	1,553	15,560	17,116
			Total	**3,032**	**3,075**	**30,574**	**33,632**
	MB2	Highway 4	inbound	1,785	1,515	15,451	16,996
			Departure	1,452	1,493	15,844	17,429
			Total	**3,237**	**3,008**	**31,296**	**34,425**
	MB3	Highway 4	inbound	1,335	1,136	11,593	12,752
			Departure	1,080	1,124	11,886	13,074
			Total	**2,415**	**2,260**	**23,479**	**25,827**
	MB4	Highway 4135	inbound	1,629	1,360	14,195	15,615
			Departure	1,525	1,262	14,086	15,494
			Total	**3,154**	**2,622**	**28,281**	**31,109**
	MB5	Highway 4	inbound	1,815	1,469	15,315	16,846
			Departure	1,457	1,668	14,834	16,318
			Total	**3,272**	**3,137**	**30,149**	**33,164**
	MB6	Highway 4	inbound	1,185	1,412	13,315	14,647
			Departure	1,335	1,162	14,013	15,415
			Total	**2,520**	**2,574**	**27,329**	**30,062**
	MB7	Highway 407	inbound	1,394	1,533	13,436	14,780
			Departure	1,514	1,472	13,467	14,814
			Total	**2,908**	**3,005**	**26,903**	**29,593**
	MB8	Highway 407	inbound	824	821	8,648	9,513
			Departure	964	1,025	8,513	9,365
			Total	**1,788**	**1,846**	**17,161**	**18,877**
	MB9	Highway 414	inbound	2,091	1,982	18,464	20,310
			Departure	1,729	1,765	19,025	20,927
			Total	**3,820**	**3,747**	**37,488**	**41,237**
	MB10	Highway 407	inbound	2,151	2,354	20,652	22,717
			Departure	2,326	2,268	20,777	22,855
			Total	**4,477**	**4,622**	**41,429**	**45,572**
	MB11	SKA 2085	inbound	804	883	7,708	8,479
			Departure	915	896	8,207	9,028
			Total	**1,719**	**1,779**	**15,916**	**17,507**
	MB12	Highway 4	inbound	1,310	1,307	12,294	13,523
			Departure	1,234	1,239	12,370	13,608
			Total	**2,544**	**2,546**	**24,664**	**27,131**
	MB13	Nipat Songkhro 1 Road	inbound	937	934	8,751	9,627
			Departure	861	863	8,645	9,510
			Total	**1,798**	**1,797**	**17,396**	**19,136**
	MB14	Highway 414	inbound	2,609	2,466	23,171	25,488
			Departure	2,163	2,213	23,844	26,229
			Total	**4,772**	**4,679**	**47,015**	**51,717**
	MB15	Highway 414	inbound	1,571	1,479	13,853	15,238
			Departure	1,299	1,324	14,294	15,724
			Total	**2,870**	**2,803**	**28,147**	**30,962**
	MB16	SKA 2029	inbound	925	1,024	8,915	9,806
			Departure	1,000	975	8,960	9,856
			Total	**1,925**	**1,999**	**17,874**	**19,662**

Table 4.11-5 Survey of Traffic Volume on Roads in Songkhla City Study Area (Continued)

Survey Date	Survey Points	Position	Direction	Morning peak hour (PCU/hr)	Evening peak hour (PCU/hr)	12 hours (PCU)	24 Hours (PCU)
Weekdays	MB17	Highway 4	inbound	1,328	1,457	12,771	14,048
			Departure	1,438	1,403	12,828	14,111
			Total	**2,766**	**2,860**	**25,599**	**28,159**
	MB18	Highway 4	inbound	1,943	1,504	16,814	18,495
			Departure	1,421	1,236	14,032	15,435
			Total	**3,364**	**2,740**	**30,846**	**33,930**
Holiday	MB1	Highway 4135	inbound	1,842	1,732	17,114	18,825
			Departure	1,606	1,769	17,691	19,460
			Total	**3,448**	**3,501**	**34,805**	**38,286**
	MB2	Highway 4	inbound	2,015	1,718	17,469	19,216
			Departure	1,629	1,692	17,892	19,681
			Total	**3,644**	**3,410**	**35,361**	**38,897**
	MB3	Highway 4	inbound	1,538	1,306	13,337	14,671
			Departure	1,237	1,287	13,659	15,025
			Total	**2,775**	**2,593**	**26,996**	**29,696**
	MB4	Highway 4135	inbound	1,873	1,561	16,316	17,948
			Departure	1,736	1,457	16,088	17,697
			Total	**3,609**	**3,018**	**32,404**	**35,645**
	MB5	Highway 4	inbound	2,066	1,666	17,469	19,216
			Departure	1,656	1,897	17,002	18,702
			Total	**3,722**	**3,563**	**34,471**	**37,918**
	MB6	Highway 4	inbound	1,341	1,610	15,049	16,554
			Departure	1,513	1,328	15,975	17,572
			Total	**2,854**	**2,938**	**31,024**	**34,126**
	MB7	Highway 407	inbound	1,606	1,759	15,494	17,044
			Departure	1,742	1,687	30,921	34,013
			Total	**3,348**	**3,446**	**46,415**	**51,057**
	MB8	Highway 407	inbound	931	927	9,766	10,742
			Departure	1,086	1,160	9,612	10,573
			Total	**2,017**	**2,087**	**19,378**	**21,315**
	MB9	Highway 414	inbound	2,402	2,277	21,432	23,576
			Departure	1,988	2,034	21,900	24,090
			Total	**4,390**	**4,311**	**43,332**	**47,665**
	MB10	Highway 407	inbound	2,425	2,666	23,327	25,660
			Departure	2,623	2,552	23,429	25,772
			Total	**5,048**	**5,218**	**46,756**	**51,431**
	MB11	SKA 2085	inbound	917	1,013	8,818	9,700
			Departure	1,047	1,020	9,384	10,323
			Total	**1,964**	**2,033**	**18,203**	**20,023**
	MB12	Highway 4	inbound	1,497	1,497	14,024	15,426
			Departure	1,402	1,417	14,105	15,515
			Total	**2,899**	**2,914**	**28,128**	**30,941**
	MB13	Nipat Songkhro 1 Road	inbound	1,079	1,076	10,066	11,073
			Departure	987	989	9,976	10,974
			Total	**2,066**	**2,065**	**20,042**	**22,046**
	MB14	Highway 414	inbound	3,001	2,841	26,513	29,164
			Departure	2,479	2,541	27,388	30,127
			Total	**5,480**	**5,382**	**53,901**	**59,291**
	MB15	Highway 414	inbound	1,767	1,672	15,629	17,191
			Departure	1,496	1,494	16,144	17,759
			Total	**3,263**	**3,166**	**31,773**	**34,950**
	MB16	SKA 2029	inbound	1,046	1,155	10,087	11,095
			Departure	1,134	1,097	10,126	11,138
			Total	**2,180**	**2,252**	**20,212**	**22,233**

Table 4.11-6 Survey of Traffic Volume on Roads in Songkhla City Study Area (Continued)

Survey Date	Survey Points	Position	Direction	Morning peak hour (PCU/hr)	Evening peak hour (PCU/hr)	12 hours (PCU)	24 Hours (PCU)
Holiday	MB17	Highway 4	inbound	1,528	1,678	14,701	16,171
			Departure	1,655	1,609	14,756	16,232
			Total	**3,183**	**3,287**	**29,458**	**32,403**
	MB18	Highway 4	inbound	2,240	1,733	19,335	21,269
			Departure	1,627	1,417	16,110	17,721
			Total	**3,867**	**3,150**	**35,445**	**38,989**

4.11.5 Survey of information obtained from public opinion hearings

From the project introduction seminar and the 1st subgroup meeting, opinions were given on the issues and suggestions that are beneficial to the project in order to lead to the conclusion of the problems and suggestions for the development plan of the public transportation system and the development plan of the traffic system. as follows

1) Current public transportation services

- Problem
  - Changes in people's travel behavior From Covid-19
  - The number of users of public transportation has decreased due to the popularity of application and black-label taxi services because of the pick-up and drop-off from the beginning to the destination.
  - Application for Taxi to run over the route of public transportation
  - The turning point at the irrigation canal road. There are many accidents.
- Suggestion
  - Propose that taxi applications be registered correctly and bid on routes to compete with existing operators in the area correctly.
  - The development of public transportation in the future should consider the expansion of people outside the city.
  - The government should have a budget to help public transportation operators.

2) Opinions on traffic problems in the study area

- Traffic jams are in the morning and evening and on Saturdays. The local people can adapt, so it is not much of a problem.
- It is proposed to use automatic traffic lights.
- Solve the problem of cars parked on the side of the road during rush hours.
- Currently, the Mahidol Ring area There are schools that encourage parents to drop off students in shopping malls and have feeders to pick up students to school to solve the problem of traffic jams caused by immigration.

4.11.6 Summary of Traffic Problems

According to Songkhla Province It is possible to summarize the problems related to the development of public transportation. as follows

1) The urban development of Songkhla Province is a development that mainly relies on the road system and private vehicles. Urban Sprawl Development is a development along the road. It is not very dense growth.
2) Although Songkhla Province is mainly dependent on private vehicles. However, because Songkhla Province is an old town and most of the road areas are quite narrow, causing traffic jams during rush hour.
3) Inefficient public transportation It is not possible to compete with private vehicles because Songkhla Province is a city with a good economy. Most people have enough income to own a private vehicle. Schedule Control costs and quickly. Therefore, most people are increasingly turning to private vehicles, and this is a cycle that causes the proportion of public transportation services that exist today to continue to decrease. However, Public transportation systems available today There are many services from tourists. Especially within urban areas, some service providers charge different rates than regular service providers. These could also be tourism problems in the future.
4) From the Urban Sprawl Development model combined with the dependence on personal vehicles. This makes the journey of Songkhla people continue to increase the distance. In addition, motorcycle driving in Songkhla has relatively little traffic discipline, which causes frequent accidents, which is the leading cause of death in Songkhla.
5) Non-standard transportation infrastructure It does not promote very efficient transportation , such as unclear traffic signs. Narrow, rough sidewalks with many obstacles, unsafe bicycle paths, as well as buildings or parts of buildings protruding into the traffic route. These are all ways to reduce the distance on foot and by bicycle, which is a mode of transportation that supports major public transportation.

Chapter 5

Transportation and Traffic Model Development

Chapter 5 Transportation and Traffic Model Development

In accordance with Scope of Work Part 4, the consultant developed a transportation and traffic model for the study area. This involved designing and developing the model's structure, from data import planning to forecasting future travel demand. The consultant will analyze and develop models for both the base year and future years. The base year model will be calibrated for 2023, and future year models will be created for 2027, 2032, 2037, 2042, 2047, 2052, and 2057. This model will cover the A.M. Peak, P.M. Peak, and daily travel, analyzing the impact of public transport route network reforms. It will also be used to analyze plans, projects, and measures for public transport and traffic system development in 11 regional cities.

5.1 Transportation and Traffic Model Development Methodology for This Study

In the transportation planning work of this project, a four-step traffic model was developed and applied. This model comprises: (1) Trip Generation Model, (2) Trip Distribution Model (3) Mode Choice Model and (4) Trip Assignment Model. This process is illustrated in **Figure 5.1-1**. The model was constructed using traffic data, highway network data, travel data, and socioeconomic data of travelers, all collected from surveys within the study area.

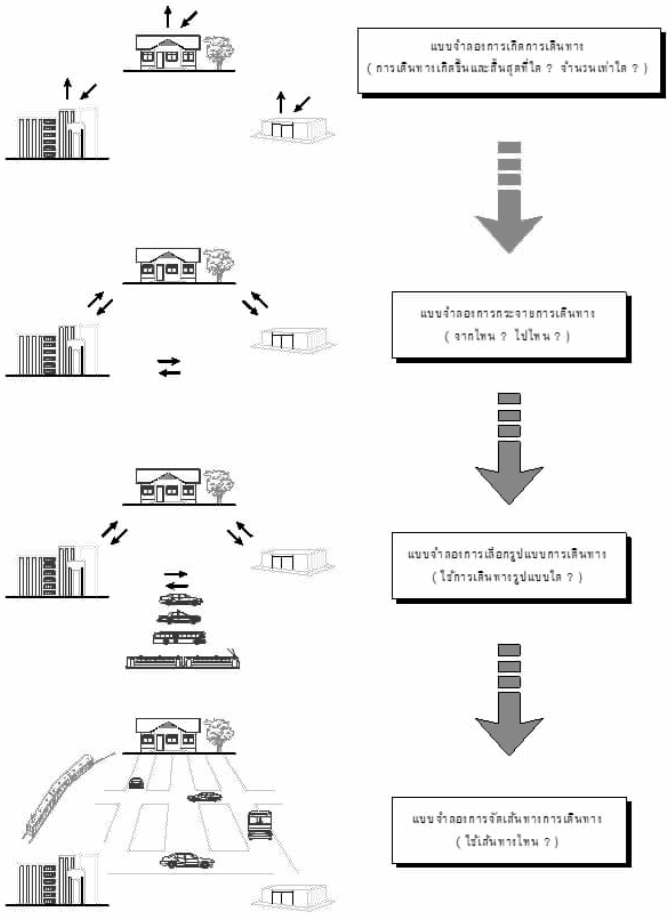


Figure 5.1-1 4-Step Model

5.2 Zone Delineation (TAZ)

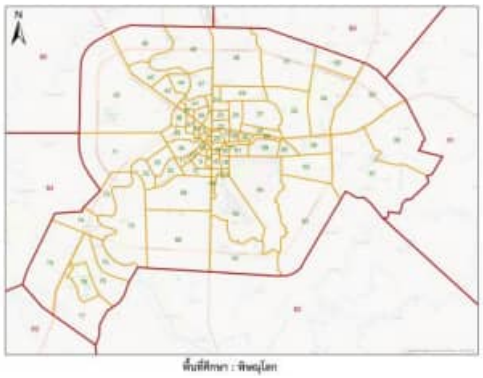
The subdivision of the study area into smaller units (Traffic Zones) aims to facilitate the analysis of travel volumes originating from each sub-area. These traffic zones serve as representative origins and destinations for trips. The size and number of these sub-areas depend on the specific requirements of each study and the characteristics of the study area, as illustrated in **Figure 5.2-1**.

For **Group 1 cities**, which have existing and well-established models, the original number of traffic zones will be maintained. However, for **Group 2 cities**, where no previous model development has occurred and new models are necessary, new **Traffic Analysis Zones (TAZs)** will be defined. This new delineation will consider the local context, existing road networks, current land use, and the principles and theories of model development for urban areas.

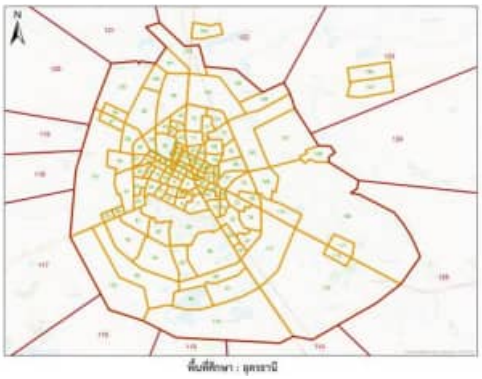
Additionally, in this study, a new requirement for zone delineation was introduced: the number of households within any given sub-area should not be less than 400. (This target, with a sampling rate of 1%, would equate to approximately 4 households or 6-7 travelers). Exceptions are made in cases of extreme necessity, where the smallest sub-area must still contain a minimum of 100 households.

(A) Chiang Mai

(B) Chiang Rai



(C) Phitsanulok



(D) Udon Thani

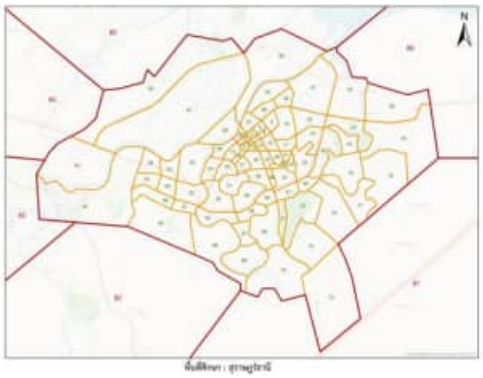
Figure 5.2-1 Zone Delineation in the 11-Province Study Area

(E) Khon Kaen

(F) Nakhon Ratchasima

(G) Ubon Ratchathani

(H) Phra Nakhon Si Ayutthaya



(I) Surat Thani

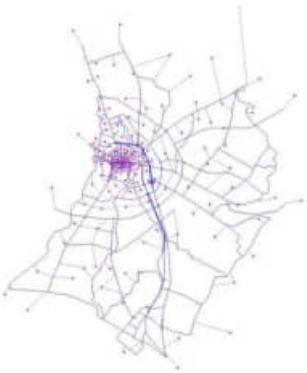
(J) Phuket

(K) Songkhla (Hat Yai)

Figure 5.2-1 Zone Delineation in the 11-Province Study Area (Cont.)

5.3 Road Network in the Model

The road network within the model represents the interconnected travel paths between areas, comprising road segments and intersections. Road segments are categorized into main roads and secondary roads, each serving distinct functions and service levels. For this study, it's essential to collect comprehensive road network data, including road attributes, for use in the analysis phase. This data helps determine the traffic volume on each road segment. The roads themselves represent the supply component, while traffic volume signifies the demand. Furthermore, we gathered and reviewed planned road network projects within the study area. This information will be combined with current traffic volume data to understand existing travel conditions on the road network and to identify planned projects that will accommodate future traffic growth. Key data sources include road network information from relevant government agencies such as the Department of Rural Roads, Department of Highways, and Department of Public Works and Town & Country Planning. Additionally, current road network data was cross-referenced and verified to ensure higher accuracy, as depicted in **Figure 5.3-1**.



(A) Chiang Mai

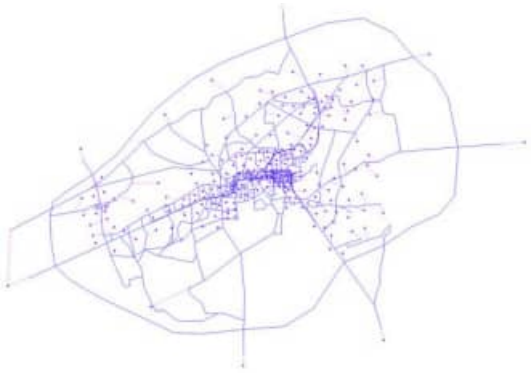
(B) Chiang Rai

(C) Phitsanulok

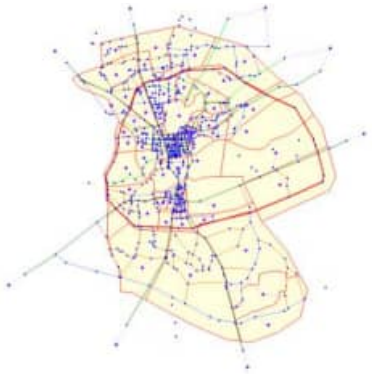
(D) Udon Thani

Figure 5.3-1 Road Network in the Model for the 11-Province Study Area

(E) Khon Kaen



(F) Nakhon Ratchasima



(G) Ubon Ratchathani

(H) Phra Nakhon Si Ayutthaya

(I) Surat Thani

(J) Phuket

(K) Songkhla (Hat Yai)

Figure 5.3-1 Road Network in the Model for the 11-Province Study Area (Cont.)

5.4 Trip Generation

The Trip Generation Model analyzes the volume of trips originating from (Trip Production) and entering (Trip Attraction) each sub-area within the study. This trip volume correlates with fundamental area data, such as population, number of laborers, and average income. Several methods can forecast trip generation, including Regression Analysis, Trip Rate Analysis, and Cross Classification Analysis. Currently, the regression equation method is popular because it effectively illustrates the relationship between factors that generate and attract travel.

The Aggregate Model, which considers the overall behavior of travelers, utilizes the Multiple Linear Regression method. Its form is shown in Equation (1). This method is convenient for adjustments and allows for a rational and reliable comparison of trip rates obtained from the analysis with the variables used to establish the relationship. The strength of the relationship between variables in the model equation is evaluated using the Coefficient of Determination (R^2). Additionally, the T-Test is performed to check if the coefficients are non-zero at a 95% Level of Confidence.

$$Y = a_1X_1 + a_2X_2 + \ldots + a_nX_n + C \quad (1)$$

Where:

Y = Dependent variable, representing the total travel volume for a given sub-area.

$X_1, \ldots, X_n$ = Independent variables, representing basic area data (e.g., population, area income).

$a_1, \ldots, a_n$ = Coefficients of the independent variables.

C = Constant term.

From the analysis of data collected through the household travel survey across the 11 study provinces, the results for travel volume by trip purpose can be summarized in **Table 5.4-1** and **Table 5.4-2**.

Table 5.4-1 Results of Travel Volume Analysis by Trip Purpose in the 11-Province Study Area - 1

Trip Purpose	Chiang Mai		Chiang Rai		Phitsanulok		Udon Thani		KhonKaen		Nakhon Ratchasima	
	Travel Volume (person-trips/day)	%	Travel Volume (person-trips/day)	%	Travel Volume (person-trips/day)	%	Travel Volume (person-trips/day)	%	Travel Volume (person-trips/day)	%	Travel Volume (person-trips/day)	%
HBW	490,210	49.8	76,638	49.8	98,943	39.0	HBW	130,715	209,245	42.0	301,490	44.5
HWE	82,784	8.4	9,445	6.1	38,800	15.3	HWE	17,141	62,398	12.5	103,242	15.2
HBO	300,555	30.6	59,428	38.6	88,359	34.8	HBO	183,810	176,627	35.4	202,049	29.8
NHB	109,978	11.2	8,346	5.4	27,893	11.0	NHB	26,574	50,255	10.1	70,902	10.5
รวม	**983,526**	**100.0**	**153,857**	**100.0**	**253,995**	**100.0**	**รวม**	**358,240**	**498,526**	**100.0**	**677,683**	**100.0**

Table 5.4-2 Results of Travel Volume Analysis by Trip Purpose in the 11-Province Study Area - 2

Trip Purpose	Ubon Ratchathani		Phra Nakhon Si Ayutthaya		Surat Thani		Phuket		Songkhla (Hat Yai)	
	Travel Volume (person-trips/day)	%	Travel Volume (person-trips/day)	%	Travel Volume (person-trips/day)	%	Travel Volume (person-trips/day)	%	Travel Volume (person-trips/day)	%
HBW	152,659	40.5	77,371	35.9	149,459	51.7	477,777	37.1	314,030	50.2
HWE	67,172	17.8	8,256	3.8	22,020	7.6	29,398	2.3	42,420	6.8
HBO	116,751	31.0	93,324	43.3	100,559	34.8	624,768	48.5	214,805	34.3
NHB	40,183	10.7	36,492	16.9	17,071	5.9	156,865	12.2	54,961	8.8
รวม	**376,765**	**100.0**	**215,442**	**100.0**	**289,110**	**100.0**	**1,288,808**	**100.0**	**626,216**	**100.0**

From the collected survey data, the consultant developed travel equations based on the principles of Regression Analysis. This involved analyzing travel characteristics by Trip Purpose, separating them into a Trip Production Model and a Trip Attraction Model, as shown in **Table 5.1-1** to **Table 5.1-11**

Figure 5.1-1 Trip Generation Model of Chiang Mai Province

Trip Purpose	Model	R^2
Trip Production Model		
HBW	= 37.31 + 0.52*Population + 0.08*Employee + 12.19*Avg_Person_Income	0.73
HWE	= 300.26 + 0.04*Population + 0.01*Student + 7.38*Avg_Person_Income	0.66
HBO	= 812.20 + 0.24*Population + 18.85*Avg_Person_Income	0.69
NHB	= 138.25 + 0.09*Population + 16.74*Avg_Person_Income	0.70
Trip Attraction Model		
HBW	= 385.73 + 0.91*Employment + 14.74*Avg_Person_Income	0.72
HWE	= 99.33 + 0.51*Education + 3.69*Avg_Person_Income	0.71
HBO	= 603.24 + 0.46*Employment + 9.34*Avg_Person_Income	0.69
NHB	= 219.17 + 0.15*Employment + 10.52*Avg_Person_Income	0.72

Figure 5.1-2 Trip Generation Model of Chiang Rai Province

Trip Purpose	Model	R^2
Trip Production Model		
HBW	= 252.032+0.034*Population + 0.013*Employment + 20.799*Avg_Income	0.61
HWE	= 52.198 + 0.005*Population + 0.001*Student + 3.348*Avg_Income	0.61
HBO	= 201.987 + 0.022*Population + 12.647*Avg_Income	0.64
NHB	= 30.396 + 0.004*Population + 2.242*Avg_Income	0.69
Trip Attraction Model		
HBW	= 141.186+0.42*Employment + 7.949*Avg_Income	0.73
HWE	= 61.693 + 0.59*Student + 1.767*Avg_Income	0.96
HBO	= 162.58 + 0.16*Employment + 9.044*Avg_Income	0.70
NHB	= 22.414 + 0.03*Employment + 1.128*Avg_Income	0.78

Table 5.1-3 Trip Generation Model of Phitsanulok Province

Trip Purpose	Model	R^2
Trip Production Model		
HBW	= 430.953 + 0.062*Population + 0.024*Employment + 19.247*Avg_Income	0.65
HWE	= 208.428 + 0.02*Population + 0.003*Student + 7.195*Avg_Income	0.80
HBO	= 478.396 + 0.048*Population + 15.814*Avg_Income	0.82
NHB	= 131.825 + 0.022*Population + 5.218*Avg_Income	0.63
Trip Attraction Model		
HBW	= 450.125 + 0.22*Employment + 17.288*Avg_Income	0.74
HWE	= 38.644 + 0.67*Student + 9.531*Avg_Income	0.98
HBO	= 375.078 + 0.21*Employment + 16.338*Avg_Income	0.74
NHB	= 145.706 + 0.07*Employment + 5.609*Avg_Income	0.73

Table 5.1-4 Trip Generation Model of Udon Thani Province

Trip Purpose	Model	R^2
Trip Production Model		
HBW	= 424.722 + 0.038*Population + 0.094*Employment + 9.971*Avg_Income	0.63
HWE	= 162.97 + 0.014*Population + 0.047*Student + 3.887*Avg_Income	0.63
HBO	= 755.145 + 0.003*Population + 12.871*Avg_Income	0.64
NHB	= 132.137 + 0.001*Population + 2.013*Avg_Income	0.64
Trip Attraction Model		
HBW	= 608.181 + 0.031*Employment + 10.175*Avg_Income	0.63
HWE	= 165.796 + 0.101*Student + 3.958*Avg_Income	0.86
HBO	= 734.93 + 0.038*Employment + 12.741*Avg_Income	0.64
NHB	= 124.944 + 0.006*Employment + 2.075*Avg_Income	0.61

Table 5.1-5 Trip Generation Model of Khon Kaen Province

Trip Purpose	Model	R^2
Trip Production Model		
HBW	= 580.485 + 0.021*Population + 0.109*Employment + 32.438*Avg_Income	0.90
HWE	= 255.133 + 0.015*Population + 0.03*Student + 9.132*Avg_Income	0.87
HBO	= 785.034 + 0.03*Population + 28.173*Avg_Income	0.86
NHB	= 195.142 + 0.01*Population + 9.012*Avg_Income	0.90
Trip Attraction Model		
HBW	= 409.779 + 0.42*Employment + 29.299*Avg_Income	0.81
HWE	= 182.834 + 0.32*Student + 10.589*Avg_Income	0.92
HBO	= 525.79 + 0.27*Employment + 23.771*Avg_Income	0.88
NHB	= 132.227 + 0.11*Employment + 9.41*Avg_Income	0.83

Table 5.1-6 Trip Generation Model of Nakhon Ratchasima Province

Trip Purpose	Model	R^2
Trip Production Model		
HBW	= 779.326 + 0.015*Population + 0.123*Employment + 24.736*Avg_Income	0.78
HWE	= 214.25 + 0.023*Population + 0.044*Student + 7.043*Avg_Income	0.83
HBO	= 565.428 + 0.026*Population + 16.473*Avg_Income	0.84
NHB	= 202.392 + 0.01*Population + 6.121*Avg_Income	0.84
Trip Attraction Model		
HBW	= 375.289 + 0.501*Employment + 26.508*Avg_Income	0.80
HWE	= 310.416 + 0.031*Student + 8.305*Avg_Income	0.82
HBO	= 431.693 + 0.356*Employment + 16.066*Avg_Income	0.84
NHB	= 18.476 + 0.18*Employment + 6.031*Avg_Income	0.89

Table 5.1-7 Trip Generation Model of Ubon Ratchathani Province

Trip Purpose	Model	R^2
Trip Production Model		
HBW	= 770.014 + 0.064*Population + 0.024*Employment + 34.826*Avg_Income	0.80
HWE	= 368.428 + 0.023*Population + 0.003*Student + 16.257*Avg_Income	0.93
HBO	= 576.896 + 0.056*Population + 27.843*Avg_Income	0.79
NHB	= 188.158 + 0.023*Population + 9.327*Avg_Income	0.89
Trip Attraction Model		
HBW	= 650.792 + 0.25*Employment + 38.488*Avg_Income	0.71
HWE	= 255.787 + 0.37*Student + 14.6741*Avg_Income	0.84
HBO	= 426.745 + 0.28*Employment + 25.578*Avg_Income	0.81
NHB	= 145.381 + 0.1*Employment + 8.39*Avg_Income	0.83

Table 5.1-8 Trip Generation Model of Phra Nakhon Si Ayutthaya Province

Trip Purpose	Model	R^2
Trip Production Model		
HBW	= 567.025 + 0.064*Population + 0.024*Employment + 24.526*Avg_Income	0.77
HWE	= 20.428 + 0.023*Population + 0.003*Student + 1.457*Avg_Income	0.68
HBO	= 506.896 + 0.056*Population + 22.643*Avg_Income	0.66
NHB	= 178.158 + 0.023*Population + 7.327*Avg_Income	0.78
Trip Attraction Model		
HBW	= 545.792 + 0.21*Employment + 25.488*Avg_Income	0.72
HWE	= 38.787 + 0.37*Student + 1.9741*Avg_Income	0.78
HBO	= 406.745 + 0.22*Employment + 20.578*Avg_Income	0.80
NHB	= 165.381 + 0.06*Employment + 7.39*Avg_Income	0.71

Table 5.1-9 Trip Generation Model of Surat Thani Province

Trip Purpose	Model	R^2
Trip Production Model		
HBW	= 767.001 + 0.064*Population + 0.024*Employment + 21.526*Avg_Income	0.86
HWE	= 91.428+ 0.023*Population + 0.003*Student + 3.057*Avg_Income	0.94
HBO	= 486.896 + 0.056*Population + 15.643*Avg_Income	0.86
NHB	= 60.158 + 0.023*Population + 1.927*Avg_Income	0.96
Trip Attraction Model		
HBW	= 645.792 + 0.2*Employment + 21.488*Avg_Income	0.70
HWE	= 95.787 + 0.35*Student + 3.0741*Avg_Income	0.74
HBO	= 421.745 + 0.2*Employment + 12.578*Avg_Income	0.80
NHB	= 40.381 + 0.07*Employment + 1.89*Avg_Income	0.94

Table 5.1-10 Trip Generation Model of Phuket Province

Trip Purpose	Model	R^2
Trip Production Model		
HBW	= 1473.631 + 0.118*Population + 0.238*Employment + 0.167*Avg_Income	0.73
HWE	= 88.291 + 0.008*Population + 0.06*Student + 0.102*Avg_Income	0.78
HBO	= 1851.58 + 0.388*Population + 2.24*Avg_Income	0.70
NHB	= 453.088 + 0.098*Population + 1.013*Avg_Income	0.70
Trip Attraction Model		
HBW	= 1625.474 + 0.598*Employment + 2.292*Avg_Income	0.86
HWE	= 107.694 + 0.5*Student + 1.51*Avg_Income	0.86
HBO	= 2066.595 + 0.72*Employment + 20.734*Avg_Income	0.84
NHB	= 606.976 + 0.176*Employment + 2.011*Avg_Income	0.84

Table 5.1-11 Trip Generation Model of Songkhla Province (Hat Yai)

Trip Purpose	Model	R^2
Trip Production Model		
HBW	= 1009.826 + 0.007*Population + 0.12*Employment + 37.532*Avg_Income	0.86
HWE	= 80.583 + 0.027*Population + 0.011*Student + 4.2193*Avg_Income	0.75
HBO	= 735.317 + 0.026*Population + 26.59*Avg_Income	0.87
NHB	= 180.892 + 0.01*Population + 6.514*Avg_Income	0.91
Trip Attraction Model		
HBW	= 854.523 + 0.22*Employment + 36.577*Avg_Income	0.85
HWE	= 124.416 + 0.22*Student + 4.759*Avg_Income	0.74
HBO	= 501.148 + 0.221*Employment + 21.572*Avg_Income	0.87
NHB	= 103.488 + 0.07*Employment + 5.711*Avg_Income	0.89

Population : Total population within each zone (persons)

Avg_Person_Income : Average per capita income within each zone (thousand Baht/person/year)

Employee : Number of employed persons within each sub-area (persons)

Student : Number of students within each sub-area (persons)

Employment : Total employment within each sub-area (persons)

Education : Total number of students within each sub-area (persons)

The consultant verified travel in 2024 that falls outside of normal daily trips, identifying these as Special Generators. This includes trips associated with various transport terminals, as shown in **Table 5.1-12** to **Table 5.4-11.**

Table 5.1-1 Special Generator Travel Volume for Chiang Mai Province

Station	Travel Volume (person-trips/day)
Airport	22,527
Bus Terminal 1	1,758
Bus Terminal 2	4,402
Bus Terminal 3	6,642
Railway Station	588
Total	**35,917**

Table 5.1-2 Special Generator Travel Volume for Chiang Rai Province

Station	Travel Volume (person-trips/day)
Airport	2,655
Bus Terminal 1	7,737
Bus Terminal 2	4,470
Total	**14,863**

Table 5.1-3 Special Generator Travel Volume for Phitsanulok Province

Station	Travel Volume (person-trips/day)
Airport	562
Bus Terminal 1	13,195
Bus Terminal 2	19,170
Railway Station	241
Total	**33,168**

Table 5.1-4 Special Generator Travel Volume for Udon Thani Province

Station	Travel Volume (person-trips/day)
Airport	2,466
Bus Terminal 1	12,748
Bus Terminal 2	4,868
Railway Station	286
Total	**20,367**

Table 5.1-5 Special Generator Travel Volume for Khon Kaen Province

Station	Travel Volume (person-trips/day)
Airport	2,095
Bus Terminal 3	26,326
Railway Station	373
Total	**28,793**

Table 5.1-6 Special Generator Travel Volume for Nakhon Ratchasima Province

Station	Travel Volume (person-trips/day)
Bus Terminal 1	27,375
Bus Terminal 2	28,219
Railway Station	1,489
Total	**57,083**

Table 5.1-7 Special Generator Travel Volume for Ubon Ratchathani Province

Station	Travel Volume (person-trips/day)
Airport	1,688
Bus Terminal 1	11,149
Railway Station	1,223
Total	**14,060**

Table 5.1-8 Special Generator Travel Volume for Phra Nakhon Si Ayutthaya Province

Station	Travel Volume (person-trips/day)
Railway Station	2,332

Table 5.1-9 Special Generator Travel Volume for Surat Thani Province

Station	Travel Volume (person-trips/day)
Airport	1,767
Bus Terminal	3,041
Railway Station	262
Total	**5,070**

Table 5.1-10 Special Generator Travel Volume for Phuket Province

Station	Travel Volume (person-trips/day)
Airport	17,791
Bus Terminal	2,086
Total	**19,877**

Table 5.4-11 Special Generator Travel Volume for Songkhla Province (Hat Yai)

Station	Travel Volume (person-trips/day)
Airport	4,381
Bus Terminal 1	16,081
Bus Terminal 2	4,092
Railway Station	612
Total	**25,167**

5.5 Trip Distribution Model

The Trip Distribution Model analyzes where trips originate from and where they are destined. Generally, there are two primary methods for building trip distribution models: the Growth Factors method and the Gravity Model. The Gravity Model is a widely used technique in traffic planning for distributing trips. It operates by using a measured resistance (friction) for travel between any origin-destination zone pair (commonly travel time or distance), similar to Newton's law of gravity.

In this study, the Doubly Constrained Gravity Model was developed for trip distribution, as shown in Equation (2) and under the constraints presented in Equations (3) and (4). This method was chosen because it allows travel characteristics to change based on the measured resistance (time, distance), which better reflects future travel behavior compared to the Growth Factors method, where future travel characteristics do not significantly differ from the current year.

$$T_{ij} = \alpha_i \cdot \beta_j \cdot P_i \cdot A_j \cdot F(c_{ij}) \quad (2)$$

$$\Sigma_j T_{ij} = P_i \quad (3)$$

$$\Sigma_i T_{ij} = A_j \quad (4)$$

Where:

T_{ij} = Travel volume from sub-area i to sub-area j

P_i = Total trip production for sub-area i

A_j = Total trip attraction for sub-area j

$F(c_{ij})$ = Impedance function for travel between sub-area i and sub-area j

α_i, β_j = Balancing factors for row i and column j respectively

The Exploit Form of Impedance Function for travel between sub-areas is obtained through calibration against base year travel behavior. The result of this calibration yields a travel matrix that is consistent with the constraints on both production (travel originating from an area) and attraction (travel attracted to an area). This study specifically employs a Combined Impedance Function for travel between sub-areas, as it effectively models common travel behaviors. Its equation form is presented in Equation (5).

$$F(c_{ij}) = c_{ij}^{x1} \cdot \exp(x_2 \cdot c_{ij}) \quad (5)$$

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$F(c_{ij})$ = Impedance function for travel between sub-area i and sub-area j

C = Travel cost between sub-area i and sub-area j

X_1 และ X_2 = Constants derived from calibration using base year travel behavior

The Trip Distribution Model utilizes the Gravity Model equation. The values for X_1 and X_2 are obtained by calibrating the model with data from the household travel survey. The calibration results for the Gravity Model, providing X_1 and X_2 values disaggregated by trip purpose, are shown in **Table 5.5-1**.

Table 5.5-1 Calibration Results of the Gravity Model (X_1, X_2 values) by Trip Purpose

Trip Purpose	X_1	X_2
HBW	-0.8137	-0.0507
HWE	-0.6820	-0.0449
HBO	-0.9830	-0.0443
NHB	-0.9456	-0.0395

5.6 Modal Split Model

The Mode Choice Model analyzes the proportion of trips made by different travel modes. For this study, we defined two primary travel modes: Private Transport (personal vehicles or equivalents) and Public Transport (available within the study area).

The theoretical framework for analyzing travel mode choice behavior is called Discrete Choice Modeling, based on the Logit Choice Model. This model assumes that when travelers face a choice of transportation options, they will select the mode that provides them with the highest utility. The utility of each travel mode is described as a linear relationship between independent variables and the utility value (which acts as the dependent variable). The probability of choosing a specific travel mode is then explained using probability theory, allowing for model construction as shown in Equation (6) and Equation (7).

$$\%\, public = \frac{1}{1 + e^{(cons. + \beta_c * X_c + \beta_t * X_t)}} \quad (6)$$

$$\%\, private = 1 - (\%\, pubic) \quad (7)$$

Where:

$\%_i$: Probability that traveler n chooses travel mode i (in this case, private mode and public mode).

$cons.$: Constant for choice i.

β_c : Coefficient for the cost of travel by private mode.

β_t : Coefficient for the value of time spent traveling by private mode.

X_c : Cost of travel by private mode (Vehicle Operating Cost, VOC, in Baht/km).

X_t : Cost of time spent traveling by private mode (Travel time divided by Value of Time, VOT).

For this study, Private Mode travel is further divided into two categories: (1) Passenger Car (PC): This includes sedans, personal pickup trucks used for passenger transport, SUVs, personal vans, and taxis/ride-sharing vehicles (App car sharing) and (2) Motorcycle. Public Mode refers to public buses.

Meanwhile, freight trucks and commercial trucks are analyzed as a separate group. In this study, the proportion of trucks derived from Mid-block (MB) traffic counts and Annual Average Daily Traffic (AADT) data from each study area is used. This proportion is then calculated as an incremental traffic volume to be assigned onto the network within the model, along with the primary Private and Public modes.

The Mode Choice Model utilizes a Binomial Logit Model for analysis. The calibrated model variables and travel volumes disaggregated by vehicle type are presented in **Table 5.6-1**. Based on the analysis results, travel volumes by vehicle type are further broken down in **Table 5.6-2** to **Table 5.6-5**.

Table 5.6-1 Analysis Results of Variables by Trip Purpose

No.	Study Area	*con1*	β_c	β_t	*con2*	β_{pt}
1	Chiang Mai	5.3473	-0.0370	-0.0048	0.9120	-0.0170
2	Chiang Rai	5.3473	-0.0370	-0.0048	1.0250	-0.0170
3	Phitsanulok	5.3473	-0.0370	-0.0048	1.0897	-0.0170
4	Udon Thani	5.3473	-0.0370	-0.0048	2.3897	-0.0270
5	Khon Kaen	5.3473	-0.0370	-0.0048	2.4197	-0.0270
6	Nakhon Ratchasima	5.3473	-0.0370	-0.0048	1.8520	-0.0270
7	Ubon Ratchathani	5.3473	-0.0370	-0.0048	1.9500	-0.0270
8	Phra Nakhon Si Ayutthaya	5.3473	-0.0370	-0.0048	1.9500	-0.0520
9	Surat Thani	6.3473	-0.0370	-0.0048	1.0250	-0.0170
10	Phuket	6.3295	-0.0370	-0.0048	2.4500	-0.0170
11	Songkhla (Hat Yai)	6.3473	-0.0370	-0.0048	1.4250	-0.0170

Table 5.6-2 Analysis Results of Travel Volume by Vehicle Type - 1

Vehicle Type	Chiang Mai		Chiang Rai		Phitsanulok	
	Travel Volume (Person-trip/day)	%	Travel Volume (Person-trip/day)	%	Travel Volume (Person-trip/day)	%
Passenger Car	541,923	55.1	59,035	38.4	101,888	40.1
Motorcycle	405,213	41.2	91,437	59.4	146,341	57.6
Public Transit	36,390	3.7	3,385	2.2	5,792	2.3
Total	**971,008**	**100.0**	**153,857**	**100.0**	**254,021**	**100.0**

Table 5.6-3 Analysis Results of Travel Volume by Vehicle Type - 2

Vehicle Type	Udon Thani		Khon Kaen		Nakhon Ratchasima	
	Travel Volume (Person-trip/day)	%	Travel Volume (Person-trip/day)	%	Travel Volume (Person-trip/day)	%
Passenger Car	139,664	39.0	216,211	43.4	274,502	40.5
Motorcycle	192,391	53.7	241,935	48.5	371,401	54.8
Public Transit	26,149	7.3	40,381	8.1	31,712	4.7
Total	**358,204**	**100.0**	**498,526**	**100.0**	**677,616**	**100.0**

Table 5.6-4 Analysis Results of Travel Volume by Vehicle Type - 3

Vehicle Type	Ubon Ratchathani		Phra Nakhon Si Ayutthaya		Surat Thani	
	Travel Volume (Person-trip/day)	%	Travel Volume (Person-trip/day)	%	Travel Volume (Person-trip/day)	%
Passenger Car	144,150	38.3	111,341	51.7	107,780	37.3
Motorcycle	213,550	56.7	95,549	44.4	180,838	62.6
Public Transit	19,064	5.1	8,553	4.0	491	0.2
Total	**376,765**	**100.0**	**215,442**	**100.0**	**289,110**	**100.0**

Table 5.6-5 Analysis Results of Travel Volume by Vehicle Type - 4

Vehicle Type	Phuket		Songkhla (Hat Yai)	
	Travel Volume (Person-trip/day)	%	Travel Volume (Person-trip/day)	%
Passenger Car	553,470	42.9	313,077	50.0
Motorcycle	728,378	56.5	306,064	48.9
Public Transit	7,089	0.6	7,013	1.1
Total	**1,288,937**	**100.0**	**626,154**	**100.0**

5.7 Trip Assignment

The Trip Assignment Model analyzes and assigns (distributes) the travel volume between any sub-areas onto the existing road network and transportation system. Applying this model yields results concerning traffic conditions, including traffic volume on various routes and driving conditions within the travel network, such as speed and travel time along routes. This information can then indicate the overall traffic situation. Several widely used techniques exist for assigning trips onto the road network in a model, including All-or-Nothing, Incremental, Capacity Restraint, User Equilibrium, Stochastic User Equilibrium, and System Optimum. In this study, the User Equilibrium method is employed for the trip assignment model, with its equations and conditions shown in Equation (8) to Equation (10). This method balances travel time (or cost) across different routes between the same zone pair, providing an exact solution. Other methods, such as the Incremental method, yield an approximate solution that is close to the exact value.

$$\text{Min} \sum_{a \in A} \int_{0}^{V_a} C_a(\mathbf{V}) d\mathbf{V} \tag{8}$$

Under the following conditions:

$$\sum_{\gamma \in R_{ij}} v_r^{ij} = q_{ij} \qquad \forall_{ij} \in I, J \tag{9}$$

$$v_r^{ij} \geq 0 \qquad \forall_{ij} \in R_{ij}, ij \in I, J \tag{10}$$

Where:

C_a = Travel cost on Link a

A = Set of all links a

V^{ij}_r = Travel volume between zone pair i and j on route r

q_{ij} = Travel demand between zone pair i and j

5.8 Model Calibration

Before applying the developed model, it must undergo calibration and validation to ensure its accuracy and reliability. This process, known as Model Calibration, assesses the model's accuracy by comparing the predicted traffic volumes on the current road network (Predicted) with the actual traffic volumes obtained from the project's traffic survey data (Observed).

The consultant calibrated and validated the model using two main data sets: current traffic volumes collected on the road network and observed travel speeds on the same network. For calibrating the model with current traffic volumes, screen line analysis was performed. The details of the screen lines, along with the calibration and validation results for traffic volume and travel speed, are presented in **Chapter 6 of the Final Report**.

5.9 Forecasted Travel Behavior within the Study Area Using the Developed Model

Once the model has been calibrated and validated for its consistency in simulating base year travel behavior, it can be applied to analyze and forecast future traffic volumes or other scenarios, assuming that travel behavior doesn't change over time. This model analyzed project traffic within the timeframe specified in the study's requirements. The analysis timeframe starts from the anticipated completion year of construction and extends every 5 years into the future, up to 30 years (2027, 2032, 2037, 2042, 2047, 2052, and 2057). This covers A.M. Peak, P.M. Peak, and Daily travel. The detailed operations are as follows:

- Future Travel Behavior Forecasting Horizon: Future travel behavior within the study area will be forecasted across seven testing periods: 2027, 2032, 2037, 2042, 2047, 2052, and 2057 (every 5 years). The year 2027 was chosen as the starting year for forecasting because it aligns with key milestones in the current master plan under the National Strategy and the Ministry of Transport's action plan.
- Key Variables for Future Travel Demand: The main variables used to determine future travel demand (in the Trip Generation Model stage) include: population within the study area, provincial gross product, average per capita income, labor force, number of students, employment, and education in each sub-area for future years. These variables are derived from trend analysis based on historical real data.
- Public Transport Mode Shift Target: A crucial objective of this study is to drive development that encourages increased public transport usage within the study area, aiming to meet the Ministry of Transport's specified indicators. The target is to increase the public transport mode share from the current level to 10% by 2027 in three pilot provinces (Phuket, Chiang Mai, and Nakhon Ratchasima), and further increase it to 20% by 2032 and 2037 for all 11 regional cities included in this study.

- Phased Testing Scenarios: Based on the aforementioned targets, the consultant has defined a stepwise procedure with six sequential steps (Steps) for testing. If a test in any given Step fails to achieve the public transport mode share target, the process proceeds to the next Step as follows:
  - **Step 1: Do Nothing**: This involves testing the travel volume and public transport mode share within the study area under a no-action scenario. The purpose is to evaluate whether the current situation can meet the Ministry of Transport's target indicators. If not, proceed to the next Step.
  - **Step 2: With Existing Development Plan**: For study areas that have previously undergone public transport system study and design projects (e.g., Chiang Mai, Phitsanulok, Udon Thani, Khon Kaen, Ubon Ratchathani, Phra Nakhon Si Ayutthaya, Phuket, and Hat Yai), this Step tests the travel volume and public transport mode share resulting from implementing projects according to these pre-existing plans. It evaluates if these plans can meet the Ministry of Transport's target indicators. If not, proceed to the next Step.
  - **Step 3: With PT Network Improvement/Extension Plan**: If the previously studied and designed public transport system cannot meet the Ministry of Transport's target indicators, this Step tests proposed network improvements resulting from the current study. These improvements might include modifying or extending existing service routes, or adding new service routes. Subsequently, the travel volume and public transport mode share within the study area are tested under these proposed enhancements to see if the Ministry of Transport's target indicators can be met. If not, proceed to the next Step.
  - **Step 4: Price-Strategy Plan**: If network improvements alone are insufficient to achieve the Ministry of Transport's target indicators, this Step tests the impact of reducing service fares (from those used in past studies). Fares will be incrementally reduced until the Ministry of Transport's targets are met. However, if fare reductions are no longer feasible but targets remain unmet, proceed to the next Step.
  - **Step 5: Travel Demand Management Policy Adaptation**: If further fare reductions are not possible and the system still cannot achieve the Ministry of Transport's public transport mode share targets, other measures will be tested, such as Road Pricing and Congestion Charge. These measures may initially be applied to congested areas like business districts or major tourist attractions. The intensity of these measures will be increased until the set targets are achieved.
  - **Step 6: Travel Demand Management Policy Adaptation – Car-free Zone**: This Step involves testing more stringent measures, specifically restricting private car use in the areas tested in Step 5. Private vehicles will be prohibited in these designated zones.

5.9.1 Model Development Results for the Chiang Mai Study Area

For the test results of public transport system development in the Chiang Mai study area, the consultant selected the forecasted results for the year 2037. This year aligns with the development target outlined in the Master Plan under the National Strategy and so on. These results illustrate the impact of public transport development measures from Cases 1 to 6, as shown in **Table 5.9-1**.

Table 5.9-1 Forecasted Travel Volume and Public Transport Mode Share in Chiang Mai Study Area under Public Transport Development Measures Cases 1 to 6 as of 2037

Test Case	Average Travel Volume (person-trips/day		Public Transport Mode Share
	Other Vehicles	Public Transport	
Case 1: No Action (Do Nothing)	952,082	41,389	3.53%
Case 2: With Existing Development Plan	774,561	149,038	13.67%
Case 3: With PT Network Improvement/Extension Plan	745,676	166,555	15.32%
Case 4: Price-Strategy Plan (Fare Sensitivity Test)	676,286	208,633	19.28%
Case 5: Travel Demand Management Policy Adaptation	665,531	215,154	19.90%
Case 6: Travel Demand Management Policy Adaptation – Car-free Zone in City Center	553,342	223,594	20.73%

From the analysis of the public transport system development measures' impact in 2037 via the model, we can summarize the comparative results for each case study as follows:

- **Baseline Scenario (Do Nothing):** Without any intervention, public transport ridership is projected to be 41,389 person-trips/day, representing a mode share of just 3.53%.
- **Cases 2 & 3 (Network Development):** Implementing planned projects and further network improvements increased the public transport mode share to 13.67% and 15.32%, respectively.
- **Case 4 (Fare Exemption Policy):** This policy led to a significant increase in public transport mode share to 19.28%, though it still fell short of the target.
- **Case 5 (Fare Exemption + Congestion Charge Policy):** The public transport mode share peaked at 19.90% (215,154 person-trips/day) under this scenario, but it still did not meet the set target.
- **Case 6 (Fare Exemption + Private Vehicle Ban):** This was the only scenario that achieved the defined target, boosting public transport ridership to 20.73% (223,594 person-trips/day).

5.9.2 Model Development Results for the Chiang Rai Study Area

For the test results of public transport system development in the Chiang Rai study area, the consultant selected the forecasted results for the year 2037. This year aligns with the development target outlined in the Master Plan under the National Strategy and so on. These results illustrate the impact of public transport development measures from Cases 1 to 6, as shown in **Table 5.9-2**.

Table 5.9-2 Forecasted Travel Volume and Public Transport Mode Share in Chiang Rai Study Area under Public Transport Development Measures Cases 1 to 6 as of 2037

Test Case	Average Travel Volume (person-trips/day		Public Transport Mode Share
	Other Vehicles	Public Transport	
Case 1: No Action (Do Nothing)	215,275	7,423	2.14%
Case 3: With PT Network Improvement/Extension Plan	210,661	10,634	6.34%
Case 4: Price-Strategy Plan (Fare Sensitivity Test)	206,253	13,702	10.37%
Case 5: Travel Demand Management Policy Adaptation	201,718	16,854	14.50%
Case 6: Travel Demand Management Policy Adaptation – Car-free Zone in City Center	182,297	23,669	23.38%

From the analysis of the public transport system development measures' impact in 2037 via the model, we can summarize the comparative results for each case study as follows:

- **Baseline Scenario (Do Nothing):** With no interventions, public transport ridership is projected to be 7,423 person-trips/day, making up a mere 2.14% mode share.
- **Case 3 (Network Development):** Further network improvements boosted the public transport mode share to 6.34%.
- **Case 4 (Fare Exemption Policy):** This policy led to an increase in public transport mode share to 10.37%, though it still fell short of the target.
- **Case 5 (Fare Exemption + Congestion Charge Policy):** Under this scenario, the public transport mode share reached its highest at 14.50% (16,854 person-trips/day), but it still didn't meet the set target.
- **Case 6 (Fare Exemption + Private Vehicle Ban):** This was the only scenario that achieved the defined target, pushing the public transport mode share up to 23.38% (23,669 person-trips/day).

5.9.3 Model Development Results for the Phitsanulok Study Area

For the test results of public transport system development in the Phitsanulok study area, the consultant selected the forecasted results for the year 2037. This year aligns with the development target outlined in the Master Plan under the National Strategy and so on. These results illustrate the impact of public transport development measures from Cases 1 to 6, as shown in **Table 5.9-3**.

Table 5.9-3 Forecasted Travel Volume and Public Transport Mode Share in Phitsanulok Study Area under Public Transport Development Measures Cases 1 to 6 as of 2037

Test Case	Average Travel Volume (person-trips/day		Public Transport Mode Share
	Other Vehicles	Public Transport	
Case 1: No Action (Do Nothing)	347,557	8,475	2.18%
Case 2: With Existing Development Plan	324,901	23,518	9.87%
Case 3: With PT Network Improvement/Extension Plan	321,443	25,811	11.04%
Case 4: Price-Strategy Plan (Fare Sensitivity Test)	314,307	30,544	13.47%
Case 5: Travel Demand Management Policy Adaptation	310,157	33,297	14.87%
Case 6: Travel Demand Management Policy Adaptation – Car-free Zone in City Center	257,348	49,259	23.03%

From the analysis of the public transport system development measures' impact in 2037 via the model, we can summarize the comparative results for each case study as follows:

- **Baseline Scenario (Do Nothing):** With no interventions, public transport ridership is projected to be 8,475 person-trips/day, making up a mere 2.18% mode share.
- **Cases 2 & 3 (Network Development):** Implementing planned projects and further network improvements boosted the public transport mode share to 9.87% and 11.04%, respectively.
- **Case 4 (Fare Exemption Policy):** This policy led to an increase in public transport mode share to 13.47%, though it still fell short of the target.
- **Case 5 (Fare Exemption + Congestion Charge Policy):** Under this scenario, the public transport mode share reached its highest at 14.87% (33,297 person-trips/day), but it still didn't meet the set target.
- **Case 6 (Fare Exemption + Private Vehicle Ban):** This was the only scenario that achieved the defined target, pushing the public transport mode share up to 23.03% (49,259 person-trips/day).

5.9.4 Model Development Results for the Udon Thani Study Area

For the test results of public transport system development in the Udon Thani study area, the consultant selected the forecasted results for the year 2037. This year aligns with the development target outlined in the Master Plan under the National Strategy and so on. These results illustrate the impact of public transport development measures from Cases 1 to 6, as shown in **Table 5.9-4**.

Table 5.9-4 Forecasted Travel Volume and Public Transport Mode Share in Udon Thani Study Area under Public Transport Development Measures Cases 1 to 6 as of 2037

Test Case	Average Travel Volume (person-trips/day		Public Transport Mode Share
	Other Vehicles	Public Transport	
Case 1: No Action (Do Nothing)	304,290	25,960	7.07%
Case 2: With Existing Development Plan	279,274	42,540	12.83%
Case 3: With PT Network Improvement/Extension Plan	277,798	43,513	13.19%
Case 4: Price-Strategy Plan (Fare Sensitivity Test)	253,498	59,605	18.80%
Case 5: Travel Demand Management Policy Adaptation	247,485	63,590	20.20%
Case 6: Travel Demand Management Policy Adaptation – Car-free Zone in City Center	214,007	74,230	23.90%

From the analysis of the public transport system development measures' impact in 2037 via the model, we can summarize the comparative results for each case study as follows:

- **Baseline Scenario (Do Nothing):** With no interventions, public transport ridership is projected to be 25,960 person-trips/day, making up a mere 7.07% mode share.
- **Cases 2 & 3 (Network Development):** Implementing planned projects and further network improvements boosted the public transport mode share to 12.83% and 13.19%, respectively.
- **Case 4 (Fare Exemption Policy):** This policy led to a significant increase in public transport mode share to 18.80%, though it still fell short of the target.
- **Case 5 (Fare Exemption + Congestion Charge Policy):** This was the first scenario to meet the target, with public transport mode share increasing to 20.20% (63,590 person-trips/day).
- **Case 6 (Fare Exemption + Private Vehicle Ban):** This scenario yielded the highest results, with public transport mode share increasing to 23.90% (74,230 person-trips/day), significantly exceeding the target.

5.9.5 Model Development Results for the Khon Kaen Study Area

For the test results of public transport system development in the Khon Kaen study area, the consultant selected the forecasted results for the year 2037. This year aligns with the development target outlined in the Master Plan under the National Strategy and so on. These results illustrate the impact of public transport development measures from Cases 1 to 6, as shown in **Table 5.9-5**.

Table 5.9-5 Forecasted Travel Volume and Public Transport Mode Share in Khon Kaen Study Area under Public Transport Development Measures Cases 1 to 6 as of 2037

Test Case	Average Travel Volume (person-trips/day		Public Transport Mode Share
	Other Vehicles	Public Transport	
Case 1: No Action (Do Nothing)	502,037	28,598	7.94%
Case 2: With Existing Development Plan	469,197	47,823	14.11%
Case 3: With PT Network Improvement/Extension Plan	462,229	51,919	15.42%
Case 4: Price-Strategy Plan (Fare Sensitivity Test)	441,694	63,960	19.29%
Case 5: Travel Demand Management Policy Adaptation	434,224	68,538	20.76%
Case 6: Travel Demand Management Policy Adaptation – Car-free Zone in City Center	398,092	76,141	23.20%

From the analysis of the public transport system development measures' impact in 2037 via the model, we can summarize the comparative results for each case study as follows:

- **Baseline Scenario (Do Nothing):** With no interventions, public transport ridership is projected to be 28,598 person-trips/day, making up a mere 7.94% mode share.
- **Cases 2 & 3 (Network Development):** Implementing planned projects and further network improvements boosted the public transport mode share to 14.11% and 15.42%, respectively.
- **Case 4 (Fare Exemption Policy):** This policy led to a significant increase in public transport mode share to 19.29%, though it still fell short of the target.
- **Case 5 (Fare Exemption + Congestion Charge Policy):** This was the first scenario to meet the target, with public transport mode share increasing to 20.76% (68,538 person-trips/day).
- **Case 6 (Fare Exemption + Private Vehicle Ban):** This scenario yielded the highest results, with public transport mode share increasing to 23.20% (76,141 person-trips/day), significantly exceeding the target.

5.9.6 Model Development Results for the Nakhon Ratchasima Study Area

For the test results of public transport system development in the Nakhon Ratchasima study area, the consultant selected the forecasted results for the year 2037. This year aligns with the development target outlined in the Master Plan under the National Strategy and so on. These results illustrate the impact of public transport development measures from Cases 1 to 6, as shown in **Table 5.9-6**.

Table 5.9-6 Forecasted Travel Volume and Public Transport Mode Share in Nakhon Ratchasima Study Area under Public Transport Development Measures Cases 1 to 6 as of 2037

Test Case	Average Travel Volume (person-trips/day		Public Transport Mode Share
	Other Vehicles	Public Transport	
Case 1: No Action (Do Nothing)	571,877	23,856	4.48%
Case 2: With Existing Development Plan	551,663	37,218	7.30%
Case 3: With PT Network Improvement/Extension Plan	505,567	67,718	13.73%
Case 4: Price-Strategy Plan (Fare Sensitivity Test)	501,310	70,434	14.30%
Case 5: Travel Demand Management Policy Adaptation	499,053	71,880	14.61%
Case 6: Travel Demand Management Policy Adaptation – Car-free Zone in City Center	421,482	104,110	21.40%

From the analysis of the public transport system development measures' impact in 2037 via the model, we can summarize the comparative results for each case study as follows:

- **Baseline Scenario (Do Nothing):** Without any interventions, public transport ridership is projected to be 23,856 person-trips/day, making up a mere 4.48% mode share.
- **Cases 2 & 3 (Network Development):** Implementing planned projects and further network improvements boosted the public transport mode share to 7.30% and 13.73%, respectively.
- **Case 4 (Fare Exemption Policy):** This policy led to an increase in public transport mode share to 14.30%, though it still fell short of the target.
- **Case 5 (Fare Exemption + Congestion Charge Policy):** Under this scenario, the public transport mode share reached its highest at 14.61% (71,880 person-trips/day), but it still didn't meet the set target.
- **Case 6 (Fare Exemption + Private Vehicle Ban):** This was the only scenario that achieved the defined target, pushing the public transport mode share up to 21.40% (104,110 person-trips/day).

5.9.7 Model Development Results for the Ubon Ratchathani Study Area

For the test results of public transport system development in the Ubon Ratchathani study area, the consultant selected the forecasted results for the year 2037. This year aligns with the development target outlined in the Master Plan under the National Strategy and so on. These results illustrate the impact of public transport development measures from Cases 1 to 6, as shown in **Table 5.9-7**.

Table 5.9-7 Forecasted Travel Volume and Public Transport Mode Share in Ubon Thani Study Area under Public Transport Development Measures Cases 1 to 6 as of 2037

Test Case	Average Travel Volume (person-trips/day		Public Transport Mode Share
	Other Vehicles	Public Transport	
Case 1: No Action (Do Nothing)	291,497	19,081	5.00%
Case 2: With Existing Development Plan	268,463	34,738	10.85%
Case 3: With PT Network Improvement/Extension Plan	262,623	38,709	12.33%
Case 4: Price-Strategy Plan (Fare Sensitivity Test)	258,825	41,293	13.29%
Case 5: Travel Demand Management Policy Adaptation	243,981	51,381	17.06%
Case 6: Travel Demand Management Policy Adaptation – Car-free Zone in City Center	198,400	67,180	22.96%

From the analysis of the public transport system development measures' impact in 2037 via the model, we can summarize the comparative results for each case study as follows:

- **Baseline Scenario (Do Nothing):** With no interventions, public transport ridership is projected to be 19,081 person-trips/day, making up a mere 5.00% mode share.
- **Cases 2 & 3 (Network Development):** Implementing planned projects and further network improvements boosted the public transport mode share to 10.85% and 12.33%, respectively.
- **Case 4 (Fare Exemption Policy):** This policy led to an increase in public transport mode share to 13.29%, though it still fell short of the target.
- **Case 5 (Fare Exemption + Congestion Charge Policy):** Under this scenario, the public transport mode share reached its highest at 17.06% (51,381 person-trips/day), but it still didn't meet the set target.
- **Case 6 (Fare Exemption + Private Vehicle Ban):** This was the only scenario that achieved the defined target, pushing the public transport mode share up to 22.96% (67,180 person-trips/day).

5.9.8 Model Development Results for the Phra Nakhon Si Ayutthaya Study Area

For the test results of public transport system development in the Phra Nakhon Si Ayutthaya study area, the consultant selected the forecasted results for the year 2037. This year aligns with the development target outlined in the Master Plan under the National Strategy and so on. These results illustrate the impact of public transport development measures from Cases 1 to 6, as shown in **Table 5.9-8**.

Table 5.9-8 Forecasted Travel Volume and Public Transport Mode Share in Phra Nakhon Si Autthaya Study Area under Public Transport Development Measures Cases 1 to 6 as of 2037

Test Case	Average Travel Volume (person-trips/day		Public Transport Mode Share
	Other Vehicles	Public Transport	
Case 1: No Action (Do Nothing)	497,278	14,679	3.89%
Case 2: With Existing Development Plan	491,547	18,318	6.25%
Case 3: With PT Network Improvement/Extension Plan	482,074	24,336	10.16%
Case 4: Price-Strategy Plan (Fare Sensitivity Test)	478,033	26,900	11.83%
Case 5: Travel Demand Management Policy Adaptation	474,268	29,283	13.38%
Case 6: Travel Demand Management Policy Adaptation – Car-free Zone in City Center	447,270	52,400	27.66%

From the analysis of the public transport system development measures' impact in 2037 via the model, we can summarize the comparative results for each case study as follows:

- **Baseline Scenario (Do Nothing):** With no interventions, public transport ridership is projected to be 14,679 person-trips/day, accounting for a mere 3.89% mode share.
- **Cases 2 & 3 (Network Development):** Implementing planned projects and further network improvements boosted the public transport mode share to 6.25% and 10.16%, respectively.
- **Case 4 (Fare Exemption Policy):** This policy led to an increase in public transport mode share to 11.83%, though it still fell short of the target.
- **Case 5 (Fare Exemption + Congestion Charge Policy):** Under this scenario, the public transport mode share reached its highest at 13.38% (29,283 person-trips/day), but it still didn't meet the set target.
- **Case 6 (Fare Exemption + Private Vehicle Ban):** This was the only scenario that achieved the defined target, pushing the public transport mode share up to 27.66% (52,400 person-trips/day).

5.9.9 Model Development Results for the Surat Thani Study Area

For the test results of public transport system development in the Surat Thani study area, the consultant selected the forecasted results for the year 2037. This year aligns with the development target outlined in the Master Plan under the National Strategy and so on. These results illustrate the impact of public transport development measures from Cases 1 to 6, as shown in **Table 5.9-9**.

Table 5.9-9 Forecasted Travel Volume and Public Transport Mode Share in Surat Thani Study Area under Public Transport Development Measures Cases 1 to 6 as of 2037

Test Case	Average Travel Volume (person-trips/day		Public Transport Mode Share
	Other Vehicles	Public Transport	
Case 1: No Action (Do Nothing)	203,341	2,697	0.19%
Case 3: With PT Network Improvement/Extension Plan	181,058	18,006	8.19%
Case 4: Price-Strategy Plan (Fare Sensitivity Test)	178,655	19,657	8.76%
Case 5: Travel Demand Management Policy Adaptation	176,790	20,938	9.40%
Case 6: Travel Demand Management Policy Adaptation – Car-free Zone in City Center	120,296	44,130	21.11%

From the analysis of the public transport system development measures' impact in 2037 via the model, we can summarize the comparative results for each case study as follows:

- **Baseline Scenario (Do Nothing):** With no interventions, public transport ridership is projected to be 2,697 person-trips/day, accounting for a mere 0.19% mode share.
- **Case 3 (Network Development):** Further network improvements boosted the public transport mode share to 8.19%.
- **Case 4 (Fare Exemption Policy):** This policy led to an increase in public transport mode share to 8.76%, though it still fell short of the target.
- **Case 5 (Fare Exemption + Congestion Charge Policy):** Under this scenario, the public transport mode share reached its highest at 9.40% (20,938 person-trips/day), but it still didn't meet the set target.
- **Case 6 (Fare Exemption + Private Vehicle Ban):** This was the only scenario that achieved the defined target, pushing the public transport mode share up to 21.11% (44,130 person-trips/day).

5.9.10 Model Development Results for the Phuket Study Area

For the test results of public transport system development in the Phuket study area, the consultant selected the forecasted results for the year 2037. This year aligns with the development target outlined in the Master Plan under the National Strategy and so on. These results illustrate the impact of public transport development measures from Cases 1 to 6, as shown in **Table 5.9-10**.

Table 5.9-10 Forecasted Travel Volume and Public Transport Mode Share in Phuket Study Area under Public Transport Development Measures Cases 1 to 6 as of 2037

Test Case	Average Travel Volume (person-trips/day		Public Transport Mode Share
	Other Vehicles	Public Transport	
Case 1: No Action (Do Nothing)	454,372	24,811	0.56%
Case 2: With Existing Development Plan	355,820	100,462	7.41%
Case 3: With PT Network Improvement/Extension Plan	313,885	133,235	10.38%
Case 4: Price-Strategy Plan (Fare Sensitivity Test)	287,363	153,594	12.22%
Case 5: Travel Demand Management Policy Adaptation	277,916	160,551	12.85%
Case 6: Travel Demand Management Policy Adaptation – Car-free Zone in City Center	40,390	255,700	21.46%

From the analysis of the public transport system development measures' impact in 2037 via the model, we can summarize the comparative results for each case study as follows:

- **Baseline Scenario (Do Nothing):** With no interventions, public transport ridership is projected to be 24,811 person-trips/day, accounting for a mere 0.56% mode share.
- **Cases 2 & 3 (Network Development):** Implementing planned projects and further network improvements boosted the public transport mode share to 7.41% and 10.38%, respectively.
- **Case 4 (Fare Exemption Policy):** This policy led to an increase in public transport mode share to 12.22%, although it still fell short of the target.
- **Case 5 (Fare Exemption + Congestion Charge Policy):** Under this scenario, the public transport mode share reached its highest at 12.85% (160,551 person-trips/day), but it still didn't meet the set target.
- **Case 6 (Fare Exemption + Private Vehicle Ban):** This was the only scenario that achieved the defined target, pushing the public transport mode share up to 21.46% (255,700 person-trips/day).

5.9.11 Model Development Results for the Songkhla Study Area (Hat Yai District)

For the test results of public transport system development in the Songkhla (Hat Yai) study area, the consultant selected the forecasted results for the year 2037. This year aligns with the development target outlined in the Master Plan under the National Strategy and so on. These results illustrate the impact of public transport development measures from Cases 1 to 6, as shown in **Table 5.9-11**.

Table 5.9-11 Forecasted Travel Volume and Public Transport Mode Share in Songkhla (Hat Yai) Study Area under Public Transport Development Measures Cases 1 to 6 as of 2037

Test Case	Average Travel Volume (person-trips/day		Public Transport Mode Share
	Other Vehicles	Public Transport	
Case 1: No Action (Do Nothing)	405,853	6,415	1.08%
Case 2: With Existing Development Plan	339,782	50,417	10.53%
Case 3: With PT Network Improvement/Extension Plan	331,098	56,199	11.77%
Case 4: Price-Strategy Plan (Fare Sensitivity Test)	324,782	60,402	12.67%
Case 5: Travel Demand Management Policy Adaptation	321,931	62,305	13.08%
Case 6: Travel Demand Management Policy Adaptation – Car-free Zone in City Center	208,741	99,653	21.11%

From the analysis of the public transport system development measures' impact in 2037 via the model, we can summarize the comparative results for each case study as follows:

- **Baseline Scenario (Do Nothing):** Without any action, public transport ridership is projected to be 6,415 person-trips/day, making up a mere 1.08% mode share.
- **Cases 2 & 3 (Network Development):** Implementing planned projects and further network improvements boosted the public transport mode share to 10.53% and 11.77%, respectively.
- **Case 4 (Fare Exemption Policy):** This policy led to an increase in public transport mode share to 12.67%, though it still fell short of the target.
- **Case 5 (Fare Exemption + Congestion Charge Policy):** Under this scenario, the public transport mode share reached its highest at 13.08% (62,305 person-trips/day), but it still didn't meet the set target.
- **Case 6 (Fare Exemption + Private Vehicle Ban):** This was the only scenario that achieved the defined target, pushing the public transport mode share up to 21.11% (99,653 person-trips/day).

For future implementation, we recommend **adopting the measures outlined in Case 3**. When compared to Cases 4, 5, and 6, Case 3 presents greater feasibility in terms of operation and is less likely to face significant resistance from urban communities. Case 3 involves establishing additional public transport routes in specific areas and maintains a 15 Baht fare throughout the entire route. This approach is expected to encounter less public opposition than Case 4, which proposes zero fares (creating an operational burden for service providers), or Case 5, which introduces a 50 Baht area entry fee that could generate substantial community resistance and impact a broader segment of the population. Therefore, Case 3 was selected for the analysis, as it offers a more suitable and practical approach for future implementation.

The project aims to promote public transport use, reduce private car dependency, and support sustainable travel. Fare rates must consider both the public's ability to pay and the competitiveness with other transport modes. Past master plan studies for public transport development revealed that a fare of 15+1 Baht per kilometer was too high compared to existing transport systems and could deter ridership. Furthermore, focus group meetings across the 11 provinces indicated that most residents favored a flat fare of 15 Baht per trip, deeming it appropriate and helpful in reducing travel costs. Therefore, the project has adopted this flat fare as a policy guideline. However, this rate may be adjusted based on operational costs and economic conditions. Continuous review will be necessary to ensure the fare remains aligned with public needs and project goals.

5.10 Stated Preference Survey: SP

Based on the results of the Stated Preference (SP) Survey, the consultant developed a mode choice model for hypothetical scenarios involving the development of public transport systems in the study area. The analysis was divided into two approaches, and the key findings from this analysis and development are summarized as follows:

5.10.1 Analysis Approach 1

For Analytical Approach 1, the consultant aimed to test travel mode choice behavior among private cars, motorcycles, and a hypothetical new public transport system. Two influential factors were considered: travel time and travel cost for each mode. This analytical approach uses a relatively straightforward hypothetical scenario. Its objective is to assess the broad influence of time and cost factors on the public's mode choice decisions. This aligns with the Mode Split component of the 4-Step Model, which was developed using Revealed Preference (RP) data from actual observed travel behavior in each study area. The coefficients derived for each city's model are shown in **Table 5.10-1**.

Table 5.10-1 SP Model Coefficients by Analytical Approach 1

Coefficient	CMI	CRI	PLK	UDN	KKN	NMA	UBN	AYA	SNI	PKT	Hat Yai
PC_Constant	1.880	1.544	1.130	1.643	2.412	1.267	1.440	1.706	1.561	1.819	1.864
PC_Time	-0.053	0.062	-0.112	-0.079	0.023	-0.058	0.032	-0.009	-0.014	0.066	-0.004
PC_Cost	0.024	-0.063	0.097	0.020	-0.040	0.052	-0.042	-0.036	0.036	-0.089	0.007
MC_Constant	2.649	2.325	2.121	2.675	3.196	1.751	2.347	1.655	1.540	2.311	1.686
MC_Time	-0.053	-0.010	-0.071	-0.009	-0.065	-0.016	-0.032	0.041	0.006	-0.097	-0.009
MC_Cost	-0.027	-0.111	-0.068	-0.141	-0.077	-0.008	-0.103	-0.114	-0.012	0.074	0.005

To facilitate understanding of the developed model, the consultant performed a Model Simulation to illustrate how travel mode choice behavior changes with variations in influential factors. Two key assumptions were made for this analysis: (1) the average speed for private vehicle travel is 30 km/hr, and (2) the travel cost for private cars is 3 Baht/km, while for motorcycles it's 1 Baht/km. From the analysis, the mode choice behavior for the newly developed public transport system can be categorized into four groups:

- **Group 1:** Chiang Mai, Chiang Rai, Udon Thani, Khon Kaen, Ubon Ratchathani. In these five study areas, the trend shows that the usage of the newly developed public transport system increases with longer travel distances. This primarily involves a mode shift from motorcycles, aligning with observed current travel behavior where motorcycle usage decreases as travel time and distance increase. However, in all five of these provinces, private car usage tends to increase with longer travel times and distances. Therefore, it can be concluded that private car users are more resistant to shifting to the newly developed public transport system than motorcycle users. An example illustrating this behavior is shown in **Figure 5.10-1**.

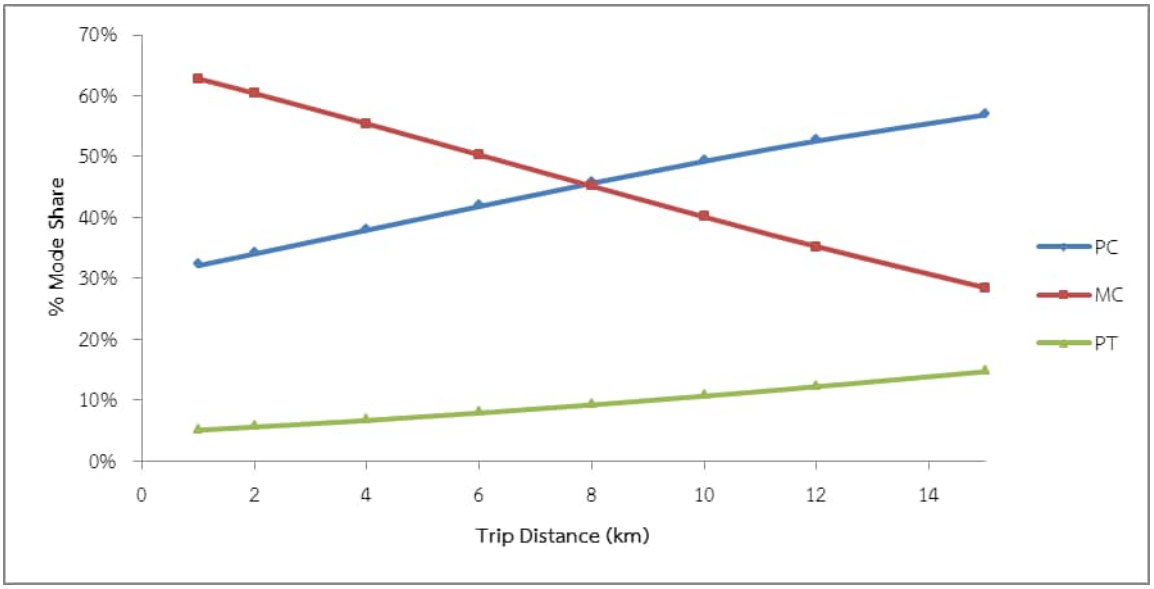


Figure 5.10-1 Relationship of Mode Shift Among Private Cars, Motorcycles, and Newly Developed Public Transport as Travel Distance Increases in Group 1 Cities (Case Study: Chiang Mai)

- **Group 2:** Phitsanulok, Nakhon Ratchasima, Surat Thani, Songkhla (Hat Yai). In these four study areas, we observed a different trend: as travel distance increases, the proportion of newly developed public transport usage tends to remain constant or even slightly decrease in some cities. Instead, the primary mode shift largely occurs between private cars and motorcycles. As expected, private car usage increases with longer travel distances, while motorcycle usage decreases. This situation could stem from several factors, including the physical characteristics of the urban communities, the location of activities, and the existing road network. Additionally, in some cities within this group, there's currently very limited public transport service within the urban area. This lack of familiarity might make it difficult for survey respondents to envision and consider future public transport options. Cities in this

group demonstrate a greater challenge in stimulating a shift to public transport compared to cities in Group 1. An example illustrating this behavior is shown in **Figure 5.10-2**.

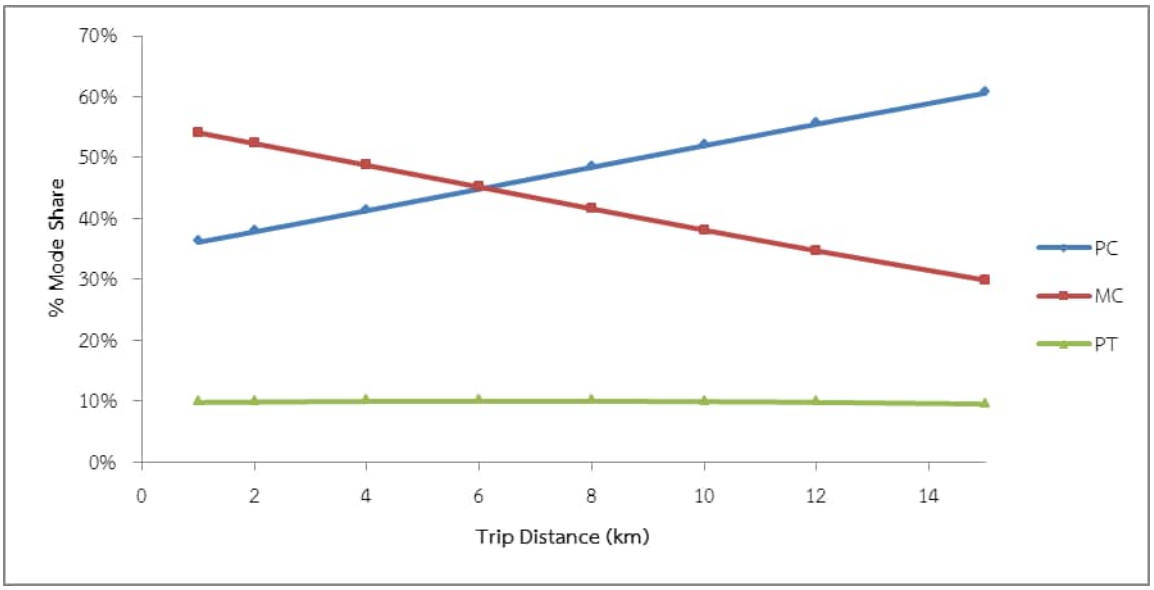


Figure 5.10-2 Relationship of Mode Shift Among Private Cars, Motorcycles, and Newly Developed Public Transport as Travel Distance Increases in Group 2 Cities (Case Study: Nakhon Ratchasima)

- **Group 3:** Phra Nakhon Si Ayutthaya. In this study area, as travel distance increases, the proportion of newly developed public transport usage tends to rise, similar to Group 1. However, what's interesting is the clear increase in motorcycle usage while private car usage decreases. This trend might be due to the characteristics of the urban community, which is bisected by major national highways. Private car users find it quite challenging to avoid these large, high-traffic routes, whereas motorcycles have more alternative route options. Another possibility is the compact size of Phra Nakhon Si Ayutthaya's urban area; most car-owning households are within the city center. When surveying residents outside the urban area, the preference for motorcycles—a familiar mode of transport—likely became more prominent among respondents. Despite these factors, the model results suggest that Phra Nakhon Si Ayutthaya still has a greater potential to encourage a shift to public transport compared to cities in Group 2, as shown in **Figure 5.10-3**.

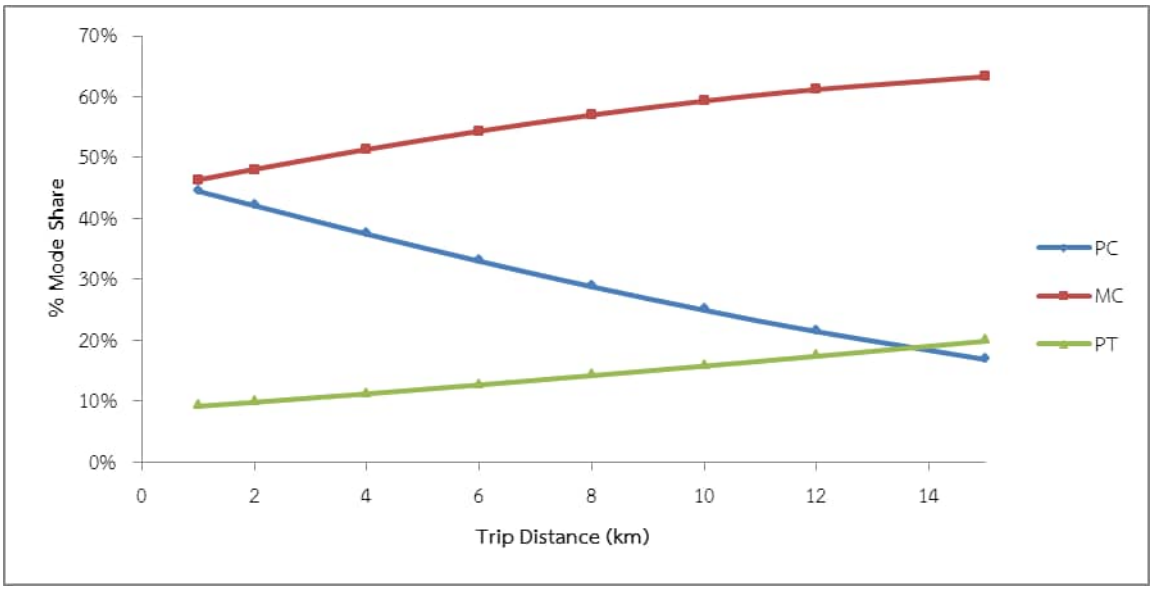


Figure 5.10-3 Relationship of Mode Shift Among Private Cars, Motorcycles, and Newly Developed Public Transport as Travel Distance Increases in Group 3 Cities (Case Study: Phra Nakhon Si Ayutthaya)

- **Group 4:** Phuket. In this study area, as travel distance increases, the proportion of newly developed public transport usage tends to rise, similar to Group 1. Interestingly, there's a clear and significant decrease in the use of both private cars and motorcycles. This trend is likely due to the severe traffic congestion on Phuket Island, which is now an issue at almost all times. Additionally, Phuket has a large "hidden" or floating population, many of whom may face limitations in parking availability, vehicle ownership costs, or simply do not own vehicles. These factors contribute to a highly positive response to public transport development. This makes Phuket potentially one of the easiest study areas to stimulate a mode shift to public transport, as shown in **Figure 5.10-4**.

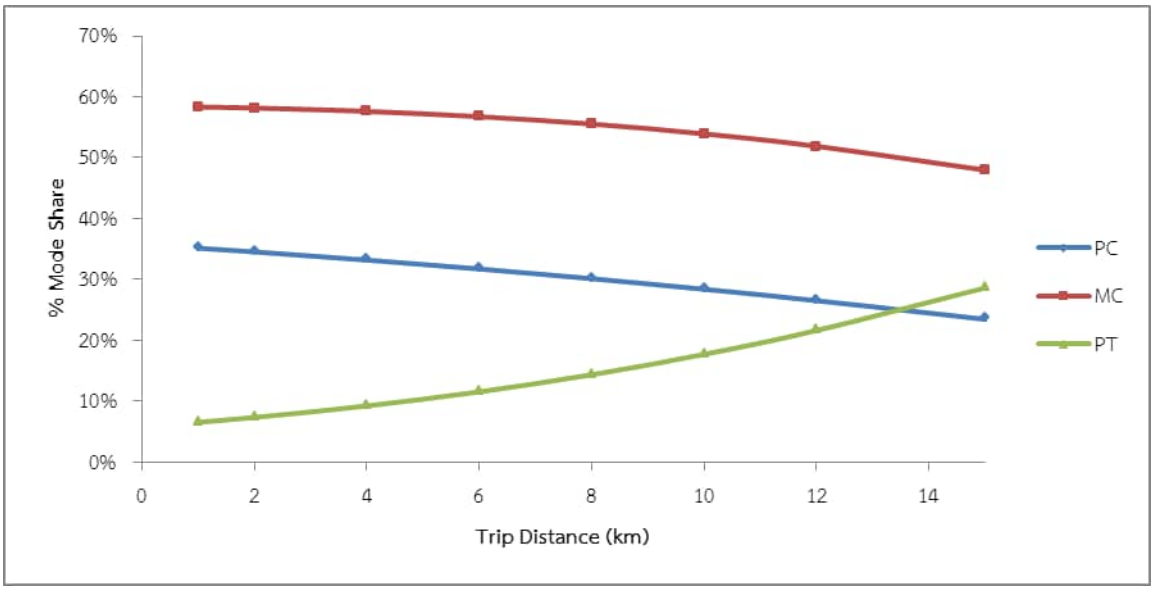


Figure 5.10-4 Relationship of Mode Shift Among Private Cars, Motorcycles, and Newly Developed Public Transport as Travel Distance Increases in Group 4 Cities (Case Study: Phuket)

This developed model will not only be used to explain travel mode choice behavior when public transport is developed in an area, but also to forecast future scenarios within the 4-Step Model when new public transport systems are introduced.

5.10.2 Analysis Approach 2

For Analytical Approach 2, the consultant aimed to test travel mode choice behavior between existing modes (regardless of their specific type) and a hypothetical newly developed public transport system. Initially, eight influential factors were considered: travel distance, public transport fare, in-vehicle public transport travel time, waiting time at stops, access time from home to stops, number of transfers, fuel price, and residential location (within/outside central business districts). After analysis, the consultant developed a mode choice model that best fit the survey results. It was found that five factors effectively explained travel mode choice behavior: (1) Travel distance, (2) Public transport fare, (3) Waiting time at stops, (4) Access time from home to stops, and (5) Number of transfers. The coefficients derived for each city's model are presented in **Table 5.10-2**.

Table 5.10-2 SP Model Coefficients by Analytical Approach 2

Coefficient	CMI	CRI	PLK	UDN	KKN	NMA	UBN	AYA	SNI	PKT	SKA	Model Total
Constant	-0.374	-1.635	1.643	1.636	1.069	1.233	1.687	-1.960	-0.466	1.991	-1.136	0.335
Distance	0.073	0.192	0.192	0.021	0.073	0.030	0.099	0.094	0.038	0.313	0.141	0.115
Fare	-0.056	-0.082	-0.082	-0.056	-0.050	-0.019	-0.067	-0.014	-0.007	-0.190	-0.058	-0.062
Waiting_Time	-0.083	-0.050	-0.050	-0.003	-0.008	-0.019	-0.025	-0.003	-0.033	-0.045	-0.070	-0.035
Access_Time	0.003	-0.059	-0.059	-0.047	-0.053	-0.040	-0.062	-0.056	-0.008	-0.011	-0.015	-0.037
Transit	-0.690	-0.027	-0.027	0.356	0.163	-0.101	0.086	-0.045	-0.201	0.330	0.056	-0.009

The mode choice model developed under Analytical Approach 2 is not intended as a forecasting tool for future travel demand within the 4-Step Model when public transport is developed. Instead, its purpose is to provide a detailed explanation of travel behavior. This understanding will then inform the recommendations for selecting and designing public transport service options in each city at a broader level. This section will present a macro-level analysis encompassing all 11 provinces simultaneously. Key interesting points can be summarized as follows:

- Distance: There's a positive relationship between distance and public transport usage. As travel distance increases, respondents in all study areas show a greater tendency to use the newly developed public transport.
- Fare: As expected, there's an inverse relationship between fare and public transport ridership. Higher fares lead to decreased public transport use.
- Waiting Time and Access Time: Both waiting time at the stop and travel time from home to the stop have an inverse relationship with public transport choice, which is also an expected outcome.
- Transfers: The models for individual cities show that transfers can have either a negative or no negative impact on public transport choice. A significant observation is that in cities with a high public transport mode share (e.g., Khon Kaen, Udon Thani, and Ubon Ratchathani), transfers are not a barrier to choosing public transport. The same applies to Phuket and

Hat Yai, even though their current public transport usage is relatively low. This suggests that respondents prioritize total travel time; as long as travel time can be managed effectively, the need for transfers does not significantly influence mode choice.

The consultant used the developed model to perform Model Simulations, similar to the previous analysis. This demonstrates the relationship between changes in mode share when any influential factor is altered, while keeping other factors controlled. These simulations, based on a combined model (created from survey data across all provinces), are presented in four analyses as follows:

- This analysis shows the overall mode shift as travel distance changes, while controlling for waiting time, access time to stops, and allowing fares to vary by distance (assumed to be 10 Baht initial fare + 1 Baht per km). We found a clear trend: as travel distance increases, people are more inclined to shift to public transport. This suggests that public transport in regional cities has a higher chance of success if its service routes are long enough to accommodate commuters traveling from suburban areas into the city center. Service routes that are too short and primarily aim to serve only those residing within the urban core may not be as successful. This relationship is further illustrated in **Figure 5.10-5**.

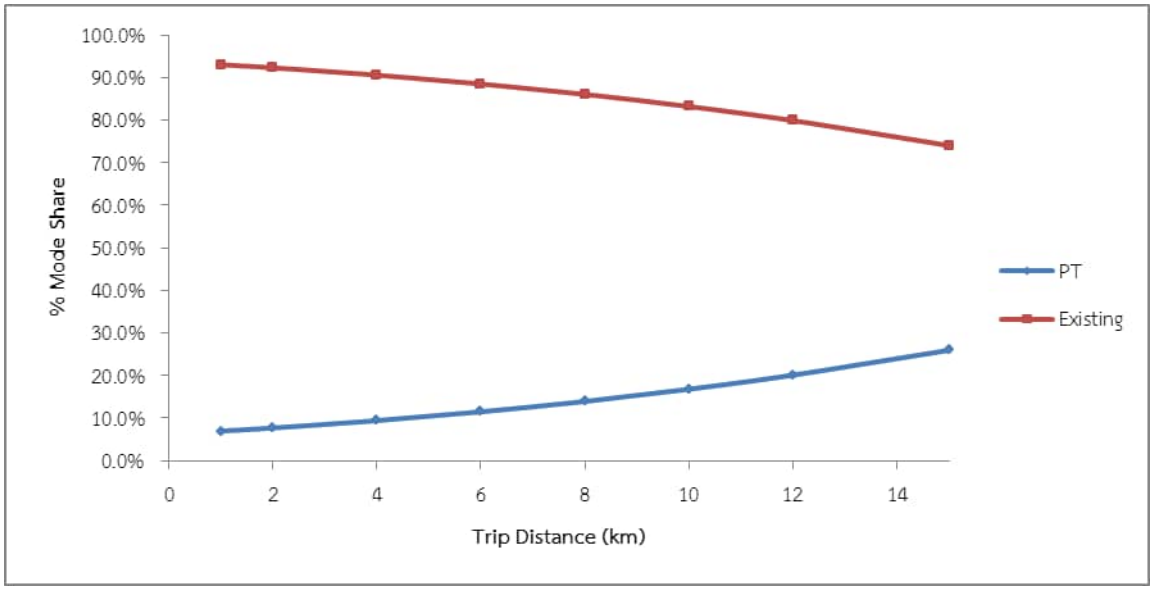


Figure 5.10-5 Relationship of Mode Shift Between Existing Travel Modes and Newly Developed Public Transport as Travel Distance Increases

- As anticipated, longer waiting times for public transport significantly reduce demand for its use. Our model, with travel distance fixed at 5 km, a fare of 15 Baht (assuming 10 Baht initial fare + 1 Baht per km), and immediate access to the bus stop, illustrates this. The results, as shown in **Figure 5.10-6**, indicate that as waiting time increases, the public transport mode share decreases substantially. Notably, at a 30-minute waiting time, public transport usage drops by approximately three-quarters compared to a no-wait scenario. This finding is crucial because it's unrealistic for medium-sized cities, like our study areas, to achieve service frequencies (headways) of under 5 minutes, as seen in large metropolises like Bangkok. When reviewing public transport system designs in international cities with populations under 1

million, it's common to find that they primarily operate on a schedule-based system rather than high frequency. This approach helps the public know exactly when to expect a bus, and it simplifies fleet management. Furthermore, given that traffic conditions in these smaller cities are generally more predictable than in larger ones, controlling vehicle operating times becomes feasible. Therefore, this issue of managing waiting times is a critical success factor for designing public transport systems in medium-sized cities.

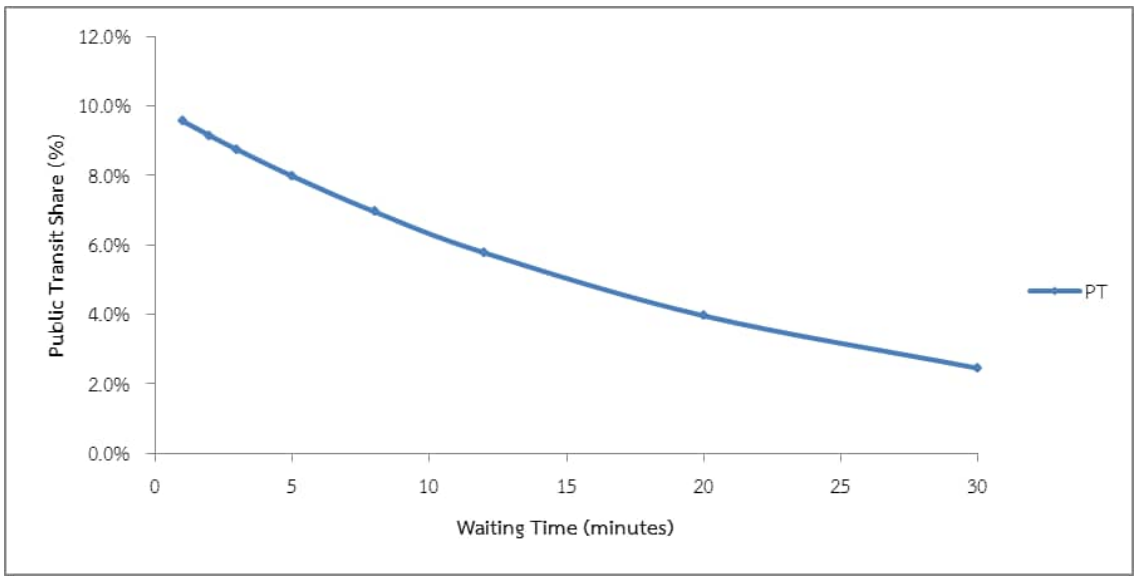


Figure 5.10-6 Public Transport Mode Share with Varying Waiting Times at Stops

- As anticipated, longer access times to public transport stops significantly reduce demand for its use. Our model, with travel distance fixed at 5 km, a fare of 15 Baht (assuming 10 Baht initial fare + 1 Baht per km), and a fixed waiting time of 5 minutes at the stop, illustrates this. The results, as shown in **Figure 5.10-7**, indicate that as access time to public transport increases, the public transport mode share decreases significantly, similar to the case of waiting time at the stop. Specifically, when it takes 15 minutes to access a stop (equivalent to approximately a 1 km walk), public transport usage drops by over four-fifths, which is highly significant. Furthermore, if we consider a walking time of 6 minutes, equivalent to a walking distance of 400 meters (which is often considered the maximum acceptable walking distance), public transport usage still drops by about 40% from the norm. Therefore, if the goal is to significantly boost public transport ridership, one of the most crucial success factors is designing the public transport network to maximize accessibility to communities. The target group should ideally be able to reach stops within a maximum of 6 minutes. This differs from larger cities where people often need to travel further, sometimes incurring more time and cost, to access major mass transit systems.

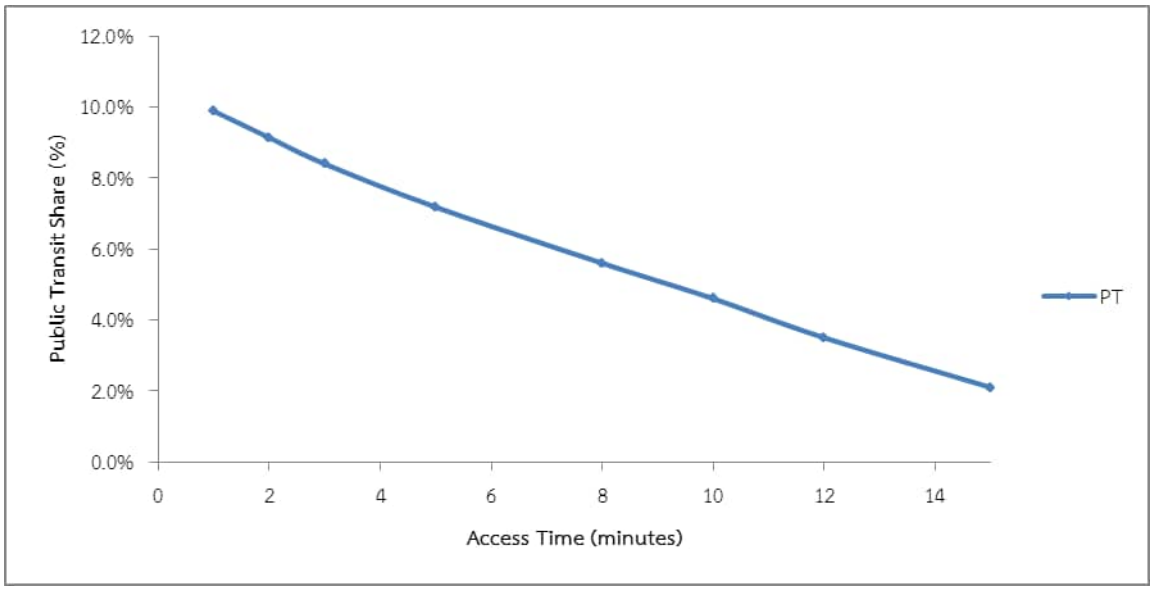


Figure 5.10-7 Public Transport Mode Share with Varying Access Times

- Fares are a highly influential factor in public transport ridership. As expected, an increase in fare directly correlates with a decrease in public transport usage. Our model, which controls for a 5 km travel distance, a 5-minute waiting time at the stop, and a 5-minute access time to the stop, clearly illustrates this. The results, as shown in **Figure 5.10-8**, highlight that price is the most significant factor influencing the choice of the newly developed public transport. In our baseline scenario, with a fare set at 15 Baht, the public transport mode share is approximately 8%. However, if the fare increases to 30 Baht, this share drops to only about 2.5%. Conversely, if the service were free, the public transport mode share would surge to approximately 23%. This demonstrates the strong price sensitivity of public transport services in regional cities. Therefore, fare setting is critically important and is interconnected with several other aspects, including investment and service provision strategies, requests for government subsidies, the selection of the main agency responsible for the project, and the country's fiscal and financial policies. This report presents a combined analysis of all 11 provinces; the consultant will conduct separate, detailed analyses for each province in the next stage.

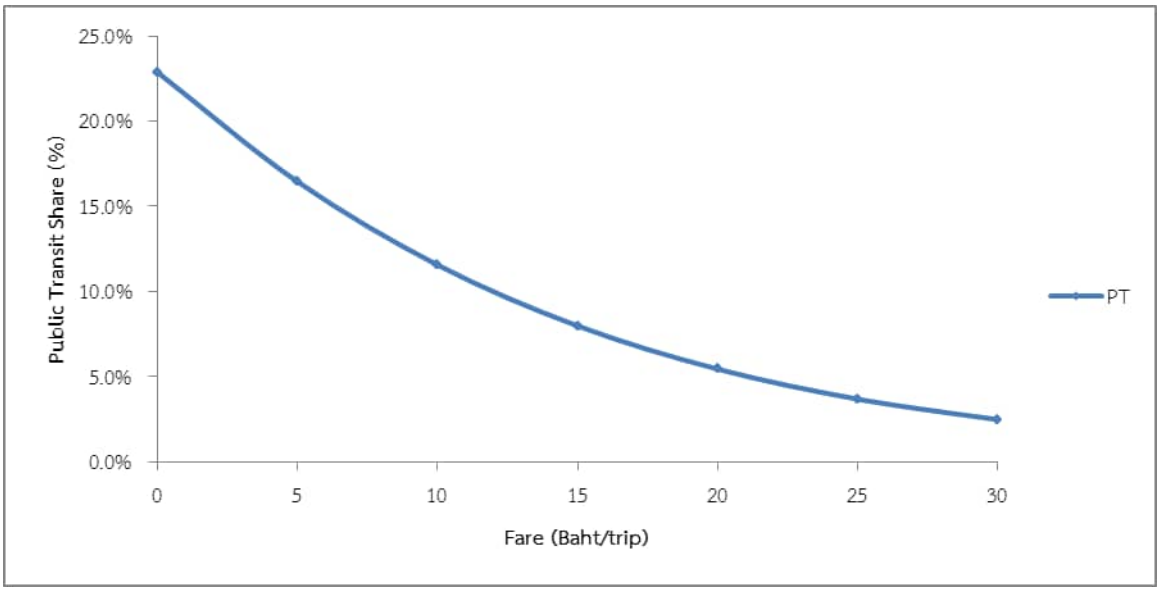


Figure 5.10-8 Public Transport Mode Share with Varying Fares

Phuket was specifically chosen as the study area for acquiring Mobile Data as part of the project's scope. This data will be used in conjunction with traffic volume surveys to analyze travel behavior. Therefore, the consultant will utilize this Mobile Data to test and refine the model for the Phuket study area, aiming for the highest possible accuracy and precision.

Chapter 6

Public Transportation Route Network in Major Regional Urban Areas

Chapter 6 Public Transportation Route Network in Major Regional Urban Areas

6.1 Summary of Public Transportation Route Network

Based on the analysis of travel demand in the study areas, the public transportation route network in the 11 major regional urban provinces can be determined as follows:

6.1.1 Chiang Mai Province

The public transportation service route network using EV Buses, as proposed by the study, comprises a total of 17 routes and 746 bus stops. The total length of the service network is 733 kilometers (round trip), covering the service area and population in Chiang Mai city and its contiguous areas according to the current comprehensive plan, as shown in **Figure 6.1-1**. Details of the proposed routes for the transitional phase of the public transportation system in Chiang Mai city are provided in **Table 6.1-2.**

Table 6.1-1 Service Area and Population Coverage in Chiang Mai City and Contiguous Areas According to the Current Comprehensive Plan

Catchment Area	Area (sq.km.)	Population (people)
Community Area according to the City's Comprehensive Plan	245.6	753,350[1]
Accessible Area within a 400 m radius of bus stops	96.7 (39.6%)	341,109 (45.3%)
Accessible Area within an 800 m radius of bus stops	186.4 (75.9%)	657,525 (87.3%)

note: [1] Number of Population in the Study Area Residing in Communities According to the City's Comprehensive Plan

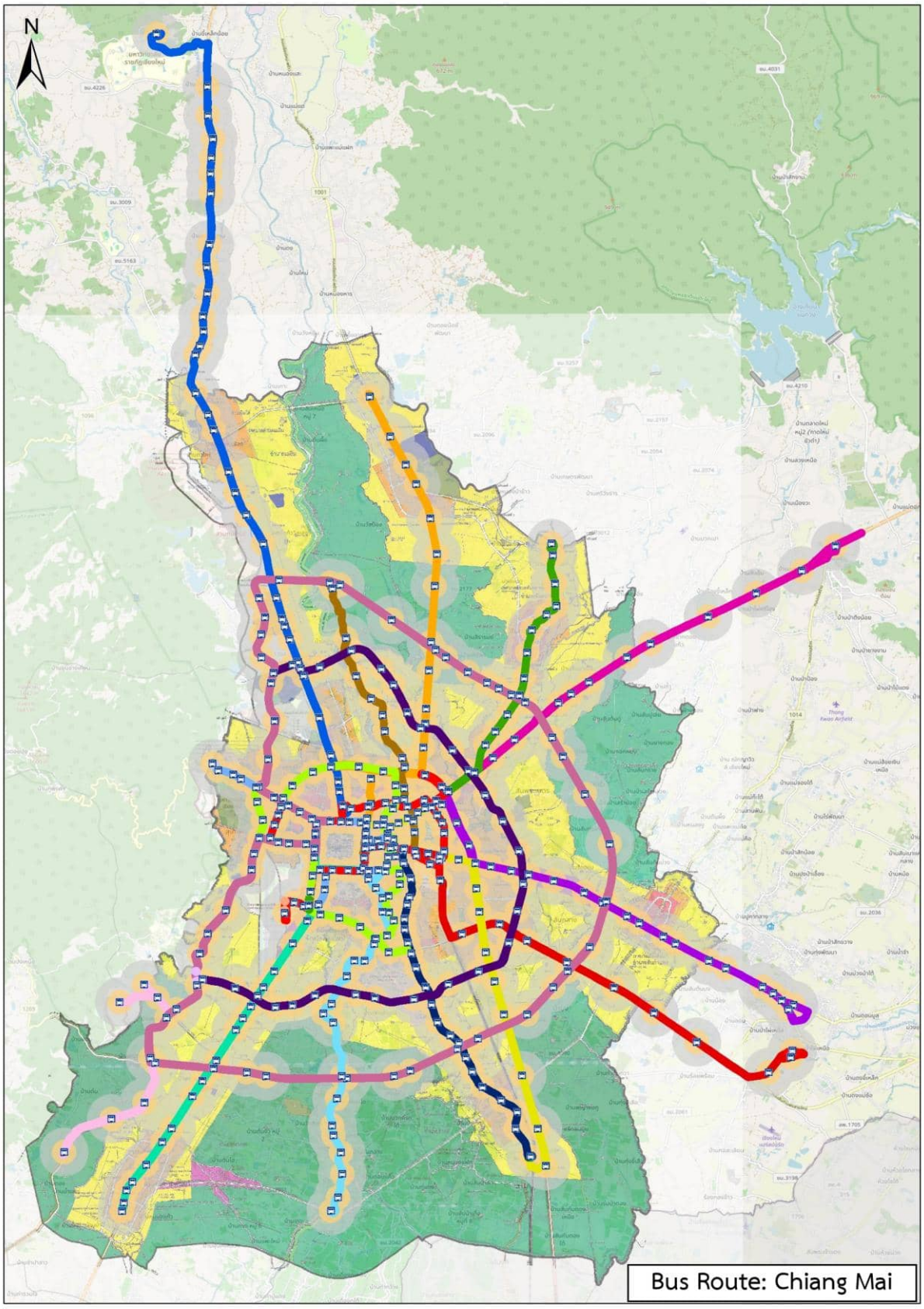


Figure 6.1-1 Map of Bus Routes and Service Area and Population Coverage in Chiang Mai City

Table 6.1-2 Proposed Route Details for the Transitional Phase of the Public Transportation System in Chiang Mai City

Line	Origin point - destination	2 directions combined		Opening year
		Distance (km)	Number of Bus Stops	
1	Tha Phae Gate - Mae Rim (Chiang Mai Rajabhat University, Mae Rim Center)	63.2	81	2027
2	Tha Phae Gate - Hang Dong (Hang Dong Ratratpatham School)	31.8	57	2027
3	Tha Phae Gate - Ban Don Pien (Ban Don Pien School)	39.7	44	2027
4	Tha Phae Gate - Hang Dong (Tem Siri Kindergarten)	49.6	58	2027
5	Tha Phae Gate - Doi Saket (Doi Saket Hospital)	41.3	52	2027
6	Tha Phae Gate - San Sai (San Sai Hospital)	42.5	45	2027
7	Tha Phae Gate - Ban Pa Muang (Wat Pa Muang Temple)	28.4	55	2027
8	Tha Phae Gate - San Kamphaeng (San Kamphaeng School)	38.5	65	2027
9	Tha Phae Gate - Sarapi (Nine Saen Market) runs the Super Highway	35.8	55	2027
10	Tha Phae Gate - Saraphi (Nine Saen Market) runs the Chiang Mai - Lamphun route.	27.8	57	2027
11	Tha Phae Gate - Nam Tong Fresh Market	37.2	54	2027
12	Tha Phae Gate - Pa Khoi Tai (Pa Khoi Tai Fresh Market)	27.1	43	2027
13	City Roundabout-1 (Chiang Mai Airport - Kru Basri Wichai Monument - Huay Kaew - Tha Phae Gate - Night Bazaar - Khlong Mae Kha)	25.6	61	2027
14	City Roundabout-2 (Chiang Mai Airport - Nimmanhaemin - Huay Kaew - Chang Puak Bus Terminal - Central Festival - Arcade Bus Terminal - Chiang Mai Railway Station - Tha Phae Gate)	25.5	45	2027
15	City Bus Roundabout-3 (Central Airport - Suthep Road - MTH - MAYA - Super Highway - Wang Singkham Road - MAYA - Warorot Market - Tha Phae Gate)	22.9	40	2027
16	Round 2	82.8	94	2027
17	Ring 3	113.5	116	2033
Total		**733.2**	**746**	

Note: The total number of bus stops will not equal the sum of the bus stops for each route, as some bus stops are shared.

6.1.2 Chiang Rai Province

The public transportation service route network using EV Buses, as proposed by the study, comprises a total of 6 routes and 314 bus stops. The total length of the service network is 253 kilometers (round trip), covering the service area and population in Chiang Rai city and its contiguous areas according to the current comprehensive plan, as shown in **Figure 6.1-2**. Details of the proposed routes for the transitional phase of the public transportation system in Chiang Rai city are provided in **Table 6.1-4.**

Table 6.1-3 Service Area and Population Coverage in Chiang Rai City and Contiguous Areas According to the Current Comprehensive Plan

Catchment Area	Area (sq.km.)	Population (people)
Community Area according to the City's Comprehensive Plan	76.2	99,750[1]
Accessible Area within a 400 m radius of bus stops	33.5 (44%)	52,668 (52.8%)
Accessible Area within an 800 m radius of bus stops	61.8 (81.2%)	89,077 (89.3%)

Note: [1] Number of Population in the Study Area Residing in Communities According to the City's Comprehensive Plan

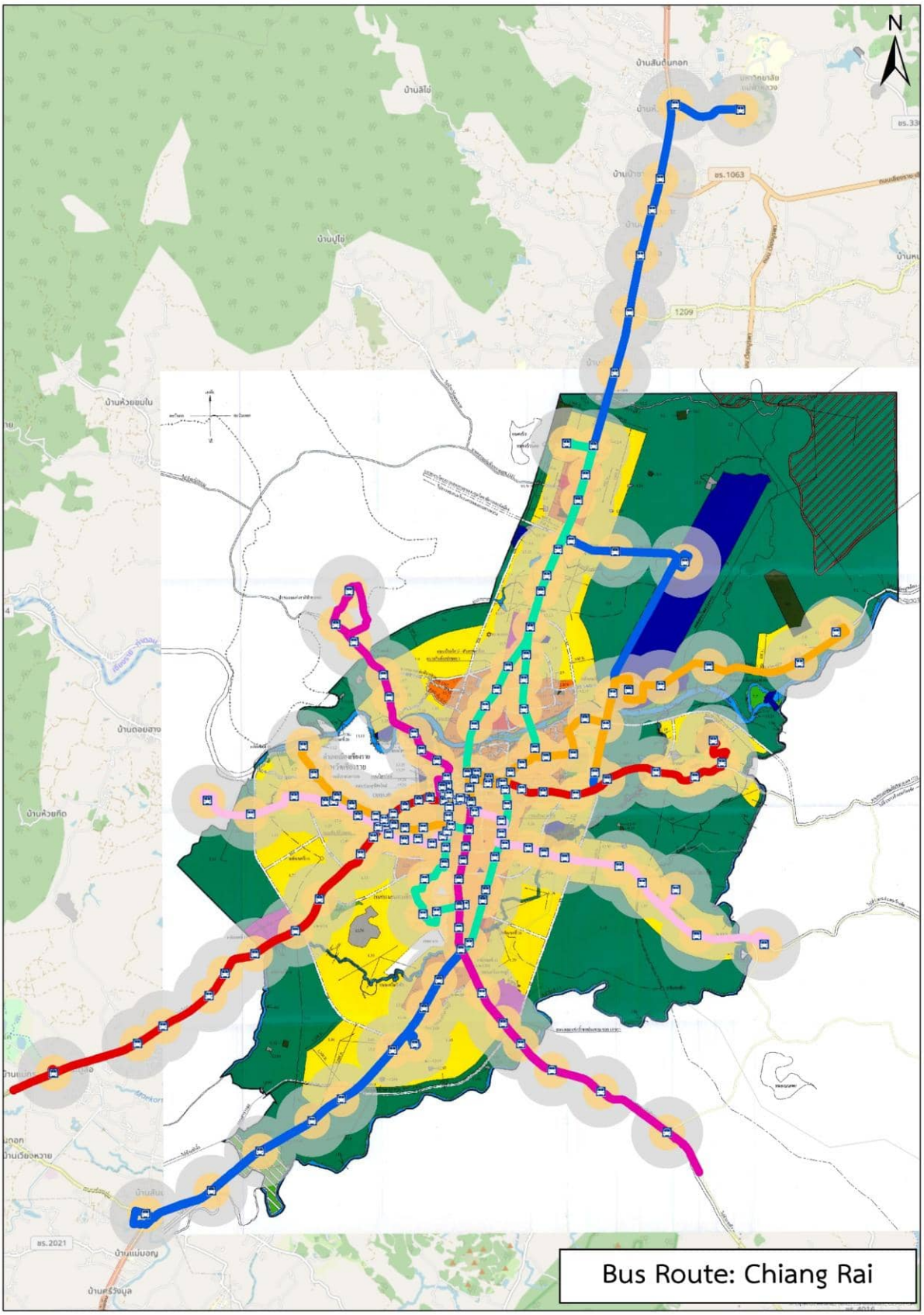


Figure 6.1-2 Map of Bus Routes and Service Area and Population Coverage in Chiang Rai City

Table 6.1-4 Proposed Route Details for the Transitional Phase of the Public Transportation System in Chiang Rai City

Line	Origin point - destination	2 directions combined		Opening year
		Distance (km)	Number of Bus Stops	
1	Mae Fah Luang University - Wat Rong Khun	77.4	81	2027
2	Chiang Rai Rajabhat University - Central Chiang Rai	27.7	56	2027
3	Ban Pa Yang Mon (Chulabhorn Royal College of Science) - Singhpark Chiang Rai	41.1	60	2027
4	Wiang Chai (Wiang Chai Kindergarten) - Hong O (Hong O Temple)	34.4	59	2027
5	Huay Pla Kang House (Huay Pla Kang Temple) - Ban Hua Doi (Wat Si Suphan)	36.0	55	2027
6	Commemoration Park - Baan Sampanthakit (Paisansart Christian School)	36.8	58	2027
Total		**253.4**	**314**	

Note: The total number of bus stops will not equal the sum of the bus stops for each route, as some bus stops are shared.

6.1.3 Phitsanulok Province

The public transportation service route network using EV Buses, as proposed by the study, comprises a total of 11 routes and 416 bus stops. The total length of the service network is 367 kilometers (round trip), covering the service area and population in Phitsanulok city and its contiguous areas according to the current comprehensive plan, as shown in **Figure 6.1-3**. Details of the proposed routes for the transitional phase of the public transportation system in Phitsanulok city are provided in **Table 6.1-6**.

Table 6.1-5 Service Area and Population Coverage in Phitsanulok City and Contiguous Areas According to the Current Comprehensive Plan

Catchment Area	Area (sq.km.)	Population (people)
Community Area according to the City's Comprehensive Plan	91.95	155,800[1]
Accessible Area within a 400 m radius of bus stops	39.5 (42.9%)	73,538 (47.2%)
Accessible Area within an 800 m radius of bus stops	61.8 (67.8%)	116,227 (74.6%)

Note: [1] Number of Population in the Study Area Residing in Communities According to the City's Comprehensive Plan

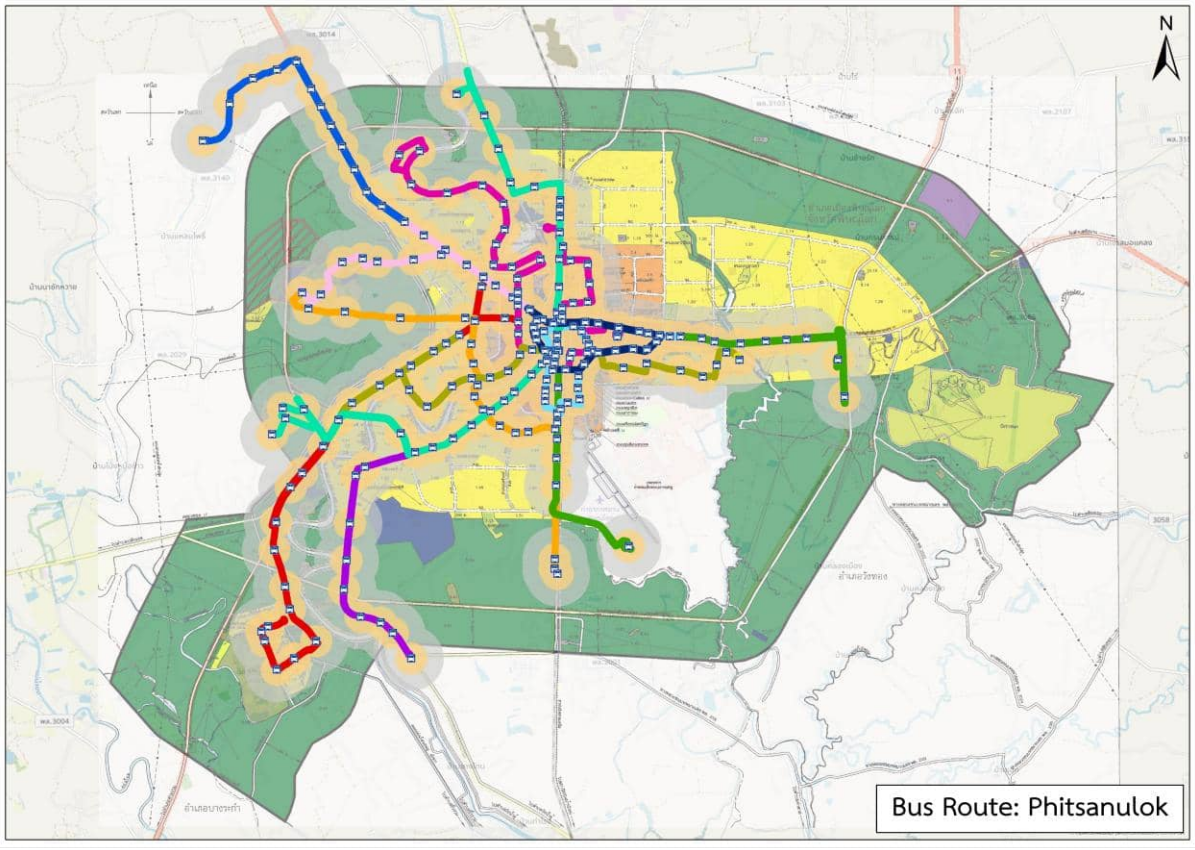


Figure 6.1-3 Map of Bus Routes and Service Area and Population Coverage in Phitsanulok City

Table 6.1-6 Proposed Route Details for the Transitional Phase of the Public Transportation System in Phitsanulok City

Line	Origin point - destination	2 directions combined		Opening year
		Distance (km)	Number of Bus Stops	
1	Phitsanulok University - Rajamangala University of Technology Lanna, Phitsanulok	44	76	2027
2	Buddha Chinraj Hospital, Bueng Kaeng Yai Branch - Wat Saeng Dao	39	59	2027
3	Naresuan University - Phitsanulok Railway Station	45	69	2027
4	Phibun Songkram Rajabhat University - Wat Pikul Wararam	32	67	2027
5	Phitsanulok Kindergarten - Plai Chumphon Sub-district Municipality	42	91	2027
6	Phibun Songkram Rajabhat University - Phra Phitsanulok Bueng Commercial College	26	40	2027
7	Phitsanulok Provincial Bus Terminal No. 2 - Phitsanulok Airport	36	62	2027
8	Phitsanulok Provincial Bus Terminal No. 1 - Wat Phrik (Soi Wat Lom Moo 5)	32	63	2027
9	Lotus Phitsanulok 2 (Tha Thong) - Wat Thep Kunchon	32	63	2027
10	Around the city	16	47	2027
11	Around the City 2	23	74	2027
Total		**367**	**416**	

Note: The total number of bus stops will not equal the sum of the bus stops for each route, as some bus stops are shared.

6.1.4 Udon Thani Province

The public transportation service route network using EV Buses, as proposed by the study, comprises a total of 12 routes and 444 bus stops. The total length of the service network is 373 kilometers (round trip), covering the service area and population in Udon Thani city and its contiguous areas according to the current comprehensive plan, as shown in **Figure 6.1-4**. Details of the proposed routes for the transitional phase of the public transportation system in Udon Thani city are provided in **Table 6.1-8**.

Table 6.1-7 Service Area and Population Coverage in Udon Thani City and Contiguous Areas According to the Current Comprehensive Plan

Catchment Area	Area (sq.km.)	Population (people)
Community Area according to the City's Comprehensive Plan	61.62	235,000[1]
Accessible Area within a 400 m radius of bus stops	65.3 (40.12%)	103,635 (44.1%)
Accessible Area within an 800 m radius of bus stops	55.72 (90.4%)	226,305 (96.3%)

note: [1] Number of Population in the Study Area Residing in Communities According to the City's Comprehensive Plan

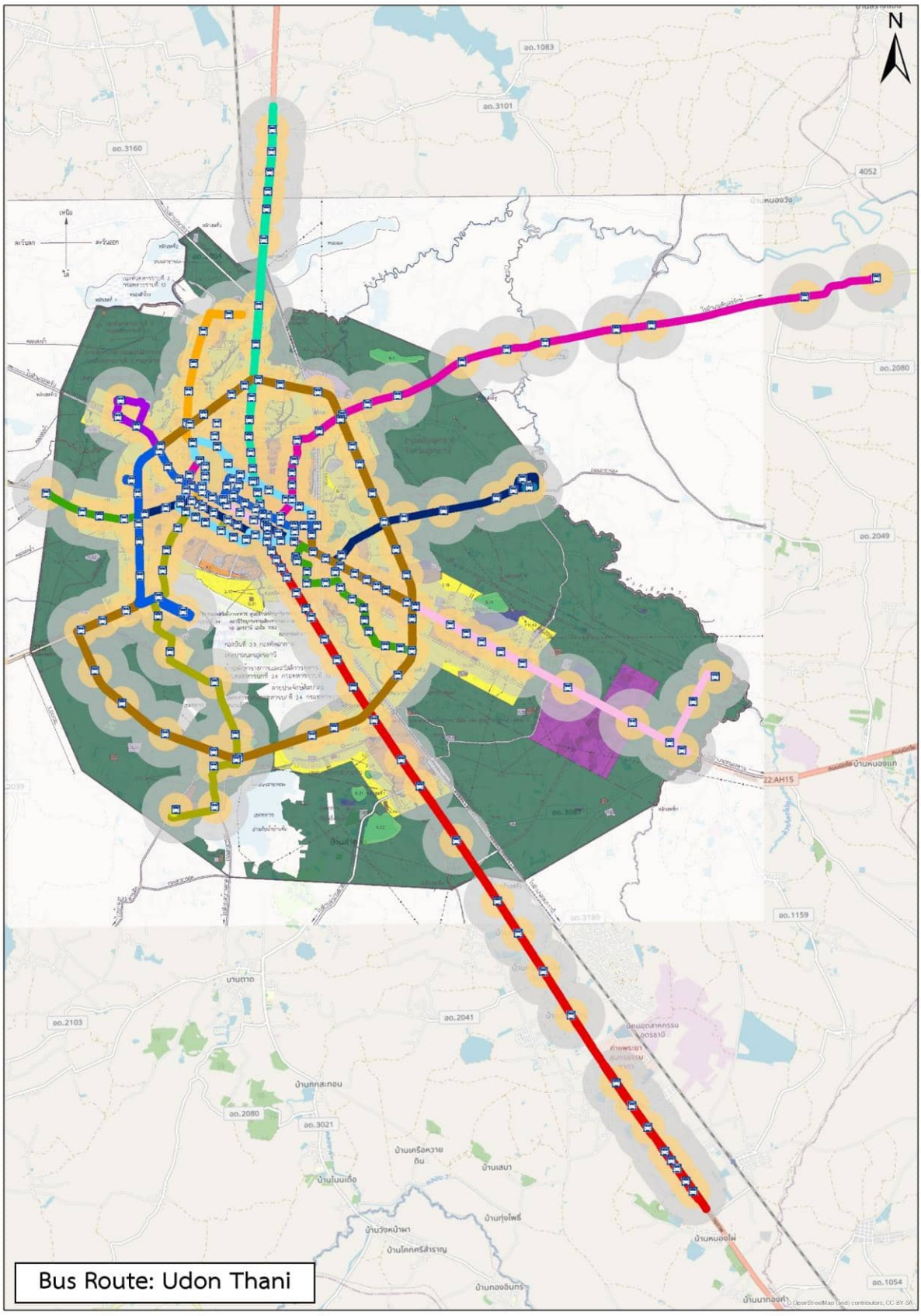


Figure 6.1-4 Map of Bus Routes and Service Area and Population Coverage in Udon Thani City

Table 6.1-8 Proposed Route Details for the Transitional Phase of the Public Transportation System in Udon Thani City

Line	Origin point - destination	2 directions combined		Opening year
		Distance (km)	Number of Bus Stops	
1	Udon Thani Airport - Udon Thani Railway Station	23.5	52	2027
2	Udon Thani Railway Station - Mu Mon (Mae Yuphin Fresh Market)	21.9	43	2027
3	Udon Thani - Non Sung Railway Station (Kanchanapisek Udon Thani Technical College)	49.1	91	2027
4	Thung Si Mueang - Nong Na Kham (Ban Nong Na Kham School)	30.6	56	2027
5	Udon Thani Hospital - Udon Thani Rajabhat University (Sam Phrao Center)	44.3	70	2027
6	Udon Thani - Mu Mon Railway Station (Nong Samrong Witthaya School)	17.8	45	2027
7	Ban Leem (Thai Siri 3 Market) - Thai Watsadu Udon Thani	28.6	74	2027
8	Udon Thani Railway Station - Ban Leem (Ban Leem School)	15	43	2027
9	Udon Thani - Ban Chan Railway Station (Udon Phatthanakan School)	28	50	2027
10	Udon Thani Provincial Bus Terminal No. 2 - Nong Na Kham (Wat Pho Si Sai Saet)	26.2	60	2027
11	Around the city (Nong Prajak Park - Central Udon Thani)	19.6	58	2027
12	Udon Thani Railway Station - Around the City	68.5	106	2033
Total		**373.1**	**444**	

Note: The total number of bus stops will not equal the sum of the bus stops for each route, as some bus stops are shared.

6.1.5 Khon Kaen Province

The public transportation service route network using EV Buses, as proposed by the study, comprises a total of 20 routes and 694 bus stops. The total length of the service network is 571 kilometers (round trip), covering the service area and population in Khon Kaen city and its contiguous areas according to the current comprehensive plan, as shown in **Figure 6.1-5**. Details of the proposed routes for the transitional phase of the public transportation system in Khon Kaen city are provided in **Table 6.1-10**.

Table 6.1-9 Service Area and Population Coverage in Khon Kaen City and Contiguous Areas According to the Current Comprehensive Plan

Catchment Area	Area (sq.km.)	Population (people)
Community Area according to the City's Comprehensive Plan	102.32	315,400[1]
Accessible Area within a 400 m radius of bus stops	54.52 (51.8%)	179,463 (56.9%)
Accessible Area within an 800 m radius of bus stops	92.47 (87.8%)	292,060 (92.6%)

Note: [1] Number of Population in the Study Area Residing in Communities According to the City's Comprehensive Plan

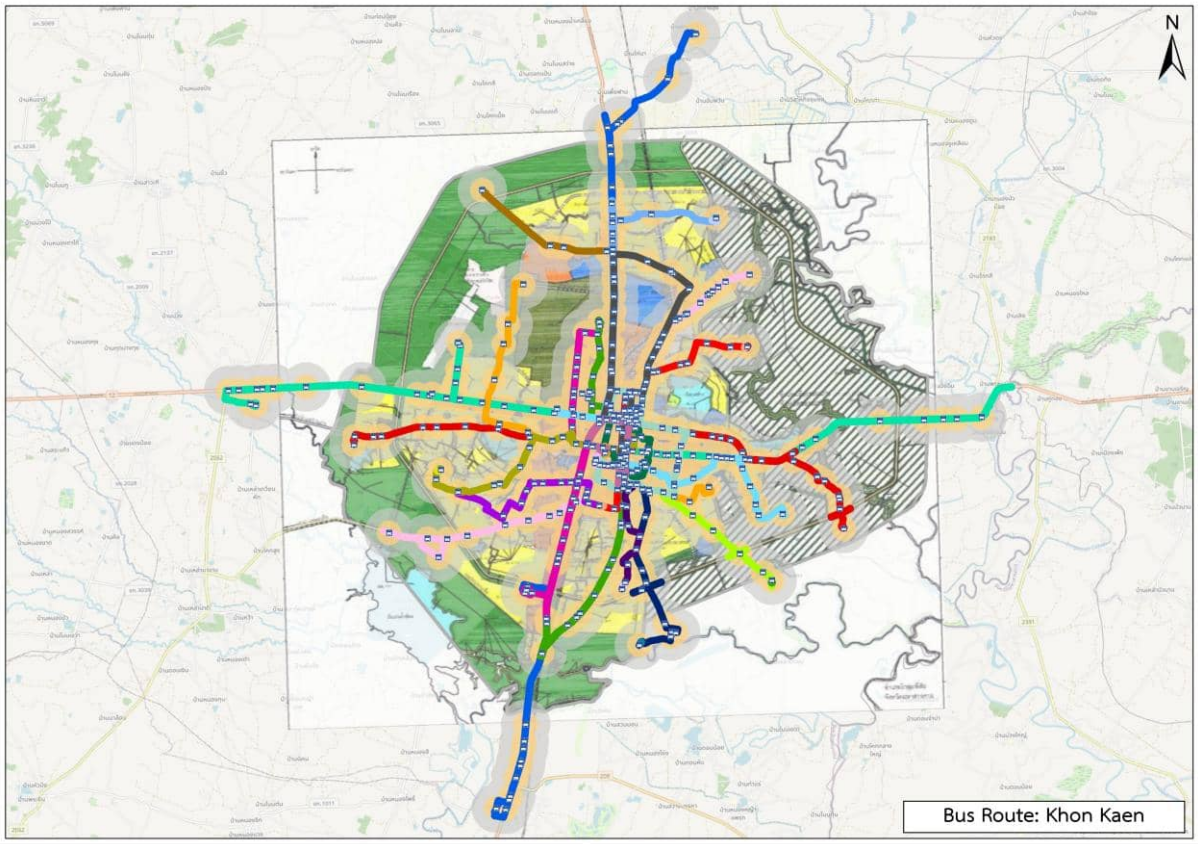


Figure 6.1-5 Map of Bus Routes and Service Area and Population Coverage in Khon Kaen City

Table 6.1-10 Proposed Route Details for the Transitional Phase of the Public Transportation System in Khon Kaen City

Line	Origin point - destination	2 directions combined		Opening year
		Distance (km)	Number of Bus Stops	
1	Wat Si Saen (Ban Nong Ka) - Tha Phra Public School	62.9	123	2027
2	Wat Tha Song Nakhon (Ban Bueng Niam) - Wat Si Bun Rueng (Ban Thum)	63.9	105	2027
3	Ban Nong Saeng Khok Noi School (Ban Nong Saeng) - Wat Tha Bueng (Ban Duck)	40.9	74	2027
4	Ban Nong Hin School (Sila) - Hua Hin Temple (Clean House)	36.2	86	2027
5	Khon Kaen University (Faculty of Medicine Roundabout) - Khon Kaen Provincial Bus Terminal No. 3	24.1	40	2027
6	Betagro Khon Kaen 3 Branch (Nontan) - 8th Infantry Regiment Yomarat	29.8	61	2027
7	Srinakarin Hospital (Khon Kaen University) - Kasem Sap Village	28.9	47	2027
8	Khon Kaen Kindergarten - Euathorn Village Phase 3 (Ban Duck) - Ban Kok Road	24.7	56	2027
9	Khon Kaen Kindergarten - Euathorn Village Phase 3 (Ban Duck) - Si Chan Road	19.55	49	2027
10	Airport School - Loei Rajabhat University (Khon Kaen Campus)	22	34	2027
11	Wat Thung Setti (Phra Lap) - Khon Kaen University (Si Tan Gate)	23.9	48	2027
12	Khon Kaen Railway Station - Ban Non Muang (behind Khon Kaen University)	27.4	62	2027
13	Khon Kaen Railway Station - Ban Sila Market	28.2	57	2027
14	Khon Kaen Provincial Administration Organization Stadium - Wat Sawang Ban Don Yang	18.94	68	2027
15	Khon Kaen Kindergarten - Ban Phue (Phra Lap)	18.67	48	2027
16	Khon Kaen Kindergarten - Khon Kaen Community Housing and Community Service Project (Old Town-Greenville)	13.9	35	2027
17	Khon Kaen Railway Station - Central Khon Kaen	13.2	35	2027
18	City Pillar Shrine - Central Khon Kaen	27.8	67	2027
19	City Pillar Shrine - Ratchadanusorn Park	12	20	2027
20	Ratchadanusorn Park - Sila	34	80	2027
Total		**571.0**	**694**	

Note: The total number of bus stops will not equal the sum of the bus stops for each route, as some bus stops are shared.

6.1.6 Nakhon Ratchasima Province

The public transportation service route network using EV Buses, as proposed by the study, comprises a total of 16 routes and 750 bus stops. The total length of the service network is 525 kilometers (round trip), covering the service area and population in Nakhon Ratchasima city and its contiguous areas according to the current comprehensive plan, as shown in **Figure 6.1-6**. Details of the proposed routes for the transitional phase of the public transportation system in Nakhon Ratchasima city are provided in **Table 6.1-12**.

Table 6.1-11 Service Area and Population Coverage in Nakhon Ratchasima City and Contiguous Areas According to the Current Comprehensive Plan

Catchment Area	Area (sq.km.)	Population (people)
Community Area according to the City's Comprehensive Plan	175.81	429,400[1]
Accessible Area within a 400 m radius of bus stops	71.80 (40.8%)	201,389 (46.9%)
Accessible Area within an 800 m radius of bus stops	122.51 (69.7%)	329,350 (76.7%)

Note: [1] Number of Population in the Study Area Residing in Communities According to the City's Comprehensive Plan

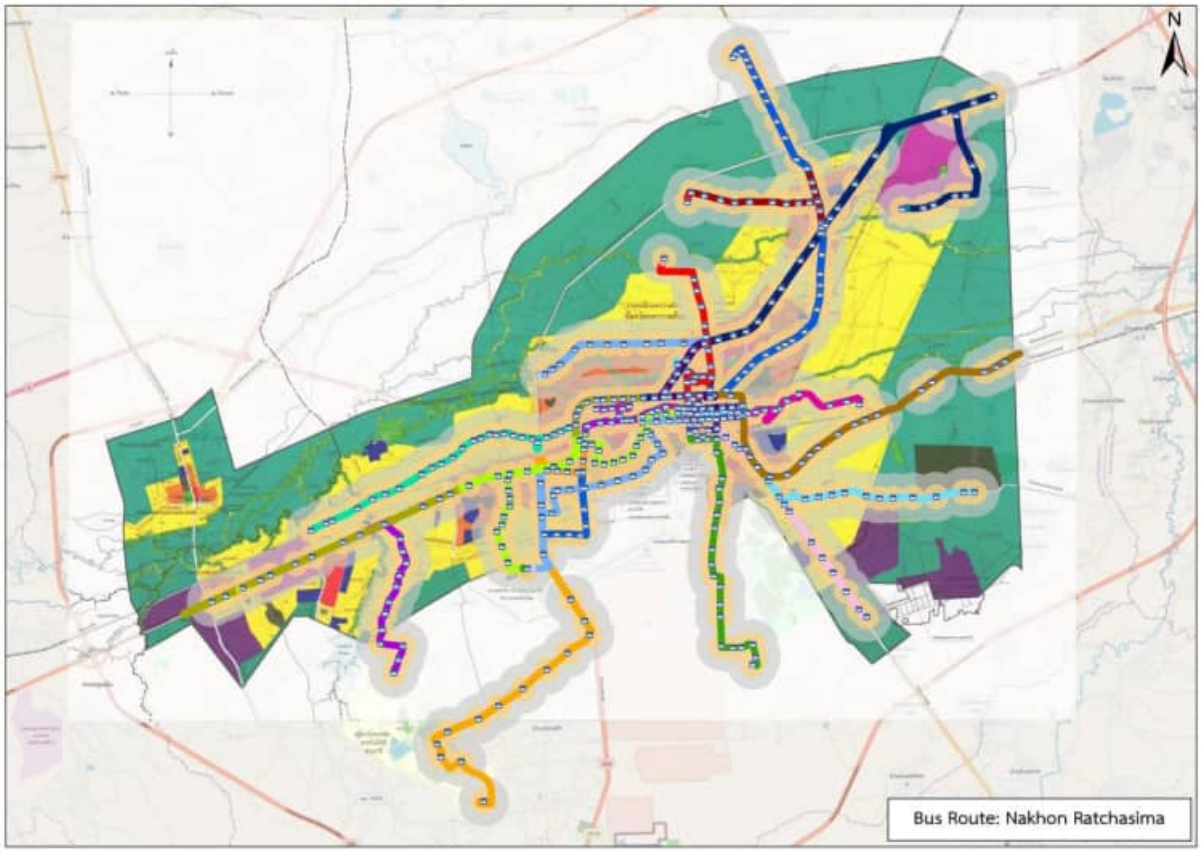


Figure 6.1-6 Map of Bus Routes and Service Area and Population Coverage in Nakhon Ratchasima City

Table 6.1-12 Proposed Route Details for the Transitional Phase of the Public Transportation System in Nakhon Ratchasima City

Line	Origin point - destination	2 directions combined		Opening year
		Distance (km)	Number of Bus Stops	
1	Nong Cha Bok (80th Anniversary Stadium) - Khok Sung (Wat Khok Sung)	51	126	2027
2	Thao Suranari Monument - Khok Krat (Ban Due)	31	84	2027
3	Thao Suranari - Johor Monument (Ban Krut Temple)	31	72	2027
4	Nakhon Ratchasima Bus Terminal 2 - Nong Bua Sala (Entrance to Suranaree Industrial Zone)	25	61	2027
5	Baan Koh (Lotus Korat) - Mareng (Wat Phalai)	25	59	2027
6	Nakhon Ratchasima - Chaiyamongkol Railway Station (Suranaree University of Technology Hospital)	45	64	2027
7	Baan Koh (Surannakorn Market) - Pho Klang (Wat Nong Pluang Noi)	25	60	2027
8	Thao Suranari Monument - Suranari (MUT Gate 4)	36	70	2027
9	Thao Suranari Monument - Khok Krat (Thepparat Nakhon Ratchasima Hospital)	39	70	2027
10	Thao Suranari Monument - Market (Ban Bu School (Pracharat Pattana))	45	72	2027
11	Nakhon Ratchasima Provincial Bus Terminal No. 2 - Nong Rawieng (Rajamangala University of Technology Isan, Nong Rawieng Education Center)	29	64	2027
12	Thao Suranari Monument - Phanau (Ban Phanau Theater)	29	52	2027
13	Nong Cha Bok (80th Anniversary Stadium) - Pru Yai (Suranari 2 Interchange Construction Project Control Office)	43	89	2027
14	Jira - Muen Wai Road Junction Railway Station (Wat Muen Wai)	17	38	2027
15	Ban Koh (Suranakorn Market) - Nong Cha Bok (80th Anniversary Stadium)	32	78	2027
16	Around the city	23	67	2027
Total		**525**	**750**	

Note: The total number of bus stops will not equal the sum of the bus stops for each route, as some bus stops are shared.

6.1.7 Ubon Ratchathani Province

The public transportation service route network using EV Buses, as proposed by the study, comprises a total of 17 routes and 570 bus stops. The total length of the service network is 408 kilometers (round trip), covering the service area and population in Ubon Ratchathani city and its contiguous areas according to the current comprehensive plan, as shown in **Figure 6.1-7**. Details of the proposed routes for the transitional phase of the public transportation system in Ubon Ratchathani city are provided in **Table 6.1-14**.

Table 6.1-13 Service Area and Population Coverage in Ubon Ratchathani City and Contiguous Areas According to the Current Comprehensive Plan

Catchment Area	Area (sq.km.)	Population (people)
Community Area according to the City's Comprehensive Plan	52.58	249,000[1]
Accessible Area within a 400 m radius of bus stops	34.2 (65.1%)	194,469 (78.1%)
Accessible Area within an 800 m radius of bus stops	50.7 (96.4%)	242,277 (97.3%)

note: [1] Number of Population in the Study Area Residing in Communities According to the City's Comprehensive Plan

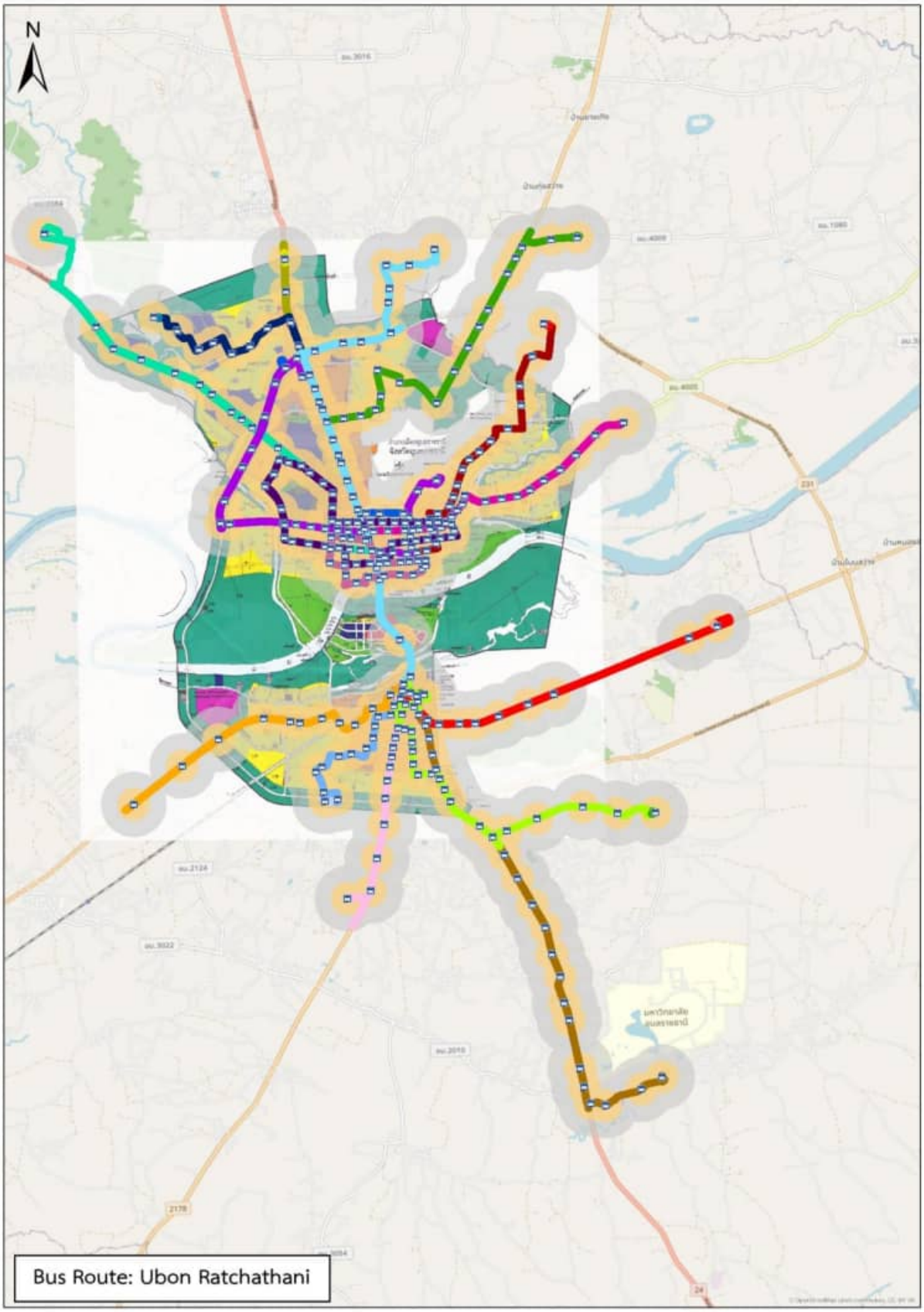


Figure 6.1-7 Map of Bus Routes and Service Area and Population Coverage in Ubon Ratchathani City

Table 6.1-14 Proposed Route Details for the Transitional Phase of the Public Transportation System in Ubon Ratchathani City

Line	Origin point - destination	2 directions combined		Opening year
		Distance (km)	Number of Bus Stops	
1	Ubon Ratchathani Provincial Bus Terminal - Ubon Ratchathani Railway Station	34.1	70	2027
2	Thung Si Mueang - Nong Khon (Thung Burapha Stadium)	27.2	48	2027
3	Thung Si Mueang - Rai Noi (Kitiyan Uppatham School)	19.0	44	2027
4	Thung Si Mueang - Sansuk (Warin Chamrap Vocational College)	22.3	41	2027
5	Thung Si Mueang - Kudlat (Ban Kho-Kud Lat School)	16.9	50	2027
6	Thung Si Mueang - Nong Kinple (Ban Thang Sai School)	25.6	39	2027
7	Thung Si Mueang - Rai Noi (50th Anniversary Hospital, Maha Vajiralongkorn under the patronage of the Patriarch)	30.0	62	2027
8	Big C Supercenter Ubon Ratchathani - Ubon Ratchathani Airport	26.4	57	2027
9	Warin Chamrap Municipal Fresh Market - Kham Yai (Ban Dam Phra School)	25.1	53	2027
10	Warin Chamrap Municipal Fresh Market - Ubon Ratchathani Zoo	30.4	63	2027
11	Warin Chamrap Municipal Fresh Market - Kham Yai (New Town Community)	31.6	62	2027
12	Warin Chamrap Municipal Fresh Market - Mueang Si Kai (Ban Mad Kamluecha School (Rat Samakkhi))	28.3	56	2027
13	Warin Chamrap Municipal Fresh Market - Sansuk (Okay, good car)	11.6	32	2027
14	Warin Chamrap Municipal Fresh Market - Bungmai (Ban Yang Wang Kang Hung School)	19.0	26	2027
15	Warin Chamrap Municipal Fresh Market - Kham Khwang (Kham Khwang Health Station)	21.3	44	2027
16	Around Town 1	25.7	82	2027
17	Around the City 2	13.6	46	2027
Total		**408**	**570**	

Note: The total number of bus stops will not equal the sum of the bus stops for each route, as some bus stops are shared.

6.1.8 Phra Nakhon Si Ayutthaya Province

The public transportation service route network using EV Buses, as proposed by the study, comprises a total of 17 routes and 490 bus stops. The total length of the service network is 432 kilometers (round trip), covering the service area and population in Ayutthaya city and its contiguous areas according to the current comprehensive plan, as shown in **Figure 6.1-8**. Details of the proposed routes for the transitional phase of the public transportation system in Ayutthaya city are provided in **Table 6.1-16**.

Table 6.1-15 Service Area and Population Coverage in Ayutthaya City and Contiguous Areas According to the Current Comprehensive Plan

Catchment Area	Area (sq.km.)	Population (people)
Community Area according to the City's Comprehensive Plan	53.54	134,900[1]
Accessible Area within a 400 m radius of bus stops	36.65 (68.5%)	106,274 (78.8%)
Accessible Area within an 800 m radius of bus stops	51.54 (96.3%)	131,203 (97.3%)

note: [1] Number of Population in the Study Area Residing in Communities According to the City's Comprehensive Plan

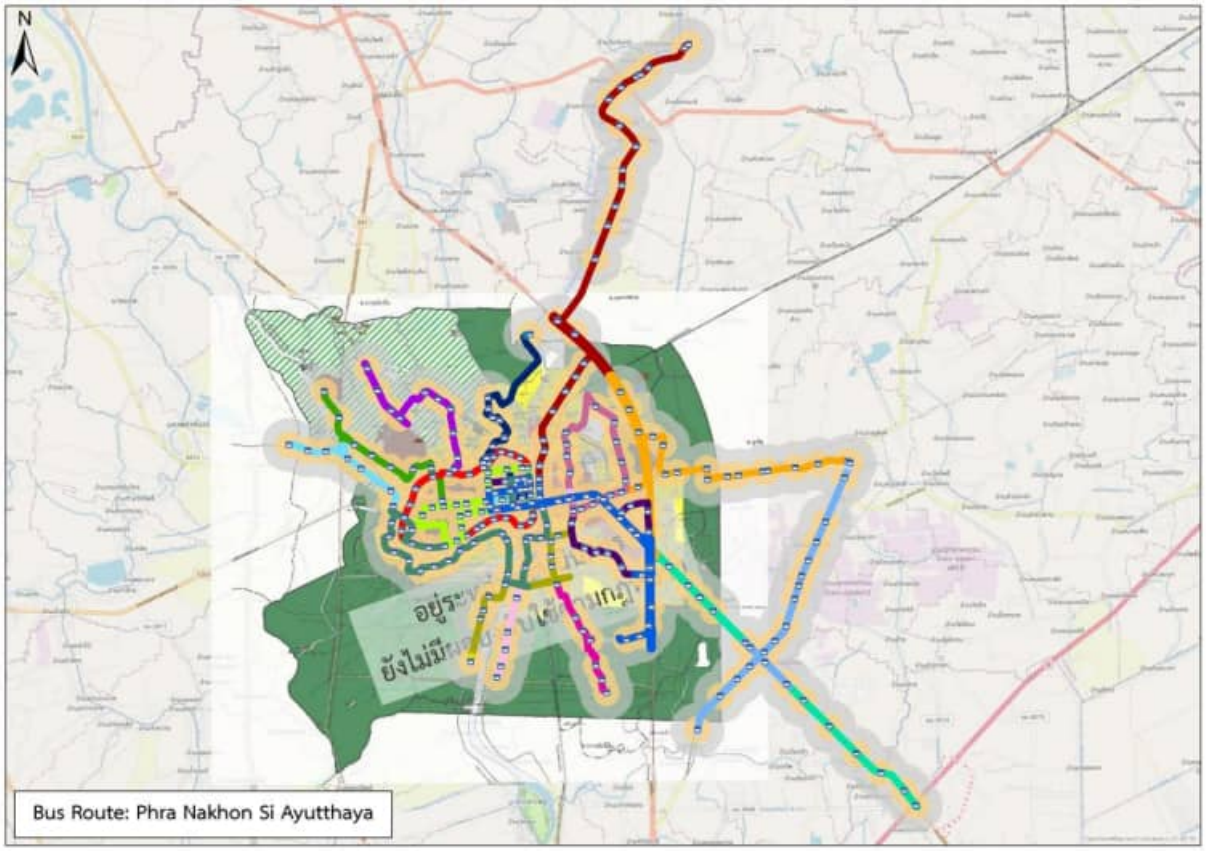


Figure 6.1-8 Map of Bus Routes and Service Area and Population Coverage in Ayutthaya City

Table 6.1-16 Proposed Route Details for the Transitional Phase of the Public Transportation System in Ayutthaya City

Line	Origin point - destination	2 directions combined		Opening year
		Distance (km)	Number of Bus Stops	
1	Chao Phrom Market - Bang Pa-in (Big C Phra Nakhon Si Ayutthaya)	30.6	50	2027
2	Bang Pa-in (Big C Phra Nakhon Si Ayutthaya) - Wang Noi (Four Right Pattana Market)	36.3	44	2027
3	Chao Phrom Market - Nakhon Luang (Nakhon Luang School (Udomrat Witthaya))	43.7	71	2027
4	Chao Phrom Market - Koh Rien (Wat Chang Thong School (Bunbumrunrat))	19.2	38	2027
5	Chao Phrom Market - Bang Pa-in (Wonderland)	21.2	42	2027
6	Chao Phrom - Uthai Weekend Market (Mill Weekend Market)	36.0	59	2027
7	Wat Sam Pluem Pagoda - Ban Mai (King Suriyothai Monument)	24.4	46	2027
8	Wat Sam Pluem Pagoda - Wat Tum	24.9	50	2027
9	Chao Phrom Market - Ban Rum (Wat Kai Tia Phruttharam)	22.9	37	2027
10	Chao Phrom Market - Ban Koh (Wat Koh Kaew Kasadaram)	17.2	30	2027
11	Wat Sam Pluem Pagoda - Bang Ban (Wat Muang Wan School)	27.8	54	2027
12	Bang Pa-in (Pannawich School) - Uthai (Wat Khok Chang)	22.6	34	2027
13	Around the island	22.8	62	2027
14	Around the Inner Island	27.0	54	2027
15	Chao Phrom Market - Wat Yai Chai Mongkol - Ayutthaya City Park	15.8	31	2027
16	Wat Sam Pluem Pagoda - Wat Ayothaya - Wat Yai Chai Mongkol School (Phawana Rangsi)	18.2	34	2027
17	Chao Phrom Market - Wat Phananchoeng Worawihan - Wat Phutthaisawan Royal Monastery - Wat Chaiyawattanaram	21.5	39	2027
Total		**432.0**	**490**	

Note: The total number of bus stops will not equal the sum of the bus stops for each route, as some bus stops are shared.

6.1.9 Surat Thani Province

The public transportation service route network using EV Buses, as proposed by the study, comprises a total of 7 routes and 328 bus stops. The total length of the service network is 261 kilometers (round trip), covering the service area and population in Surat Thani city and its contiguous areas according to the current comprehensive plan, as shown in **Figure 6.1-9**. Details of the proposed routes for the transitional phase of the public transportation system in Surat Thani city are provided in **Table 6.1-18**.

Table 6.1-17 Service Area and Population Coverage in Surat Thani City and Contiguous Areas According to the Current Comprehensive Plan

Catchment Area	Area (sq.km.)	Population (people)
Community Area according to the City's Comprehensive Plan	104.62	179,550[1]
Accessible Area within a 400 m radius of bus stops	44.38 (42.4%)	83,670 (46.6%)
Accessible Area within an 800 m radius of bus stops	66.56 (63.6%)	125,505 (69.9%)

note: [1] Number of Population in the Study Area Residing in Communities According to the City's Comprehensive Plan

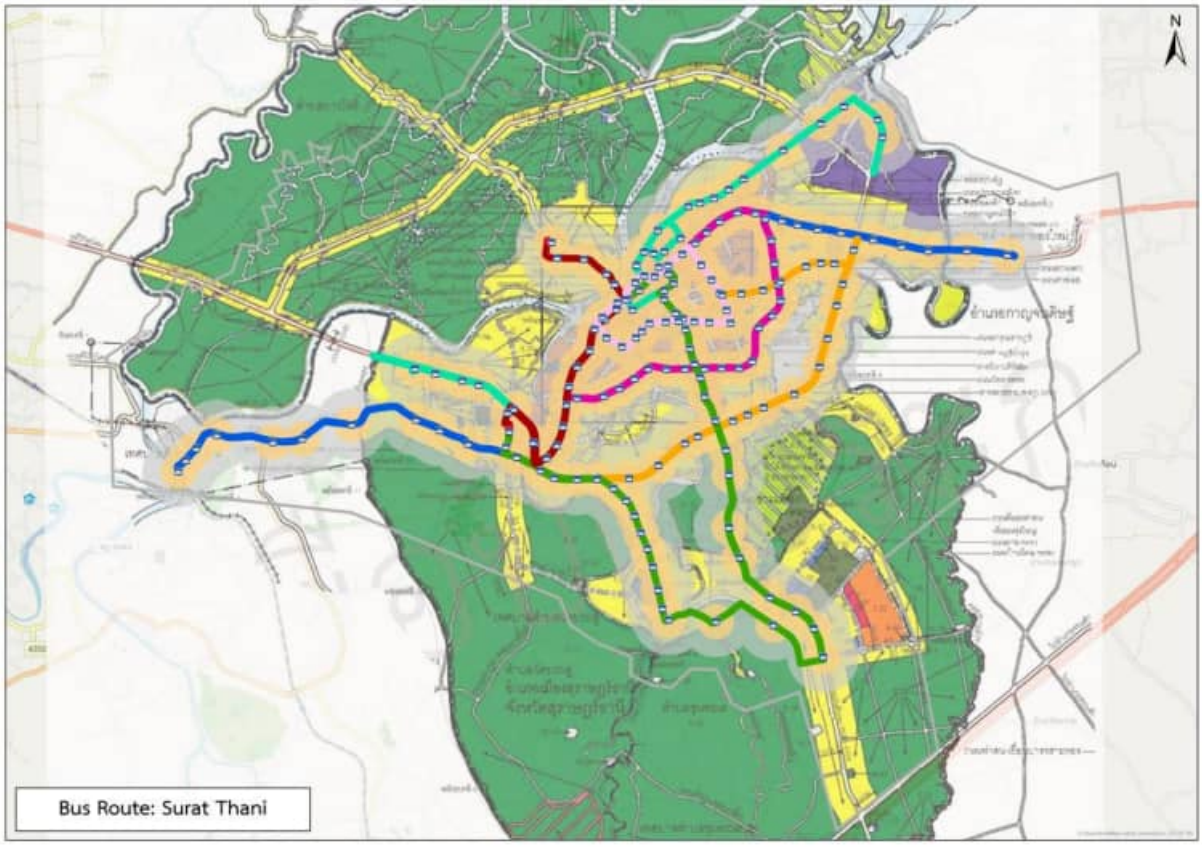


Figure 6.1-9 Map of Bus Routes and Service Area and Population Coverage in Surat Thani City

Table 6.1-18 Proposed Route Details for the Transitional Phase of the Public Transportation System in Surat Thani City

Line	Origin point - destination	2 directions combined		Opening year
		Distance (km)	Number of Bus Stops	
1	Phunphin (Surat Thani Railway Station) - Kanchanadit)	49.6	87	2027
2	Wat Pradu (PTT Wat Pradu Junction) - Bang Kung (Provincial Electricity Authority, Bandon 2 Power Station)	41.2	73	2027
3	Surat Thani Provincial Bus Terminal - Bang Bai Bai (Wat Bang Bai Bai School)	18.4	40	2027
4	Around Town 1	17.4	46	2027
5	Around the City 2	28.7	70	2027
6	Around City 3	48.2	97	2027
7	Around the city - Khun Talay Pond	57.7	109	2027
Total		**261.2**	**328**	

Note: The total number of bus stops will not equal the sum of the bus stops for each route, as some bus stops are shared.

6.1.10 Phuket Province

The public transportation service route network using EV Buses, as proposed by the study, comprises a total of 10 routes and 775 bus stops. The total length of the service network is 576 kilometers (round trip), covering the service area and population in Phuket province according to the current comprehensive plan, as shown in **Figure 6.1-10**. Details of the proposed routes for the transitional phase of the public transportation system in Phuket province are provided in **Table 6.1-20**.

Table 6.1-19 Service Area and Population Coverage in Phuket Province According to the Current Comprehensive Plan

Catchment Area	Area (sq.km.)	Population (people)
Community Area according to the City's Comprehensive Plan	227.59	777,100[1]
Accessible Area within a 400 m radius of bus stops	101.1 (44.4%)	379,225 (48.8%)
Accessible Area within an 800 m radius of bus stops	163.33 (71.8%)	614,686 (79.1%)

note: [1] Number of Population in the Study Area Residing in Communities According to the City's Comprehensive Plan

Figure 6.1-10 Map of Bus Routes and Service Area and Population Coverage in Phuket Province

Table 6.1-20 Proposed Route Details for the Transitional Phase of the Public Transportation System in Phuket Province

Line	Origin point - destination	2 directions combined		Opening year
		Distance (km)	Number of Bus Stops	
1	Checkpoint at Chatachai Pier - Chalong Intersection	112.9	147	2027
2	Phuket Airport - Rawai	94.0	178	2027
3	Bang Tao Beach - Phuket Aquarium	68.9	148	2027
4	Phuket Airport - Rawai 2	118.8	170	2027
5	Rassada Pier - Marina Pier	25.9	71	2027
6	Around Town 1	5.7	17	2027
7	Phuket Provincial Bus Terminal No. 2 - Around the City	17.6	49	2027
8	Around Muang 2 (Museum Phuket - Chillwa Flea Market - B.B.S.2 - Kingkaew)	35.8	70	2027
9	Around Patong City	6.9	18	2027
10	Museum Phuket - Patong	89.0	89	2027
Total		**575.6**	**775**	

Note: The total number of bus stops will not equal the sum of the bus stops for each route, as some bus stops are shared.

6.1.11 Songkhla Province (Hat Yai)

The public transportation service route network using EV Buses, as proposed by the study, comprises a total of 9 routes and 368 bus stops. The total length of the service network is 259 kilometers (round trip), covering the service area and population in Hat Yai city and its contiguous areas according to the current comprehensive plan, as shown in **Figure 6.1-11**. Details of the proposed routes for the transitional phase of the public transportation system in Hat Yai city are provided in **Table 6.1-22**.

Table 6.1-21 Service Area and Population Coverage in Hat Yai City and Contiguous Areas According to the Current Comprehensive Plan

Catchment Area	Area (sq.km.)	Population (people)
Community Area according to the City's Comprehensive Plan	168.1	383,800[1]
Accessible Area within a 400 m radius of bus stops	61.6 (36.4%)	156,207 (40.7%)
Accessible Area within an 800 m radius of bus stops	119.26 (71%)	326,998 (85.2%)

note: [1] Number of Population in the Study Area Residing in Communities According to the City's Comprehensive Plan

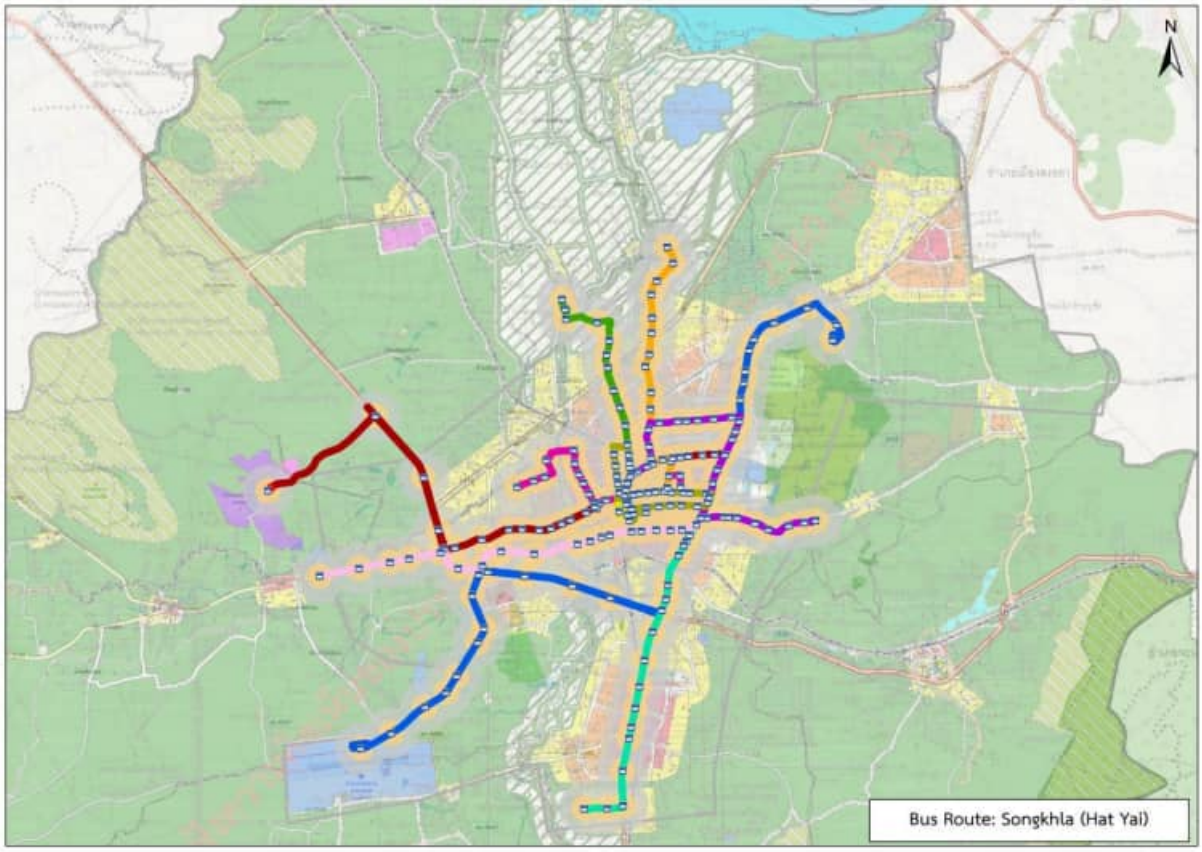


Figure 6.1-11 Map of Bus Routes and Service Area and Population Coverage in Hat Yai City

Table 6.1-22 Proposed Route Details for the Transitional Phase of the Public Transportation System in Hat Yai City

Line	Origin point - destination	2 directions combined		Opening year
		Distance (km)	Number of Bus Stops	
1	Hat Yai Pittayakhom School - Hat Yai Airport	53.8	78	2027
2	Prince of Songkla Hospital - Hat Yai Vidayalai 2 School	23.2	42	2027
3	Prince of Songkla Hospital - Southern Industrial Estate	41.9	70	2027
4	Prince of Songkla Hospital - Irrigation Office No. 16	27.6	44	2027
5	Prince of Songkla Hospital - Ban Bang Fab Mosque	21.7	59	2027
6	Prince of Songkla Hospital - Ban Thung Nam School	21.5	47	2027
7	Prince of Songkla Hospital - Ban Han School	22.6	59	2027
8	Hat Yai Clock Tower - Kho Hong Municipal Office	25.0	64	2027
9	Around the city	21.9	69	2027
Total		**259.2**	**368**	

Note: The total number of bus stops will not equal the sum of the bus stops for each route, as some bus stops are shared.

6.2 Study of Suitable Public Transportation System Options

6.2.1 Concepts for Selecting a Suitable Public Transportation System

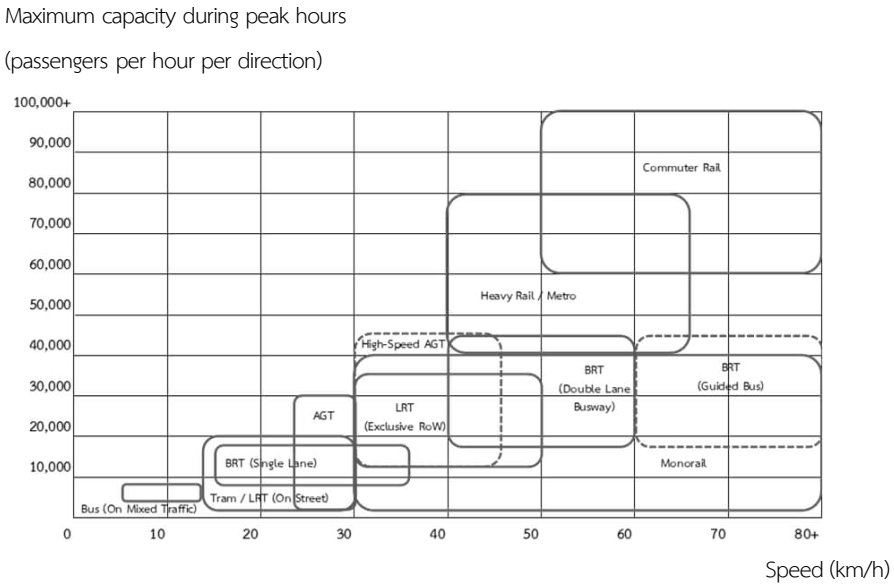
In accordance with the regional urban public transportation system development strategy, focusing on the development of standardized and safe public transportation that provides equitable and high-quality service, reduces energy consumption, and is environmentally friendly, the consultant will consider and select suitable public transportation modes that align with these strategic issues. This selection will be based on engineering suitability, passenger volume, and the economic feasibility of the project.

The Office of Transport and Traffic Policy and Planning (OTP) (2009), as part of its study for the revision of the Mass Rapid Transit Master Plan in the Bangkok Metropolitan Region (M-Map), studied the selection of efficient mass transit system technologies, which are related to the right-of-way used for operation, categorized into three types:

1) No Independent Right-of-Way: Operation on the ground-level road mixed with other types of vehicles, known as Mixed Traffic.
2) Separate Right of Way (SROW): Independent lanes on the ground-level road separated from general traffic lanes but still involve intersections and pedestrian crossings where vehicles must stop, similar to general vehicles.
3) Private Right of Way (PROW): Dedicated infrastructure with elevated or underground tracks, or completely grade-separated from roads, resulting in the best passenger service performance.

Considering technology and the development of mass transit systems with a primary focus on service efficiency, technologies with Separate Right of Way (SROW) and Private Right of Way (PROW) can provide more efficient passenger transport than systems without an independent right-of-way. These systems include Bus Rapid Transit (BRT), Tram, Automated Guideway Transit, Monorail, Light Rail Transit (LRT), and Heavy Rail Transit (HRT).

Speed and capacity of the mass transit system are crucial for managing travel demand. Each type of mass transit system has different speed and capacity characteristics, as shown in **Figure 6.2-1**, which illustrates the suitability of selecting a mass transit system mode appropriate to travel demand. It can be observed that suburban rail systems have the highest passenger carrying capacity, ranging from approximately 60,000 to over 100,000 passengers per hour per direction. This is followed by heavy rail transit, with a capacity of approximately 40,000 – 80,000 passengers per hour per direction. In contrast, bus rapid transit with dedicated lanes can carry approximately 18,000 – 45,000 passengers per hour per direction; high-speed automated guided transit can carry approximately 12,000 – 45,000 passengers per hour per direction; monorail systems can carry approximately 12,000 – 45,000 passengers per hour per direction; automated guided transit can carry approximately 2,000 – 30,000 passengers per hour per direction; light rail transit on a private right-of-way can carry approximately 10,000 – 25,000 passengers per hour per direction; bus rapid transit with at-grade intersections can carry approximately 8,000 – 17,000 passengers per hour per direction; tram and light rail transit on streets can carry approximately 2,000 – 15,000 passengers per hour per direction; and regular buses operating on general roads can carry approximately 5,000 – 8,000 passengers per hour per direction, respectively, as shown in **Figure 6.2-1.**



Source: Compiled from Webb and Tee (2014), Meale (2015), and Bombardier (2015) by Consultants.

Figure 6.2-1 Comparison of the Efficiency of Each Type of Mass Transit System

The development of a public transportation system requires selecting a system that is appropriate for the volume of demand and travel objectives. Therefore, the design of a public transportation network necessitates the integration of various modes of public transport (Intermodal public transport system), with a primary system for main routes. Large metropolitan cities often adopt heavy rail transit as the main system due to its high capacity, complemented by secondary or feeder systems that bring passengers from outside the main system's service area to maximize the efficiency of the city's public mass transit. For this project study, the consultant will focus on mass transit systems with lower capacities, such as Tram, Automated Guideway Transit, Monorail, Light Rail Transit, Bus Rapid Transit, and regular Bus systems, for comparison. Details of each system and guidelines for their consideration are as follows:

6.2.2 Guidelines for Considering Suitable Public Transportation System Modes

6.2.2.1 Public Transportation System Modes

The public transportation system mode to be used for implementation in the transitional phase is the **Low-Floor EV Bus, operating on shared road surfaces with other types of vehicles (Street Transit).** Key factors for consideration include:

- Capacity: Passenger volume and system capacity.
- Accessibility: Ability to reach communities.
- Flexibility: Flexibility in adjusting routes and frequency.
- Cost: Significantly lower investment and O&M costs compared to other systems.
- Local Contents: Potential for domestic development and production.
- Travel Time Reliability: Traffic conditions in regional cities are still at a level where bus travel time can be well-controlled.
- Project Preparation: Greater ability to implement the project in a shorter timeframe compared to other systems.

Figure 6.2-2 Example of a Public Transportation System to be Used for Implementation in the Transitional Phase

6.2.2.2 Route Scheduling (Schedule/Timetable)

Guidelines for determining the route scheduling (Schedule/Timetable) for the public transportation system to be used for implementation in the transitional phase are as follows:

- Specify the arrival time of the bus at each bus stop.
- Difficult to implement; requires good and detailed planning, including risk factor control.
- Efficient cost management and reduced waiting times for travelers.
- Suitable for cities with lower ridership.
- Real-time Tracking technology is used to communicate and notify passengers of arrival times

6.2.2.3 Service Frequency (Policy-based Frequencies)

Guidelines for determining the service frequency (Policy-based Frequencies) for the public transportation system to be used for implementation in the transitional phase are as follows:

- Determine service frequency based on an appropriate Service Level. This method is suitable for cities, areas, or routes where public transportation development has just begun.
- Standard bus operation frequency:
  - 10 to 20 minutes – during peak hours.
  - 20 to 60 minutes – during off-peak hours.

The preliminary proposed service frequency (Target Service Level) is shown in **Table 6.2-1**.

Table 6.2-1 Preliminary Proposed Service Frequency (Target Service Level)

Target Service Level			
Stage	2027-2032	2033-2037	2038 Onwards
Service Hours	6.00 a.m. – 9 p.m.	6.00 a.m. – 11 p.m.	5.30 a.m. – 11.00 p.m.
Peak Hours (7:00 a.m. - 9:00 a.m. / 4:00 p.m. - 6:00 p.m.)	15 minutes	10 minutes	10 minutes or less (Expand Peak Hour)
Off-peak Hours/Holidays	30 minutes	20 minutes	15 minutes

6.3 Summary of Suitable Public Transportation System Modes

Based on the study results, the summary of suitable public transportation system modes, the public transportation service launch plan, the bus operation plan and service frequency for various routes, and the number of EV Buses required for service on each route (Fleet Size) in the 11 major regional urban provinces are as follows:

6.3.1 Chiang Mai Province

Table 6.3-1 Service Launch Plan for Various Routes

Line	Origin point - destination	Plans to open services on each route													
		25	26	27	28	28	30	31	32	33	34	35	36	37	38+
1	Tha Phae Gate - Mae Rim (Chiang Mai Rajabhat University, Mae Rim Center)														
2	Tha Phae Gate - Hang Dong (Hang Dong Ratratpatham School)														
3	Tha Phae Gate - Ban Don Pien (Ban Don Pien School)														
4	Tha Phae Gate - Hang Dong (Tem Siri Kindergarten)														
5	Tha Phae Gate - Doi Saket (Doi Saket Hospital)														
6	Tha Phae Gate - San Sai (San Sai Hospital)														
7	Tha Phae Gate - Ban Pa Muang (Wat Pa Muang Temple)														
8	Tha Phae Gate - San Kamphaeng (San Kamphaeng School)														
9	Tha Phae Gate - Sarapi (Nine Saen Market) runs the Super Highway														
10	Tha Phae Gate - Saraphi (Nine Saen Market) runs the Chiang Mai - Lamphun route.														
11	Tha Phae Gate - Nam Tong Fresh Market														
12	Tha Phae Gate - Pa Khoi Tai (Pa Khoi Tai Fresh Market)														
13	Chiang Mai Airport - Guru Basri Wichai Monument														
14	Around the city (Chiang Mai Airport - Nimmanhaemin - Chang Puak Bus Terminal - Arcade Bus Terminal - Chiang Mai Railway Station)														
15	Around the city (Far Eastern University - Maya - Warorot Market)														
16	Round 2														
17	Ring 3														

Table 6.3-2 Bus Operation Plan and Service Frequency for Various Routes

Line	Origin point - destination	Scheduled Trips and Service Frequency ($^{Peak}/_{Off\text{-}Peak}$: Minutes)													
		25	26	27	28	28	30	31	32	33	34	35	36	37	38+
1	Tha Phae Gate - Mae Rim (Chiang Mai Rajabhat University, Mae Rim Center)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
2	Tha Phae Gate - Hang Dong (Hang Dong Ratratpatham School)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
3	Tha Phae Gate - Ban Don Pien (Ban Don Pien School)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
4	Tha Phae Gate - Hang Dong (Tem Siri Kindergarten)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
5	Tha Phae Gate - Doi Saket (Doi Saket Hospital)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
6	Tha Phae Gate - San Sai (San Sai Hospital)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
7	Tha Phae Gate - Ban Pa Muang (Wat Pa Muang Temple)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
8	Tha Phae Gate - San Kamphaeng (San Kamphaeng School)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
9	Tha Phae Gate - Sarapi (Nine Saen Market) runs the Super Highway			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
10	Tha Phae Gate - Saraphi (Nine Saen Market) runs the Chiang Mai - Lamphun route.			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
11	Tha Phae Gate - Nam Tong Fresh Market			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
12	Tha Phae Gate - Pa Khoi Tai (Pa Khoi Tai Fresh Market)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
13	Chiang Mai Airport - Guru Basri Wichai Monument			$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$
14	Around the city (Chiang Mai Airport - Nimmanhaemin - Chang Puak Bus Terminal - Arcade Bus Terminal - Chiang Mai Railway Station)			$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$
15	Around the city (Far Eastern University - Maya - Warorot Market)			$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$
16	Round 2			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
17	Ring 3									$^{20}/_{40}$	$^{20}/_{40}$	$^{20}/_{40}$	$^{20}/_{40}$	$^{20}/_{40}$	$^{20}/_{40}$

Table 6.3-3 Number of EV Buses Required for Service on Each Route (Fleet Size)

Line	Origin point - destination	Number of buses during peak hours			Number of buses during Off-Peak		
		27-32	33-37	38+	27-32	33-37	38+
1	Tha Phae Gate - Mae Rim (Chiang Mai Rajabhat University, Mae Rim Center)	21	31	31	7	10	13
2	Tha Phae Gate - Hang Dong (Hang Dong Ratratpatham School)	11	16	16	4	5	7
3	Tha Phae Gate - Ban Don Pien (Ban Don Pien School)	13	20	20	4	6	8
4	Tha Phae Gate - Hang Dong (Tem Siri Kindergarten)	16	24	24	5	8	10
5	Tha Phae Gate - Doi Saket (Doi Saket Hospital)	14	20	20	5	7	9
6	Tha Phae Gate - San Sai (San Sai Hospital)	14	21	21	5	7	9
7	Tha Phae Gate - Ban Pa Muang (Wat Pa Muang Temple)	10	14	14	3	5	6
8	Tha Phae Gate - San Kamphaeng (San Kamphaeng School)	13	19	19	4	6	8
9	Tha Phae Gate - Sarapi (Nine Saen Market) runs the Super Highway	12	18	18	4	6	8
10	Tha Phae Gate - Saraphi (Nine Saen Market) runs the Chiang Mai - Lamphun route.	9	14	14	3	5	6
11	Tha Phae Gate - Nam Tong Fresh Market	12	18	18	4	6	8
12	Tha Phae Gate - Pa Khoi Tai (Pa Khoi Tai Fresh Market)	9	14	14	3	5	6
13	Chiang Mai Airport - Guru Basri Wichai Monument	9	13	13	3	4	6
14	Around the city (Chiang Mai Airport - Nimmanhaemin - Chang Puak Bus Terminal - Arcade Bus Terminal - Chiang Mai Railway Station)	9	13	13	3	4	6
15	Around the city (Far Eastern University - Maya - Warorot Market)	8	11	11	3	4	5
16	Round 2	27	40	40	9	13	17
17	Ring 3	-	28	28	-	9	12
Total		207	334	334	69	110	144
Total (Spared vehicles included)		**238**	**384**	**384**	**79**	**127**	**166**

6.3.2 Chiang Rai Province

Table 6.3-4 Service Launch Plan for Various Routes

Line	Origin point - destination	Plans to open services on each route													
		25	26	27	28	28	30	31	32	33	34	35	36	37	38+
1	Mae Fah Luang University - Wat Rong Khun														
2	Chiang Rai Rajabhat University - Central Chiang Rai														
3	Ban Pa Yang Mon (Chulabhorn Royal College of Science) - Singhpark Chiang Rai														
4	Wiang Chai (Wiang Chai Kindergarten) - Hong O (Hong O Temple)														
5	Huay Pla Kang House (Huay Pla Kang Temple) - Ban Hua Doi (Wat Si Suphan)														
6	Commemoration Park - Baan Sampanthakit (Paisansart Christian School)														

Table 6.3-5 Bus Operation Plan and Service Frequency for Various Routes

Line	Origin point - destination	Scheduled Trips and Service Frequency ($^{Peak}/_{Off\text{-}Peak}$: Minutes)													
		25	26	27	28	28	30	31	32	33	34	35	36	37	38+
1	Mae Fah Luang University - Wat Rong Khun			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
2	Chiang Rai Rajabhat University - Central Chiang Rai			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
3	Ban Pa Yang Mon (Chulabhorn Royal College of Science) - Singhpark Chiang Rai			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
4	Wiang Chai (Wiang Chai Kindergarten) - Hong O (Hong O Temple)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
5	Huay Pla Kang House (Huay Pla Kang Temple) - Ban Hua Doi (Wat Si Suphan)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
6	Commemoration Park - Baan Sampanthakit (Paisansart Christian School)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$

Table 6.3-6 Number of EV Buses Required for Service on Each Route (Fleet Size)

Line	Origin point - destination	Number of buses during peak hours			Number of buses during Off-Peak		
		27-32	33-37	38+	27-32	33-37	38+
1	Mae Fah Luang University - Wat Rong Khun	16	24	24	8	12	16
2	Chiang Rai Rajabhat University - Central Chiang Rai	6	9	9	3	5	6
3	Ban Pa Yang Mon (Chulabhorn Royal College of Science) - Singhpark Chiang Rai	9	13	13	5	7	9
4	Wiang Chai (Wiang Chai Kindergarten) - Hong O (Hong O Temple)	7	11	11	4	6	7
5	Huay Pla Kang House (Huay Pla Kang Temple) - Ban Hua Doi (Wat Si Suphan)	8	11	11	4	6	8
6	Commemoration Park - Baan Sampanthakit (Paisansart Christian School)	8	12	12	4	6	8
Total		54	80	80	28	42	54
Total (Spared vehicles included)		**62**	**92**	**92**	**32**	**48**	**62**

6.3.3 Phitsanulok Province

Table 6.3-7 Service Launch Plan for Various Routes

Line	Origin point - destination	Plans to open services on each route													
		25	26	27	28	28	30	31	32	33	34	35	36	37	38+
1	Phitsanulok University - Rajamangala University of Technology Lanna, Phitsanulok														
2	Buddha Chinraj Hospital, Bueng Kaeng Yai Branch - Wat Saeng Dao														
3	Naresuan University - Phitsanulok Railway Station														
4	Phibun Songkram Rajabhat University - Wat Pikul Wararam														
5	Phitsanulok Kindergarten - Plai Chumphon Sub-district Municipality														
6	Phibun Songkram Rajabhat University - Phra Phitsanulok Bueng Commercial College														
7	Phitsanulok Provincial Bus Terminal No. 2 - Phitsanulok Airport														
8	Phitsanulok Provincial Bus Terminal No. 1 - Wat Phrik (Soi Wat Lom Moo 5)														
9	Lotus Phitsanulok 2 (Tha Thong) - Wat Thep Kunchon														
10	Around the city														
11	Around the City 2														

Table 6.3-8 Bus Operation Plan and Service Frequency for Various Routes

Line	Origin point - destination	Scheduled Trips and Service Frequency ($^{Peak}/_{Off\text{-}Peak}$: Minutes)													
		25	26	27	28	28	30	31	32	33	34	35	36	37	38+
1	Phitsanulok University - Rajamangala University of Technology Lanna, Phitsanulok			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
2	Buddha Chinraj Hospital, Bueng Kaeng Yai Branch - Wat Saeng Dao			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
3	Naresuan University - Phitsanulok Railway Station			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
4	Phibun Songkram Rajabhat University - Wat Pikul Wararam			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
5	Phitsanulok Kindergarten - Plai Chumphon Sub-district Municipality			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
6	Phibun Songkram Rajabhat University - Phra Phitsanulok Bueng Commercial College			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
7	Phitsanulok Provincial Bus Terminal No. 2 - Phitsanulok Airport			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
8	Phitsanulok Provincial Bus Terminal No. 1 - Wat Phrik (Soi Wat Lom Moo 5)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
9	Lotus Phitsanulok 2 (Tha Thong) - Wat Thep Kunchon			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
10	Around the city			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
11	Around the City 2			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$

Table 6.3-9 Number of EV Buses Required for Service on Each Route (Fleet Size)

Line	Origin point - destination	Number of buses during peak hours			Number of buses during Off-Peak		
		27-32	33-37	38+	27-32	33-37	38+
1	Phitsanulok University - Rajamangala University of Technology Lanna, Phitsanulok	9	14	14	5	7	9
2	Buddha Chinraj Hospital, Bueng Kaeng Yai Branch - Wat Saeng Dao	8	12	12	4	6	8
3	Naresuan University - Phitsanulok Railway Station	9	14	14	5	7	9
4	Phibun Songkram Rajabhat University - Wat Pikul Wararam	7	10	10	4	5	7
5	Phitsanulok Kindergarten - Plai Chumphon Sub-district Municipality	9	13	13	5	7	9
6	Phibun Songkram Rajabhat University - Phra Phitsanulok Bueng Commercial College	6	8	8	3	4	6
7	Phitsanulok Provincial Bus Terminal No. 2 - Phitsanulok Airport	8	11	11	4	6	8
8	Phitsanulok Provincial Bus Terminal No. 1 - Wat Phrik (Soi Wat Lom Moo 5)	7	10	10	4	5	7
9	Lotus Phitsanulok 2 (Tha Thong) - Wat Thep Kunchon	7	10	10	4	5	7
10	Around the city	4	5	5	2	3	4
11	Around the City 2	5	7	7	3	4	5
Total		79	114	114	43	59	79
Total (Spared vehicles included)		**91**	**131**	**131**	**49**	**68**	**91**

6.3.4 Udon Thani Province

Table 6.3-10 Service Launch Plan for Various Routes

Line	Origin point - destination	Plans to open services on each route													
		25	26	27	28	28	30	31	32	33	34	35	36	37	38+
1	Udon Thani Airport - Udon Thani Railway Station														
2	Udon Thani Railway Station - Mu Mon (Mae Yuphin Fresh Market)														
3	Udon Thani - Non Sung Railway Station (Kanchanapisek Udon Thani Technical College)														
4	Thung Si Mueang - Nong Na Kham (Ban Nong Na Kham School)														
5	Udon Thani Hospital - Udon Thani Rajabhat University (Sam Phrao Center)														
6	Udon Thani - Mu Mon Railway Station (Nong Samrong Witthaya School)														
7	Ban Leem (Thai Siri 3 Market) - Thai Watsadu Udon Thani														
8	Udon Thani Railway Station - Ban Leem (Ban Leem School)														
9	Udon Thani - Ban Chan Railway Station (Udon Phatthanakan School)														
10	Udon Thani Provincial Bus Terminal No. 2 - Nong Na Kham (Wat Pho Si Sai Saet)														
11	Around the city (Nong Prajak Park - Central Udon Thani)														
12	Udon Thani Railway Station - Around the City														

Table 6.3-11 Bus Operation Plan and Service Frequency for Various Routes

Line	Origin point - destination	Scheduled Trips and Service Frequency ($^{Peak}/_{Off\text{-}Peak}$: Minutes)													
		25	26	27	28	28	30	31	32	33	34	35	36	37	38+
1	Udon Thani Airport - Udon Thani Railway Station			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
2	Udon Thani Railway Station - Mu Mon (Mae Yuphin Fresh Market)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
3	Udon Thani - Non Sung Railway Station (Kanchanapisek Udon Thani Technical College)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
4	Thung Si Mueang - Nong Na Kham (Ban Nong Na Kham School)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
5	Udon Thani Hospital - Udon Thani Rajabhat University (Sam Phrao Center)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
6	Udon Thani - Mu Mon Railway Station (Nong Samrong Witthaya School)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
7	Ban Leem (Thai Siri 3 Market) - Thai Watsadu Udon Thani			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
8	Udon Thani Railway Station - Ban Leem (Ban Leem School)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
9	Udon Thani - Ban Chan Railway Station (Udon Phatthanakan School)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
10	Udon Thani Provincial Bus Terminal No. 2 - Nong Na Kham (Wat Pho Si Sai Saet)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
11	Around the city (Nong Prajak Park - Central Udon Thani)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
12	Udon Thani Railway Station - Around the City									$^{20}/_{40}$	$^{20}/_{40}$	$^{20}/_{40}$	$^{20}/_{40}$	$^{20}/_{40}$	$^{20}/_{40}$

Table 6.3-12 Number of EV Buses Required for Service on Each Route (Fleet Size)

Line	Origin point - destination	Number of buses during peak hours			Number of buses during Off-Peak		
		27-32	33-37	38+	27-32	33-37	38+
1	Udon Thani Airport - Udon Thani Railway Station	5	8	8	3	4	5
2	Udon Thani Railway Station - Mu Mon (Mae Yuphin Fresh Market)	5	7	7	3	4	5
3	Udon Thani - Non Sung Railway Station (Kanchanapisek Udon Thani Technical College)	10	15	15	5	8	10
4	Thung Si Mueang - Nong Na Kham (Ban Nong Na Kham School)	7	10	10	4	5	7
5	Udon Thani Hospital - Udon Thani Rajabhat University (Sam Phrao Center)	9	14	14	5	7	9
6	Udon Thani - Mu Mon Railway Station (Nong Samrong Witthaya School)	4	6	6	2	3	4
7	Ban Leem (Thai Siri 3 Market) - Thai Watsadu Udon Thani	6	9	9	3	5	6
8	Udon Thani Railway Station - Ban Leem (Ban Leem School)	3	5	5	2	3	3
9	Udon Thani - Ban Chan Railway Station (Udon Phatthanakan School)	6	9	9	3	5	6
10	Udon Thani Provincial Bus Terminal No. 2 - Nong Na Kham (Wat Pho Si Sai Saet)	6	8	8	3	4	6
11	Around the city (Nong Prajak Park - Central Udon Thani)	4	6	6	2	3	4
12	Udon Thani Railway Station - Around the City	0	11	11	0	6	7
Total		65	108	108	35	57	72
Total (Spared vehicles included)		**75**	**124**	**124**	**40**	**66**	**83**

6.3.5 Khon Kaen Province

Table 6.3-13 Service Launch Plan for Various Routes

Line	Origin point - destination	Plans to open services on each route													
		25	26	27	28	28	30	31	32	33	34	35	36	37	38+
1	Wat Si Saen (Ban Nong Ka) - Tha Phra Public School														
2	Wat Tha Song Nakhon (Ban Bueng Niam) - Wat Si Bun Rueng (Ban Thum)														
3	Ban Nong Saeng Khok Noi School (Ban Nong Saeng) - Wat Tha Bueng (Ban Duck)														
4	Ban Nong Hin School (Sila) - Hua Hin Temple (Clean House)														
5	Khon Kaen University (Faculty of Medicine Roundabout) - Khon Kaen Provincial Bus Terminal No. 3														
6	Betagro Khon Kaen 3 Branch (Nontan) - 8th Infantry Regiment Yomarat														
7	Srinakarin Hospital (Khon Kaen University) - Kasem Sap Village														
8	Khon Kaen Kindergarten - Euathorn Village Phase 3 (Ban Duck) - Ban Kok Road														
9	Khon Kaen Kindergarten - Euathon Village Phase 3 (Ban Ped) - Si Chan Road														
10	Airport School - Loei Rajabhat University (Khon Kaen Campus)														
11	Wat Thung Setti (Phra Lap) - Khon Kaen University (Si Tan Gate)														
12	Khon Kaen Railway Station - Ban Non Muang (behind Khon Kaen University)														
13	Khon Kaen Railway Station - Ban Sila Market														
14	Khon Kaen Provincial Administration Organization Stadium - Wat Sawang Ban Don Yang														
15	Khon Kaen Kindergarten - Ban Phue (Phra Lap)														
16	Khon Kaen Kindergarten - Khon Kaen Community Housing and Community Service Project (Old Town-Greenville)														
17	Khon Kaen Railway Station - Central Khon Kaen														
18	City Pillar Shrine - Central Khon Kaen														
19	City Pillar Shrine - Ratchadanusorn Park														
20	Ratchadanusorn Park - Sila														

Table 6.3-14 Bus Operation Plan and Service Frequency for Various Routes

Line	Origin point - destination	Scheduled Trips and Service Frequency ($^{Peak}/_{Off\text{-}Peak}$: Minutes)													
		25	26	27	28	28	30	31	32	33	34	35	36	37	38+
1	Wat Si Saen (Ban Nong Ka) - Tha Phra Public School			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
2	Wat Tha Song Nakhon (Ban Bueng Niam) - Wat Si Bun Rueng (Ban Thum)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
3	Ban Nong Saeng Khok Noi School (Ban Nong Saeng) - Wat Tha Bueng (Ban Duck)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
4	Ban Nong Hin School (Sila) - Hua Hin Temple (Clean House)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
5	Khon Kaen University (Faculty of Medicine Roundabout) - Khon Kaen Provincial Bus Terminal No. 3			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
6	Betagro Khon Kaen 3 Branch (Nontan) - 8th Infantry Regiment Yomarat			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
7	Srinakarin Hospital (Khon Kaen University) - Kasem Sap Village			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
8	Khon Kaen Kindergarten - Euathorn Village Phase 3 (Ban Duck) - Ban Kok Road			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
9	Khon Kaen Kindergarten - Euathon Village Phase 3 (Ban Ped) - Si Chan Road			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
10	Airport School - Loei Rajabhat University (Khon Kaen Campus)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
11	Wat Thung Setti (Phra Lap) - Khon Kaen University (Si Tan Gate)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
12	Khon Kaen Railway Station - Ban Non Muang (behind Khon Kaen University)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
13	Khon Kaen Railway Station - Ban Sila Market			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
14	Khon Kaen Provincial Administration Organization Stadium - Wat Sawang Ban Don Yang			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
15	Khon Kaen Kindergarten - Ban Phue (Phra Lap)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
16	Khon Kaen Kindergarten - Khon Kaen Community Housing and Community Service Project (Old Town-Greenville)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
17	Khon Kaen Railway Station - Central Khon Kaen			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
18	City Pillar Shrine - Central Khon Kaen			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
19	City Pillar Shrine - Ratchadanusorn Park			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
20	Ratchadanusorn Park - Sila			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$

Table 6.3-15 Number of EV Buses Required for Service on Each Route (Fleet Size)

Line	Origin point - destination	Number of buses during peak hours			Number of buses during Off-Peak		
		27-32	33-37	38+	27-32	33-37	38+
1	Wat Si Saen (Ban Nong Ka) - Tha Phra Public School	13	19	19	7	10	13
2	Wat Tha Song Nakhon (Ban Bueng Niam) - Wat Si Bun Rueng (Ban Thum)	13	20	20	7	10	13
3	Ban Nong Saeng Khok Noi School (Ban Nong Saeng) - Wat Tha Bueng (Ban Duck)	9	13	13	5	7	9
4	Ban Nong Hin School (Sila) - Hua Hin Temple (Clean House)	8	11	11	4	6	8
5	Khon Kaen University (Faculty of Medicine Roundabout) - Khon Kaen Provincial Bus Terminal No. 3	5	8	8	3	4	5
6	Betagro Khon Kaen 3 Branch (Nontan) - 8th Infantry Regiment Yomarat	6	9	9	3	5	6
7	Srinakarin Hospital (Khon Kaen University) - Kasem Sap Village	6	9	9	3	5	6
8	Khon Kaen Kindergarten - Euathorn Village Phase 3 (Ban Duck) - Ban Kok Road	5	8	8	3	4	5
9	Khon Kaen Kindergarten - Euathon Village Phase 3 (Ban Ped) - Si Chan Road	4	6	6	2	3	4
10	Airport School - Loei Rajabhat University (Khon Kaen Campus)	5	7	7	3	4	5
11	Wat Thung Setti (Phra Lap) - Khon Kaen University (Si Tan Gate)	5	8	8	3	4	5
12	Khon Kaen Railway Station - Ban Non Muang (behind Khon Kaen University)	6	9	9	3	5	6
13	Khon Kaen Railway Station - Ban Sila Market	6	9	9	3	5	6
14	Khon Kaen Provincial Administration Organization Stadium - Wat Sawang Ban Don Yang	4	6	6	2	3	4
15	Khon Kaen Kindergarten - Ban Phue (Phra Lap)	4	6	6	2	3	4
16	Khon Kaen Kindergarten - Khon Kaen Community Housing and Community Service Project (Old Town-Greenville)	3	5	5	2	3	3
17	Khon Kaen Railway Station - Central Khon Kaen	3	4	4	2	2	3
18	City Pillar Shrine - Central Khon Kaen	6	9	9	3	5	6
19	City Pillar Shrine - Ratchadanusorn Park	3	4	4	2	2	3
20	Ratchadanusorn Park - Sila	7	11	11	4	6	7
Total		121	181	181	66	96	121
Total (Spared vehicles included)		**139**	**208**	**208**	**76**	**110**	**139**

6.3.6 Nakhon Ratchasima Province

Table 6.3-16 Service Launch Plan for Various Routes

Line	Origin point - destination	Plans to open services on each route													
		25	26	27	28	28	30	31	32	33	34	35	36	37	38+
1	Nong Cha Bok (80th Anniversary Stadium) - Khok Sung (Wat Khok Sung)														
2	Thao Suranari Monument - Khok Krat (Ban Due)														
3	Thao Suranari - Johor Monument (Ban Krut Temple)														
4	Nakhon Ratchasima Bus Terminal 2 - Nong Bua Sala (Entrance to Suranaree Industrial Zone)														
5	Baan Koh (Lotus Korat) - Mareng (Wat Phalai)														
6	Nakhon Ratchasima - Chaiyamongkol Railway Station (Suranaree University of Technology Hospital)														
7	Baan Koh (Surannakorn Market) - Pho Klang (Wat Nong Pluang Noi)														
8	Baan Koh (Surannakorn Market) - Pho Klang (Wat Nong Pluang Noi)														
9	Thao Suranari Monument - Khok Krat (Thepparat Nakhon Ratchasima Hospital)														
10	Thao Suranari Monument - Market (Ban Bu School (Pracharat Pattana))														
11	Nakhon Ratchasima Provincial Bus Terminal No. 2 - Nong Rawieng (Rajamangala University of Technology Isan, Nong Rawieng Education Center)														
12	Thao Suranari Monument - Phanau (Ban Phanau Theater)														
13	Nong Cha Bok (80th Anniversary Stadium) - Pru Yai (Suranari 2 Interchange Construction Project Control Office)														
14	Jira - Muen Wai Road Junction Railway Station (Wat Muen Wai)														
15	Ban Koh (Suranakorn Market) - Nong Cha Bok (80th Anniversary Stadium)														
16	Around the city														

Table 6.3-17 Bus Operation Plan and Service Frequency for Various Routes

Line	Origin point - destination	Scheduled Trips and Service Frequency ($^{Peak}/_{Off\text{-}Peak}$: Minutes)													
		25	26	27	28	28	30	31	32	33	34	35	36	37	38+
1	Nong Cha Bok (80th Anniversary Stadium) - Khok Sung (Wat Khok Sung)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
2	Thao Suranari Monument - Khok Krat (Ban Due)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
3	Thao Suranari - Johor Monument (Ban Krut Temple)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
4	Nakhon Ratchasima Bus Terminal 2 - Nong Bua Sala (Entrance to Suranaree Industrial Zone)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
5	Baan Koh (Lotus Korat) - Mareng (Wat Phalai)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
6	Nakhon Ratchasima - Chaiyamongkol Railway Station (Suranaree University of Technology Hospital)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
7	Baan Koh (Surannakorn Market) - Pho Klang (Wat Nong Pluang Noi)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
8	Baan Koh (Surannakorn Market) - Pho Klang (Wat Nong Pluang Noi)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
9	Thao Suranari Monument - Khok Krat (Thepparat Nakhon Ratchasima Hospital)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
10	Thao Suranari Monument - Market (Ban Bu School (Pracharat Pattana))			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
11	Nakhon Ratchasima Provincial Bus Terminal No. 2 - Nong Rawieng (Rajamangala University of Technology Isan, Nong Rawieng Education Center)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
12	Thao Suranari Monument - Phanau (Ban Phanau Theater)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
13	Nong Cha Bok (80th Anniversary Stadium) - Pru Yai (Suranari 2 Interchange Construction Project Control Office)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
14	Jira - Muen Wai Road Junction Railway Station (Wat Muen Wai)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
15	Ban Koh (Suranakorn Market) - Nong Cha Bok (80th Anniversary Stadium)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
16	Around the city			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$

Table 6.3-18 Number of EV Buses Required for Service on Each Route (Fleet Size)

Line	Origin point - destination	Number of buses during peak hours			Number of buses during Off-Peak		
		27-32	33-37	38+	27-32	33-37	38+
1	Nong Cha Bok (80th Anniversary Stadium) - Khok Sung (Wat Khok Sung)	14	21	21	6	8	11
2	Thao Suranari Monument - Khok Krat (Ban Due)	9	13	13	4	5	7
3	Thao Suranari - Johor Monument (Ban Krut Temple)	9	13	13	4	5	7
4	Nakhon Ratchasima Bus Terminal 2 - Nong Bua Sala (Entrance to Suranaree Industrial Zone)	7	11	11	3	4	6
5	Baan Koh (Lotus Korat) - Mareng (Wat Phalai)	7	10	10	3	4	5
6	Nakhon Ratchasima - Chaiyamongkol Railway Station (Suranaree University of Technology Hospital)	12	18	18	5	7	9
7	Baan Koh (Surannakorn Market) - Pho Klang (Wat Nong Pluang Noi)	7	10	10	3	4	5
8	Baan Koh (Surannakorn Market) - Pho Klang (Wat Nong Pluang Noi)	10	15	15	4	6	8
9	Thao Suranari Monument - Khok Krat (Thepparat Nakhon Ratchasima Hospital)	11	16	16	4	6	8
10	Thao Suranari Monument - Market (Ban Bu School (Pracharat Pattana))	13	19	19	5	7	10
11	Nakhon Ratchasima Provincial Bus Terminal No. 2 - Nong Rawieng (Rajamangala University of Technology Isan, Nong Rawieng Education Center)	8	12	12	3	5	6
12	Thao Suranari Monument - Phanau (Ban Phanau Theater)	8	12	12	3	5	6
13	Nong Cha Bok (80th Anniversary Stadium) - Pru Yai (Suranari 2 Interchange Construction Project Control Office)	12	18	18	5	7	9
14	Jira - Muen Wai Road Junction Railway Station (Wat Muen Wai)	5	7	7	2	3	4
15	Ban Koh (Suranakorn Market) - Nong Cha Bok (80th Anniversary Stadium)	9	13	13	4	5	7
16	Around the city	7	10	10	3	4	5
Total		148	218	218	61	85	113
Total (Spared vehicles included)		**170**	**251**	**251**	**70**	**98**	**130**

6.3.7 Ubon Ratchathani Province

Table 6.3-19 Service Launch Plan for Various Routes

Line	Origin point - destination	Plans to open services on each route													
		25	26	27	28	28	30	31	32	33	34	35	36	37	38+
1	Ubon Ratchathani Provincial Bus Terminal - Ubon Ratchathani Railway Station														
2	Thung Si Mueang - Nong Khon (Thung Burapha Stadium)														
3	Thung Si Mueang - Rai Noi (Kitiyan Uppatham School)														
4	Thung Si Mueang - Sansuk (Warin Chamrap Vocational College)														
5	Thung Si Mueang - Kudlat (Ban Kho-Kud Lat School)														
6	Thung Si Mueang - Nong Kinple (Ban Thang Sai School)														
7	Thung Si Mueang - Rai Noi (50th Anniversary Hospital, Maha Vajiralongkorn under the patronage of the Patriarch)														
8	Big C Supercenter Ubon Ratchathani - Ubon Ratchathani Airport														
9	Warin Chamrap Municipal Fresh Market - Kham Yai (Ban Dam Phra School)														
10	Warin Chamrap Municipal Fresh Market - Ubon Ratchathani Zoo														
11	Warin Chamrap Municipal Fresh Market - Kham Yai (New Town Community)														
12	Warin Chamrap Municipal Fresh Market - Mueang Si Kai (Ban Mad Kamluecha School (Rat Samakkhi))														
13	Warin Chamrap Municipal Fresh Market - Sansuk (Okay, good car)														
14	Warin Chamrap Municipal Fresh Market - Bungmai (Ban Yang Wang Kang Hung School)														
15	Warin Chamrap Municipal Fresh Market - Kham Khwang (Kham Khwang Health Station)														
16	Around Town 1														
17	Around the City 2														

Table 6.3-20 Bus Operation Plan and Service Frequency for Various Routes

Line	Origin point - destination	Scheduled Trips and Service Frequency ($^{Peak}/_{Off\text{-}Peak}$: Minutes)												
		25	26	27	28	28	30	31	32	33	34	35	36	37
1	Ubon Ratchathani Provincial Bus Terminal - Ubon Ratchathani Railway Station		$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
2	Thung Si Mueang - Nong Khon (Thung Burapha Stadium)		$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
3	Thung Si Mueang - Rai Noi (Kitiyan Uppatham School)		$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
4	Thung Si Mueang - Sansuk (Warin Chamrap Vocational College)		$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
5	Thung Si Mueang - Kudlat (Ban Kho-Kud Lat School)		$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
6	Thung Si Mueang - Nong Kinple (Ban Thang Sai School)		$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
7	Thung Si Mueang - Rai Noi (50th Anniversary Hospital, Maha Vajiralongkorn under the patronage of the Patriarch)		$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
8	Big C Supercenter Ubon Ratchathani - Ubon Ratchathani Airport		$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
9	Warin Chamrap Municipal Fresh Market - Kham Yai (Ban Dam Phra School)		$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
10	Warin Chamrap Municipal Fresh Market - Ubon Ratchathani Zoo		$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
11	Warin Chamrap Municipal Fresh Market - Kham Yai (New Town Community)		$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$
12	Warin Chamrap Municipal Fresh Market - Mueang Si Kai (Ban Mad Kamluecha School (Rat Samakkhi))		$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$
13	Warin Chamrap Municipal Fresh Market - Sansuk (Okay, good car)		$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$
14	Warin Chamrap Municipal Fresh Market - Bungmai (Ban Yang Wang Kang Hung School)		$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
15	Warin Chamrap Municipal Fresh Market - Kham Khwang (Kham Khwang Health Station)		$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$
16	Around Town 1		$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$
17	Around the City 2		$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$

Table 6.3-21 Number of EV Buses Required for Service on Each Route (Fleet Size)

Line	Origin point - destination	Number of buses during peak hours			Number of buses during Off-Peak		
		27-32	33-37	38+	27-32	33-37	38+
1	Ubon Ratchathani Provincial Bus Terminal - Ubon Ratchathani Railway Station	7	11	11	4	6	7
2	Thung Si Mueang - Nong Khon (Thung Burapha Stadium)	6	9	9	3	5	6
3	Thung Si Mueang - Rai Noi (Kitiyan Uppatham School)	4	6	6	2	3	4
4	Thung Si Mueang - Sansuk (Warin Chamrap Vocational College)	5	7	7	3	4	5
5	Thung Si Mueang - Kudlat (Ban Kho-Kud Lat School)	4	6	6	2	3	4
6	Thung Si Mueang - Nong Kinple (Ban Thang Sai School)	6	8	8	3	4	6
7	Thung Si Mueang - Rai Noi (50th Anniversary Hospital, Maha Vajiralongkorn under the patronage of the Patriarch)	6	9	9	3	5	6
8	Big C Supercenter Ubon Ratchathani - Ubon Ratchathani Airport	6	8	8	3	4	6
9	Warin Chamrap Municipal Fresh Market - Kham Yai (Ban Dam Phra School)	6	8	8	3	4	6
10	Warin Chamrap Municipal Fresh Market - Ubon Ratchathani Zoo	7	10	10	4	5	7
11	Warin Chamrap Municipal Fresh Market - Kham Yai (New Town Community)	7	10	10	4	5	7
12	Warin Chamrap Municipal Fresh Market - Mueang Si Kai (Ban Mad Kamluecha School (Rat Samakkhi))	6	9	9	3	5	6
13	Warin Chamrap Municipal Fresh Market - Sansuk (Okay, good car)	3	4	4	2	2	3
14	Warin Chamrap Municipal Fresh Market - Bungmai (Ban Yang Wang Kang Hung School)	4	6	6	2	3	4
15	Warin Chamrap Municipal Fresh Market - Kham Khwang (Kham Khwang Health Station)	5	7	7	3	4	5
16	Around Town 1	6	8	8	3	4	6
17	Around the City 2	3	5	5	2	3	3
Total		91	131	131	49	69	91
Total (Spared vehicles included)		**105**	**151**	**151**	**56**	**79**	**105**

6.3.8 Phra Nakhon Si Ayutthaya Province

Table 6.3-22 Service Launch Plan for Various Routes

Line	Origin point - destination	Plans to open services on each route													
		25	26	27	28	28	30	31	32	33	34	35	36	37	38+
1	Chao Phrom Market - Bang Pa-in (Big C Phra Nakhon Si Ayutthaya)														
2	Bang Pa-in (Big C Phra Nakhon Si Ayutthaya) - Wang Noi (Four Right Pattana Market)														
3	Chao Phrom Market - Nakhon Luang (Nakhon Luang School (Udomrat Witthaya))														
4	Chao Phrom Market - Koh Rien (Wat Chang Thong School (Bunbumrunrat))														
5	Chao Phrom Market - Bang Pa-in (Wonderland)														
6	Chao Phrom - Uthai Weekend Market (Mill Weekend Market)														
7	Wat Sam Pluem Pagoda - Ban Mai (King Suriyothai Monument)														
8	Wat Sam Pluem Pagoda - Wat Tum														
9	Chao Phrom Market - Ban Rum (Wat Kai Tia Phruttharam)														
10	Chao Phrom Market - Ban Koh (Wat Koh Kaew Kasadaram)														
11	Wat Sam Pluem Pagoda - Bang Ban (Wat Muang Wan School)														
12	Bang Pa-in (Pannawich School) - Uthai (Wat Khok Chang)														
13	Around the island														
14	Around the Inner Island														
15	Chao Phrom Market - Wat Yai Chai Mongkol - Ayutthaya City Park														
16	Wat Sam Pluem Pagoda - Wat Ayothaya - Wat Yai Chai Mongkol School (Phawana Rangsi)														
17	Chao Phrom Market - Wat Phananchoeng Worawihan - Wat Phutthaisawan Royal Monastery - Wat Chaiyawattanaram														

Table 6.3-23 Bus Operation Plan and Service Frequency for Various Routes

Line	Origin point - destination	Scheduled Trips and Service Frequency ($^{Peak}/_{Off\text{-}Peak}$: Minutes)													
		25	26	27	28	28	30	31	32	33	34	35	36	37	38+
1	Chao Phrom Market - Bang Pa-in (Big C Phra Nakhon Si Ayutthaya)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
2	Bang Pa-in (Big C Phra Nakhon Si Ayutthaya) - Wang Noi (Four Right Pattana Market)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
3	Chao Phrom Market - Nakhon Luang (Nakhon Luang School (Udomrat Witthaya))			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
4	Chao Phrom Market - Koh Rien (Wat Chang Thong School (Bunbumrunrat))			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
5	Chao Phrom Market - Bang Pa-in (Wonderland)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
6	Chao Phrom - Uthai Weekend Market (Mill Weekend Market)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
7	Wat Sam Pluem Pagoda - Ban Mai (King Suriyothai Monument)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
8	Wat Sam Pluem Pagoda - Wat Tum			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
9	Chao Phrom Market - Ban Rum (Wat Kai Tia Phruttharam)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
10	Chao Phrom Market - Ban Koh (Wat Koh Kaew Kasadaram)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
11	Wat Sam Pluem Pagoda - Bang Ban (Wat Muang Wan School)			$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$
12	Bang Pa-in (Pannawich School) - Uthai (Wat Khok Chang)			$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$
13	Around the island			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
14	Around the Inner Island			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
15	Chao Phrom Market - Wat Yai Chai Mongkol - Ayutthaya City Park			$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$
16	Wat Sam Pluem Pagoda - Wat Ayothaya - Wat Yai Chai Mongkol School (Phawana Rangsi)			$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$
17	Chao Phrom Market - Wat Phananchoeng Worawihan - Wat Phutthaisawan Royal Monastery - Wat Chaiyawattanaram			$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{15}/_{15}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$	$^{10}/_{10}$

Table 6.3-24 Number of EV Buses Required for Service on Each Route (Fleet Size)

Line	Origin point - destination	Number of buses during peak hours			Number of buses during Off-Peak		
		27-32	33-37	38+	27-32	33-37	38+
1	Chao Phrom Market - Bang Pa-in (Big C Phra Nakhon Si Ayutthaya)	7	11	11	4	5	7
2	Bang Pa-in (Big C Phra Nakhon Si Ayutthaya) - Wang Noi (Four Right Pattana Market)	9	13	13	4	6	8
3	Chao Phrom Market - Nakhon Luang (Nakhon Luang School (Udomrat Witthaya))	10	15	15	5	7	9
4	Chao Phrom Market - Koh Rien (Wat Chang Thong School (Bunbumrunrat))	5	7	7	2	3	4
5	Chao Phrom Market - Bang Pa-in (Wonderland)	5	8	8	3	4	5
6	Chao Phrom - Uthai Weekend Market (Mill Weekend Market)	9	13	13	4	6	8
7	Wat Sam Pluem Pagoda - Ban Mai (King Suriyothai Monument)	6	9	9	3	4	5
8	Wat Sam Pluem Pagoda - Wat Tum	6	9	9	3	4	5
9	Chao Phrom Market - Ban Rum (Wat Kai Tia Phruttharam)	6	8	8	3	4	5
10	Chao Phrom Market - Ban Koh (Wat Koh Kaew Kasadaram)	4	6	6	2	3	4
11	Wat Sam Pluem Pagoda - Bang Ban (Wat Muang Wan School)	7	10	10	3	5	6
12	Bang Pa-in (Pannawich School) - Uthai (Wat Khok Chang)	6	8	8	3	4	5
13	Around the island	6	8	8	3	4	5
14	Around the Inner Island	7	10	10	3	5	6
15	Chao Phrom Market - Wat Yai Chai Mongkol - Ayutthaya City Park	4	6	6	2	3	4
16	Wat Sam Pluem Pagoda - Wat Ayothaya - Wat Yai Chai Mongkol School (Phawana Rangsi)	5	7	7	2	3	4
17	Chao Phrom Market - Wat Phananchoeng Worawihan - Wat Phutthaisawan Royal Monastery - Wat Chaiyawattanaram	5	8	8	3	4	5
Total		107	156	156	52	74	95
Total (Spared vehicles included)		**123**	**179**	**179**	**60**	**85**	**109**

6.3.9 Surat Thani Province

Table 6.3-25 Service Launch Plan for Various Routes

Line	Origin point - destination	Plans to open services on each route													
		25	26	27	28	28	30	31	32	33	34	35	36	37	38+
1	Phunphin (Surat Thani Railway Station) - Kanchanadit)														
2	Wat Pradu (PTT Wat Pradu Junction) - Bang Kung (Provincial Electricity Authority, Bandon 2 Power Station)														
3	Surat Thani Provincial Bus Terminal - Bang Bai Bai (Wat Bang Bai Bai School)														
4	Around Town 1														
5	Around the City 2														
6	Around City 3														
7	Around the city - Khun Talay Pond														

Table 6.3-26 Bus Operation Plan and Service Frequency for Various Routes

Line	Origin point - destination	Scheduled Trips and Service Frequency ($^{Peak}/_{Off\text{-}Peak}$: Minutes)													
		25	26	27	28	28	30	31	32	33	34	35	36	37	38+
1	Phunphin (Surat Thani Railway Station) - Kanchanadit)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
2	Wat Pradu (PTT Wat Pradu Junction) - Bang Kung (Provincial Electricity Authority, Bandon 2 Power Station)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
3	Surat Thani Provincial Bus Terminal - Bang Bai Bai (Wat Bang Bai Bai School)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
4	Around Town 1			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
5	Around the City 2			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
6	Around City 3			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
7	Around the city - Khun Talay Pond			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$

Table 6.3-27 Number of EV Buses Required for Service on Each Route (Fleet Size)

Line	Origin point - destination	Number of buses during peak hours			Number of buses during Off-Peak		
		27-32	33-37	38+	27-32	33-37	38+
1	Phunphin (Surat Thani Railway Station) - Kanchanadit)	10	15	15	5	8	10
2	Wat Pradu (PTT Wat Pradu Junction) - Bang Kung (Provincial Electricity Authority, Bandon 2 Power Station)	9	13	13	5	7	9
3	Surat Thani Provincial Bus Terminal - Bang Bai Bai (Wat Bang Bai Bai School)	4	6	6	2	3	4
4	Around Town 1	4	6	6	2	3	4
5	Around the City 2	6	9	9	3	5	6
6	Around City 3	10	15	15	5	8	10
7	Around the city - Khun Talay Pond	12	18	18	6	9	12
Total		55	82	82	28	43	55
Total (Spared vehicles included)		**63**	**94**	**94**	**32**	**49**	**63**

6.3.10 Phuket Province

Table 6.3-28 Service Launch Plan for Various Routes

Line	Origin point - destination	Plans to open services on each route													
		25	26	27	28	28	30	31	32	33	34	35	36	37	38+
1	Checkpoint at Chatachai Pier - Chalong Intersection														
2	Phuket Airport - Rawai														
3	Bang Tao Beach - Phuket Aquarium														
4	Phuket Airport - Rawai 2														
5	Rassada Pier - Marina Pier														
6	Around Town 1														
7	Phuket Provincial Bus Terminal No. 2 - Around the City														
8	Around Muang 2 (Museum Phuket - Chillwa Flea Market - B.B.S.2 - Kingkaew)														
9	Around Patong City														
10	Museum Phuket - Patong														

Table 6.3-29 Bus Operation Plan and Service Frequency for Various Routes

Line	Origin point - destination	Scheduled Trips and Service Frequency ($^{Peak}/_{Off\text{-}Peak}$: Minutes)													
		25	26	27	28	28	30	31	32	33	34	35	36	37	38+
1	Checkpoint at Chatachai Pier - Chalong Intersection			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
2	Phuket Airport - Rawai			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
3	Bang Tao Beach - Phuket Aquarium			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
4	Phuket Airport - Rawai 2			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
5	Rassada Pier - Marina Pier			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
6	Around Town 1			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
7	Phuket Provincial Bus Terminal No. 2 - Around the City			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
8	Around Muang 2 (Museum Phuket - Chillwa Flea Market - B.B.S.2 - Kingkaew)			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
9	Around Patong City			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
10	Museum Phuket - Patong			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$

Table 6.3-30 Number of EV Buses Required for Service on Each Route (Fleet Size)

Line	Origin point - destination	Number of buses during peak hours			Number of buses during Off-Peak		
		27-32	33-37	38+	27-32	33-37	38+
1	Checkpoint at Chatachai Pier - Chalong Intersection	37	55	55	12	17	23
2	Phuket Airport - Rawai	31	46	46	10	15	19
3	Bang Tao Beach - Phuket Aquarium	23	34	34	7	11	14
4	Phuket Airport - Rawai 2	39	58	58	12	18	24
5	Rassada Pier - Marina Pier	9	13	13	3	4	6
6	Around Town 1	2	3	3	1	1	2
7	Phuket Provincial Bus Terminal No. 2 - Around the City	6	9	9	2	3	4
8	Around Muang 2 (Museum Phuket - Chillwa Flea Market - B.B.S.2 - Kingkaew)	12	18	18	4	6	8
9	Around Patong City	3	4	4	1	2	2
10	Museum Phuket - Patong	29	43	43	9	14	18
Total		191	283	283	61	91	120
Total (Spared vehicles included)		**220**	**325**	**325**	**70**	**105**	**138**

6.3.11 Songkhla Province (Hat Yai)

Table 6.3-31 Service Launch Plan for Various Routes

Line	Origin point - destination	Plans to open services on each route													
		25	26	27	28	28	30	31	32	33	34	35	36	37	38+
1	Hat Yai Pittayakhom School - Hat Yai Airport														
2	Prince of Songkla Hospital - Hat Yai Vidayalai 2 School														
3	Prince of Songkla Hospital - Southern Industrial Estate														
4	Prince of Songkla Hospital - Irrigation Office No. 16														
5	Prince of Songkla Hospital - Ban Bang Fab Mosque														
6	Prince of Songkla Hospital - Ban Thung Nam School														
7	Prince of Songkla Hospital - Ban Han School														
8	Hat Yai Clock Tower - Kho Hong Municipal Office														
9	Around the city														

Table 6.3-32 Bus Operation Plan and Service Frequency for Various Routes

Line	Origin point - destination	Scheduled Trips and Service Frequency ($^{Peak}/_{Off\text{-}Peak}$: Minutes)													
		25	26	27	28	28	30	31	32	33	34	35	36	37	38+
1	Hat Yai Pittayakhom School - Hat Yai Airport			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
2	Prince of Songkla Hospital - Hat Yai Vidayalai 2 School			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
3	Prince of Songkla Hospital - Southern Industrial Estate			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
4	Prince of Songkla Hospital - Irrigation Office No. 16			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
5	Prince of Songkla Hospital - Ban Bang Fab Mosque			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
6	Prince of Songkla Hospital - Ban Thung Nam School			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
7	Prince of Songkla Hospital - Ban Han School			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
8	Hat Yai Clock Tower - Kho Hong Municipal Office			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$
9	Around the city			$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{15}/_{30}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{20}$	$^{10}/_{15}$

Table 6.3-33 Number of EV Buses Required for Service on Each Route (Fleet Size)

Line	Origin point - destination	Number of buses during peak hours			Number of buses during Off-Peak		
		27-32	33-37	38+	27-32	33-37	38+
1	Hat Yai Pittayakhom School - Hat Yai Airport	13	19	19	6	9	11
2	Prince of Songkla Hospital - Hat Yai Vidayalai 2 School	6	8	8	3	4	5
3	Prince of Songkla Hospital - Southern Industrial Estate	10	15	15	5	7	9
4	Prince of Songkla Hospital - Irrigation Office No. 16	7	10	10	3	5	6
5	Prince of Songkla Hospital - Ban Bang Fab Mosque	5	8	8	3	4	5
6	Prince of Songkla Hospital - Ban Thung Nam School	5	8	8	3	4	5
7	Prince of Songkla Hospital - Ban Han School	6	8	8	3	4	5
8	Hat Yai Clock Tower - Kho Hong Municipal Office	6	9	9	3	4	5
9	Around the city	6	8	8	3	4	5
Total		64	93	93	32	45	56
Total (Spared vehicles included)		**74**	**107**	**107**	**37**	**52**	**64**

Chapter 7

Public Transportation Development Plan and Urban Traffic System Development Plan

Chapter 7 Public transportation development plan and urban traffic system development plan

7.1 Principles for the preparation of public transportation development plans and traffic development plans

According to the Cabinet Resolution on 4 December 2017 The Cabinet has set a plan for only 3 Level only. 1 The National Strategy is a goal for sustainable development of the country according to the principles of good governance to be used as a framework for the preparation of various plans to be consistent and integrated. By conveying development goals and issues to the level of the plan. 2 and 3 systematically, the plan at the level 2 It is a guideline to drive the country in various dimensions to achieve the goals of the strategy and transfer to the guidelines for implementing the plan at the level of 3 This will be a practical plan that is clear in accordance with the mission of the government department that is consistent with the implementation of the plan at the level of the 1 and the level at 2 or as required by law, or in accordance with international obligations or conventions. As shown in the whole plan. 3 Levels in **Figure 7.1-1** In addition, the name of the plan is determined at the level of 3 as follows:

1) The name "Government Action Plan" shall be used as a plan of the government department at the ministerial level or equivalent and at other levels in accordance with the provisions of the Royal Decree on Criteria and Methods for Good Administration of Civil Affairs, B.E. 2546 (2003) and (No. 2) B.E. 2562 (2019), which require all government agencies to prepare a five-year government action plan and an annual plan.

2) The name "Action Plan for Phase ... (B.E. ... - ....) shall be used, unless the name of the plan is specified in the law before the Cabinet Resolution is issued and according to the Cabinet Resolution dated December 3, 2019, which approved the guidelines for driving the National Strategy into practice in accordance with the National Strategy Committee.

3) The name "Other Plans" shall refer to other Tier 3 plans of government agencies that have The law requires that the name be used.

Source : Office of the National Economic and Social Development Council

Figure 7.1-1 Levels of the National Strategy Plan

Therefore, in preparing a public transportation development plan and a traffic development plan. The plans prepared by government agencies will be all Level 3 plans, which will transform Level 1 Plans and Level 2 Plans into practice by affecting the achievement of the goals of Level 2 Plans, especially at least one Master Plan, and must affect the achievement of the goals of the National Strategy according to the principle of cause-and-effect relationship (Casual Relationship : XYZ) between government plans/projects and the national strategy, as shown in **Figure 7.1-2** This is to help the overall implementation of various tasks in the same direction to achieve the goals of the National Strategy. It is also useful to use for tracking. Inspect and evaluate the performance of various plans/projects. This will be a tool to support decision-making in the formulation of projects or policies based on empirical evidence in the future. The preparation of the Level 3 Plan must be in accordance with the Guidelines for the Preparation of Level 3 Plans and the Proposal of Level 3 Plans in the section of Action Plans prepared by the Office of the National Economic and Social Development Council, which has been approved by the National Strategy Committee and presented to the Cabinet for acknowledgement, so that the relevant agencies can implement it correctly and in the same direction.

Source : Office of the National Economic and Social Development Council

Figure 7.1-2 Transforming the National Strategy into Practice with the Principle of Causal Linkage (Casual Relationship : XYZ)

7.2 Guidelines for the preparation of regional urban public transportation system plans

The process of preparing a public transportation development plan includes: Suggestions for appropriate routes and public transportation networks Selection of the right form of public transportation For the planning of this project, the consultant will classify the provincial groups into 2 groups as follows:

- **The 1st group of provinces** is the group of provinces that have studied the public transportation network. It consists of 7 provinces, namely Chiang Mai Province, Khon Kaen Province, Nakhon Ratchasima Province, Phitsanulok Province, Udon Thani Province, Phuket Province and Songkhla Province (Hat Yai).
- **The second group of provinces** is a group of provinces that have not studied the public transportation network before. It consists of 4 provinces, namely Chiang Rai Province, Ubon Ratchathani Province, Phra Nakhon Si Ayutthaya Province. and Surat Thani Province.

The study guidelines of each provincial group are detailed as shown in **Figure 7.2-1 Figure 7.2-2** respectively For the guidelines for the preparation of the province's public transportation network plan that

has been studied before. As shown in **Figure 7.2-1** The consultant will review the route and public transportation network. Based on the current travel volume survey data. Urban development plan, provincial development plan, and other related development plans, including transportation and traffic development. roads and highways that may affect the changing travel demand in the area. Then, the public transportation routes within the network will be prioritized.

Once the route and network are initially suitable, the consultant will test the route using the traffic and transportation model developed for the province. The passenger volume results of each route from the model for each year, the development goals will be used to analyze the model of the system suitable for each development stage. The consultant will analyze the economic feasibility of each route to support the prioritization of the route and the preparation of a plan for the development of the public transportation system in the urban areas of the province.

However, In each process to prepare a plan for the development of public transportation systems in regional cities, it consists of: Selection of routes and networks The consultant will present in detail in **sections 5.5.3 – 5.5.5.**

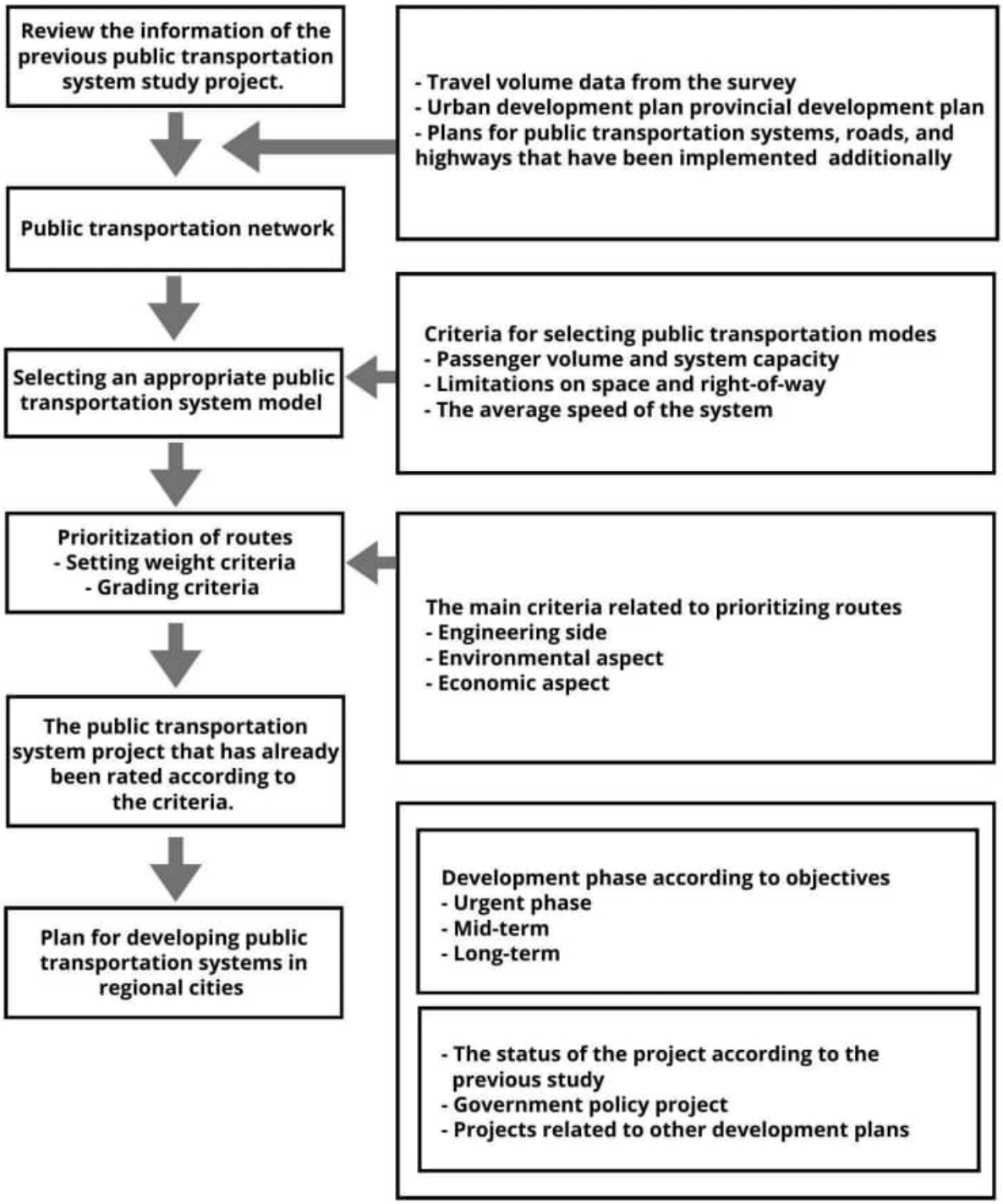


Figure 7.2-1 the preparation of appropriate public transportation network plans for the group of provinces that have studied the public transportation network

For provinces that have not yet studied the public transportation network. The consultant will conduct the study according to the guidelines shown in **Figure 7.2-2**

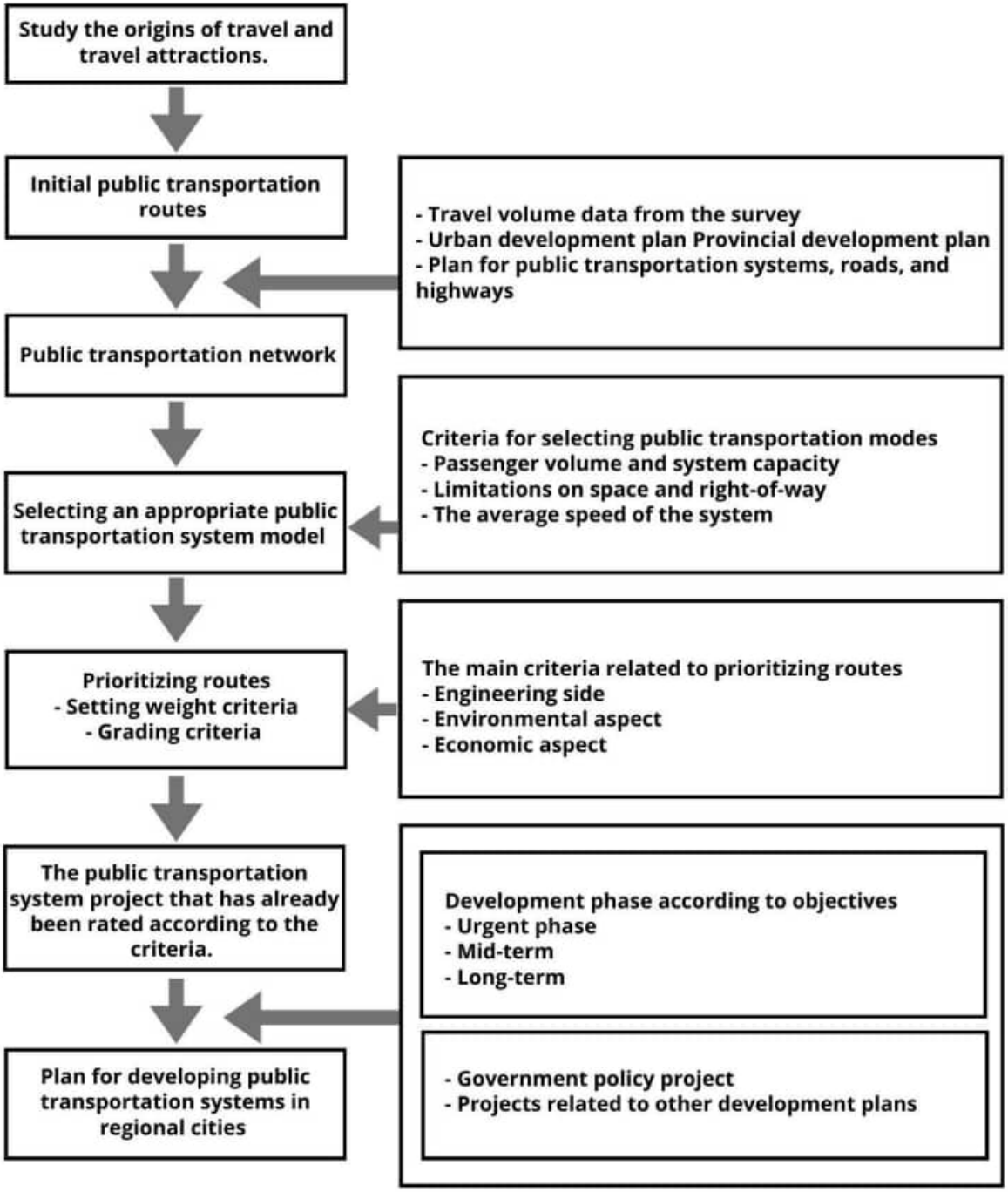


Figure 7.2-2 for the preparation of appropriate public transportation network plans for provincial groups that have not yet studied the public transportation network before.

7.3 Concept for Developing Regional Urban Public Transportation System Development Guidelines

Based on the analysis of strategic linkages at the national level, including those of the Ministry of Transport and the Office of Transport and Traffic Policy and Planning (OTP), as related to the preparation of public transportation development plans for regional cities in Section 7.4.1, The Consultant will link the acquired strategies with the urban development guidelines of the province and other spatial development plans. As well as presenting the province's appropriate public transportation development strategy. In order to develop public transportation systems to meet the needs of both national, The consultant will formulate ideas for the preparation of the public transportation development plan. as follows:

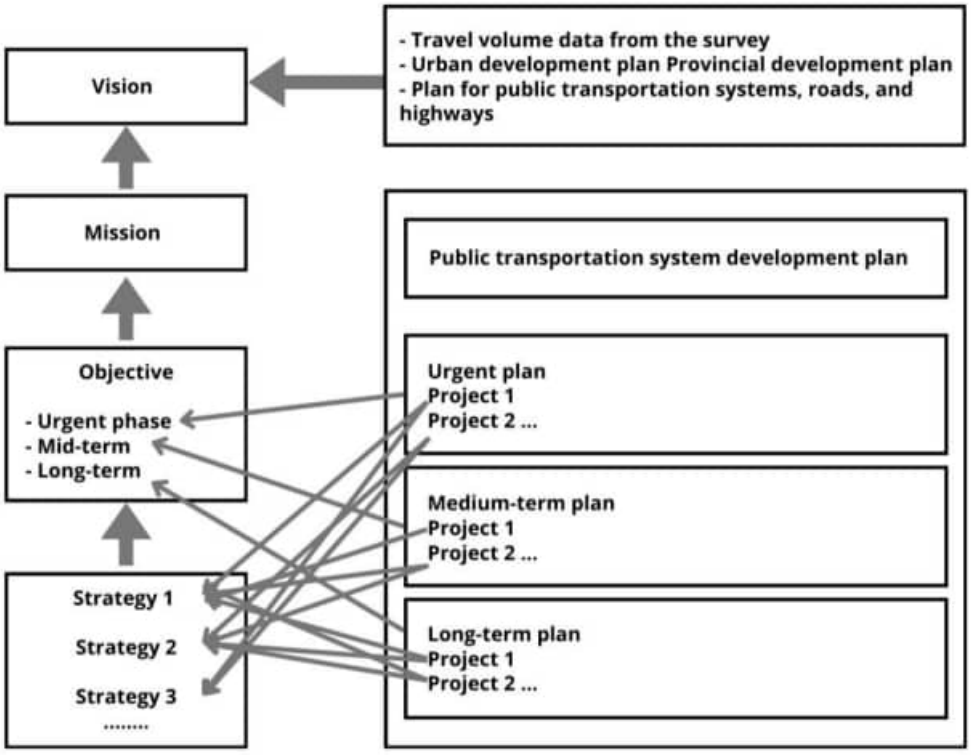


Figure 7.3-1 the Vision, Mission, Goals, and Strategy systematically to prepare a plan for the development of the public transportation system.

1) Vision

From various development policies and strategic plans related to the project, including: Policies and strategic plans at the national, regional and provincial levels, including the National Strategy, the Ministry of Transport, the Provincial Strategy, the National Strategy, the Ministry of Transport, the Ministry of Transport, the Ministry of Transport, which were reviewed in Chapter 2 and analyzed in the strategic linkage analysis under Section 7.4.1 The Consultant will process the strategic concepts and plans to determine the vision or vision of the future of the public transportation system in line with the plans and needs of the provinces and regions.

2) Mission

Based on the vision of the public transportation system, the consultant will determine the mission or mission that must be achieved in the long term for the public transportation system in that province.

3) Targets

Based on the vision and mission, the consultant will determine the objectives or level of performance that will be achieved. The objectives will be divided into short, medium and long-term, which will consist of relevant projects that are appropriate and urgent in each phase. Depending on the nature of the mission, the goal is to be a destination that guides the way forward in operations.

4) Development Approach

The consultant will determine the development guidelines or operational guidelines to achieve the objectives in each specified phase. The development guidelines must support the achievement of the objectives and set appropriate indicators for the follow-up of the implementation of the development guidelines.

5) Public Transport Development Plan

The consultant will prepare a public transportation development plan consisting of appropriate public transportation projects or routes based on the suitability based on economic analysis and route prioritization, as well as the urgency of the project according to government policies. The proposed public transportation system project aims to support the implementation of the set strategy. However, Guidelines for drawing up a plan will be discussed in more detail in Section 7.2

7.4 Summary of the public transportation development plan and the urban traffic system development plan.

From the National Strategy 2018 - 2037, Strategy 2, the Strategy for Building Competitiveness, has set development goals that focus on enhancing the country's potential in various dimensions. To increase the country's competitiveness. By developing the country's infrastructure in various dimensions, including the transportation and transportation network. In the Master Plan under the National Strategy 2018-2037, infrastructure, logistics and digital issues have focused on the continuous development of transportation infrastructure and logistics systems, which is an important part of building the country's competitiveness. In the Master Plan, the sub-master plan target 7.1 Transportation infrastructure and logistics system has been set and set targets to achieve the goal of increasing public transportation travel in urban areas. The target has been set. Proportion of urban public transport trips to total urban trips The target value In major cities, the total region will increase by at least 10 percent by 2023-2027 and by at least 20 percent by 2037.

The strategic planning process for the development of public transportation systems in regional cities has involved the systematic collection of transportation and traffic data, along with the current utilization of public transit systems within the study areas. This includes traffic flow analysis on existing transportation networks, as well as assessment of current and projected travel demand patterns. The outcomes have informed recommendations for an optimal public transportation network, prioritization of transit corridors, and identification of appropriate transport technologies and passenger-supporting facilities across all 11 provinces. These analyses serve as the foundation for the formulation of transportation development programs, urban

traffic management projects, and implementation measures aimed at enhancing public transportation systems. Additionally, modal shift promotion strategies have been proposed to encourage greater public transport usage, tailored to the specific needs and suitability of each area. The results will contribute to the development of a comprehensive Public Transportation Action Plan and Urban Traffic Management Action Plan. These plans will serve to guide the refinement of future mobility enhancement policies and transit promotion strategies, with a focus on sustainability and resilience aligned with present-day urban transport conditions.

According to the Office of the National Economic and Social Development Council (NESDC), the main cities in regional cities are Chiang Mai, Khon Kaen, Nakhon Ratchasima, Phitsanulok, Udon Thani, Phuket, and Songkhla (Hat Yai). Consider that in order to have information on public transportation systems in 4 additional regional cities, including Chiang Rai Province, Ubon Ratchathani Province, and Phra Nakhon Si Ayutthaya Province. Therefore, it is necessary to study, survey, and develop tools to collect people's travel data in order to know information and analyze behavior. The region's changing travel.

Vision, Mission, Objectives and Strategies in accordance with the Strategic Plan for the Development of Public Transportation in Regional Cities as shown in **Figure 7.4-1** The essence of the plan consists of the following details:

7.4.1 Vision

Major Regional Cities of Thailand There must be a good and efficient public transportation system. It is convenient, fast, safe, at an affordable price, and environmentally friendly to provide services to the public and visitors thoroughly and equally.

7.4.2 Mission

1) Develop a good and efficient public transportation system. Convenient, fast, safe, affordable, and environmentally friendly to support travel for everyone. In the main regional cities of Thailand.
2) Promote the use of public transportation and encourage the change in travel mode from private vehicles to public transportation. (Mode Shift) for travel within the main cities of Thailand.
3) Solve problems from the transportation and traffic sectors within urban areas in the main regions of Thailand in a sustainable manner.
4) Supporting the development and driving of the economic system and the tourism sector in the main cities of Thailand.

7.4.3 Targets

1) There is a public transportation network system that covers the service area thoroughly and can connect travel with various modes of transportation. In the main regional cities of Thailand.
2) There is a public transportation system with good service quality. It is standardized, modern, convenient and safe, and has reasonable and fair fares in major cities and regions of Thailand.
3) The development of public transportation can encourage the use and change of travel from private vehicles to public transportation in urban areas, major regions of Thailand.
4) Alleviate traffic conditions so that the traffic of the urban road network is less congested.

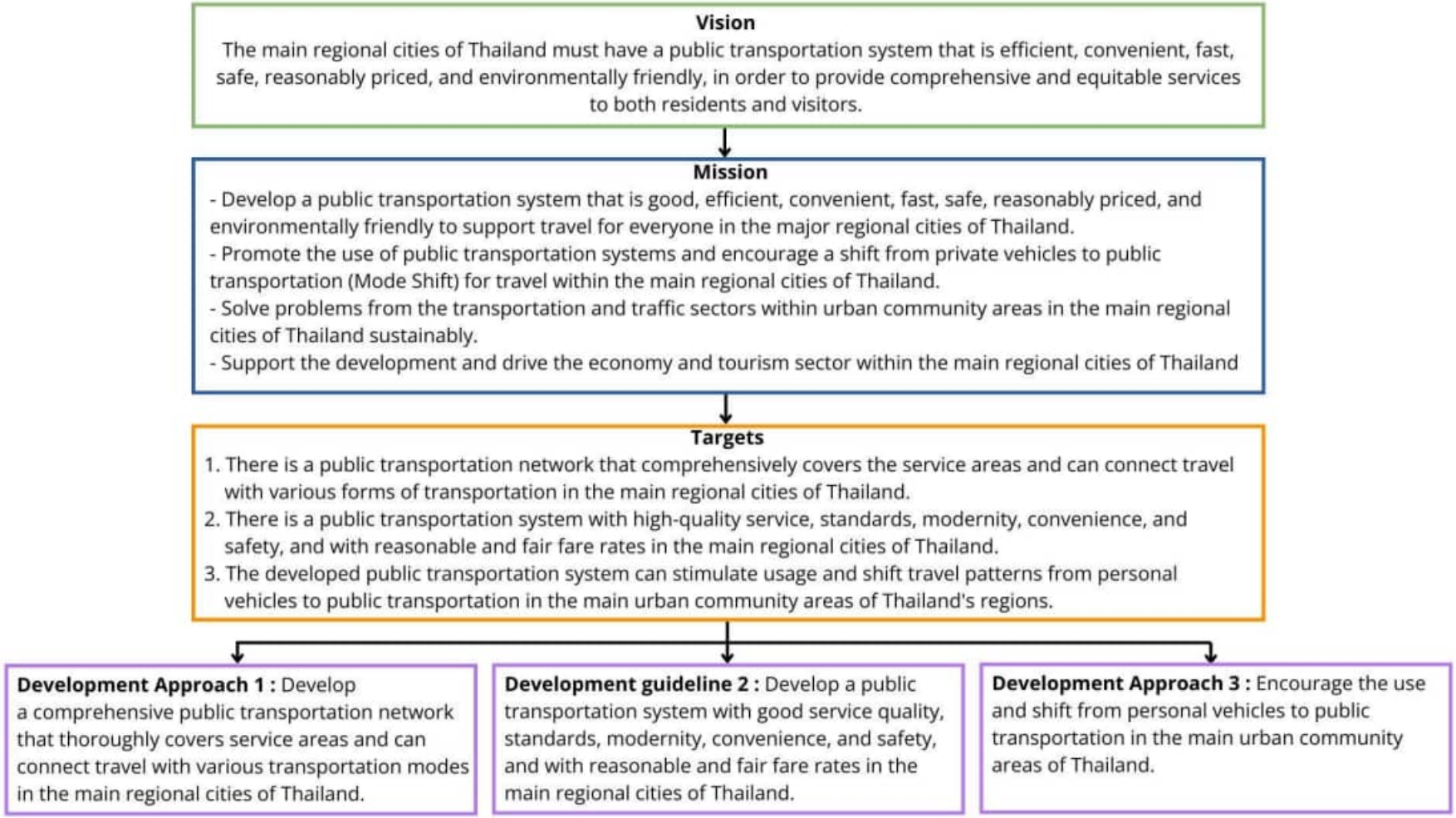


Figure 7.4-1 Plan for the Development of Public Transport in Regional Cities

7.4.4 Total Goals and Indicators

1) Target

(1) There is a public transportation network system that covers the service area thoroughly and can connect travel with various modes of transportation. In the main regional cities of Thailand.

(2) There is a public transportation system with good service quality. It is standardized, modern, convenient and safe, and has reasonable and fair fares in major cities and regions of Thailand.

(3) The development of public transportation can encourage the use and change of travel from private vehicles to public transportation in urban areas, major regions of Thailand.

2) Target value

Goal Configuration Consider in line with the goal of preparing a public transportation development plan as mentioned above, which focuses on facilitating public transportation access to more people. It must also be in accordance with the guidelines of the master plan under the National Strategy. Issue 7 emphasizes the development of public transportation systems to support the distribution of prosperity and the creation of new economic centers, as well as the development of transportation system linkages to improve the quality of life of the people. Reduce losses from road accidents, including the integration of all forms of travel and transportation database systems to lead to intelligent traffic control and management at both the local and national levels. The goal is to **increase public transportation travel in urban areas. The proportion of public transportation trips in urban areas to trips. In all cities of travel in major cities in the region, an average of not less than 20 percent during 2028 – 2037.**

Therefore, in order to determine the targets to lead to the success of the Development Plan and to be in line with the target values of the Master Plan under the National Strategy, it is necessary to focus on the development of public transportation routes in accordance with the details of the proposed Public Transportation Route Development Plan, so that the use of public transportation systems will increase in the future.

(1) The development of a public transportation system so that people can travel more conveniently through the public transportation system.

7.4.5 Development Guidelines and Strategies under the Public Transportation Development Plan and Traffic Development Plan

7.4.5.1 Chiang Mai Province

The action plan for the development of the public transportation system and the urban traffic system development plan consists of 2 development approaches, 4 strategy, 4 objectives and 13 projects (41 sub-projects) with a total budget of 7,378.82 million baht. as follows:

(1) Development Approach 1: Development of Public Transportation System in Regional Cities, Chiang Mai Province

1. Strategy 1.1 : Develop the public transportation network to cover the service area thoroughly and be able to connect travel with various modes of transportation in major cities and regions of Thailand, consisting of 1 objective, 3 projects (8 sub-projects), with a total budget of 4,026.17 million baht. There are important projects such as the bus route development project, the construction project of public bus stops, the construction of public bus stops, the construction of public bus stops, and the construction of public bus stops. Procurement of Electric Public Buses (EV BUS) Development and Construction of Maintenance Centers (Depot)
2. Strategy 1.2 : Develop a public transportation system with good service quality. It consists of 1 objective, 4 projects (7 sub-projects) with a total budget of 3,121.88 million baht. There are important projects such as the project to improve public bus safety standards. Technology and Smart System Installation Project Feasibility Study Project on Setting Appropriate Fare Rates and Using the Shared Ticket System Web Application and Mobile Application Study and Development Project
3. Strategy 1.3: Encourage the use and change of travel from private vehicles to public transportation in the main urban areas of Thailand. It consists of 1 objective, 2 projects (4 sub-projects), with a total amount of 125.00 million baht. There are important projects such as the feasibility study project for land acquisition and construction of parking buildings, TDM measures in administration and operation.

(2) Development Guideline 2: Development of Urban Traffic System, Chiang Mai Province

1. Strategy 2.1 : Improve and develop infrastructure to support the city's public transportation system, consisting of 1 objective, 4 projects (22 sub-projects), with a total budget of 105.77 million baht. There are important projects such as the project to improve traffic problems at intersections. Safe Road Use Promotion Project Infrastructure Development Project to Support Public Transportation.

However, If the project is under the Public Transportation Development Plan and the Urban Traffic System Development Plan, Chiang Mai Province It can be driven to practice according to the set time frame. This is an incentive for people to switch to public transportation services and reduce the use of private vehicles. Reduce traffic problems and reduce air pollution problems.

Table 7.4-1 Summary of development guidelines according to the Public Transportation Development Plan and Traffic System Development Plan in Chiang Mai City

project	list	Investment Budget (Million Baht)	Budget (Million Baht)		
			Short-term 2026 - 2032	Medium Term 2033 - 2037	Long Term 2038 - 2046
Development Approach 1: Development of Public Transportation System in Regional Cities, Chiang Mai Province					
Strategy 1.1 : Develop the public transportation network to cover the service area thoroughly and be able to connect travel with various modes of transportation. In the main regional cities of Thailand.					
Objective 1 : To have a public transportation network system that covers the service area thoroughly and can connect travel with various modes of transportation. In the main regional cities of Thailand.					
1	Bus Route Development Project (3 sub-projects)	0.17	0.16	0.01	-
2	Bus Users' Travel Facilitation Project (3 sub-projects)	3,626.00	2,531.00	1,095.00	-
3	Development and Construction of Maintenance Center (Depot) (2 sub-projects)	400.00	400.00	-	-
Strategy 1.2 : Develop a public transportation system with good service quality. It is standardized, modern, convenient and safe, and has reasonable and fair fares in major cities and regions of Thailand.					
Objective 2 : To have a public transportation system with good service quality. It is standardized, modern, convenient and safe, and has reasonable and fair fares in major cities and regions of Thailand.					
4	Public Bus Safety Standards Improvement Project (4 sub-projects)	3,081.88	655.31	871.37	1,555.20
5	Technology and Smart System Installation Project	10.00	10.00	-	-
6	Feasibility Study Project on Setting Appropriate Fare Rates and Using the Shared Ticket System	15.00	15.00	-	-
7	Study and develop web applications and mobile applications to be used as databases for planning and decision-making in the choice of routes and public transportation.	15.00	-	15.00	-
Strategy 1.3: Encourage the use and change of travel from private vehicles to public transportation in the main urban areas of Thailand.					
Objective 3 : The development of public transportation can encourage the use and change of travel from private vehicles to public transportation in the main urban areas of Thailand.					
8	Feasibility Study Project for Land Acquisition and Construction of Parking and Parking Buildings (2 sub-projects)	10.00	10.00	-	-
9	TDM Measures in Administration and Implementation (2 sub-projects)	115.00	36.00	24.00	55.00
Development Guideline 2: Development of Urban Traffic System, Chiang Mai Province					
Strategy 2.1 : Improve and develop infrastructure to support urban public transportation					
Objective 4 : Alleviating traffic conditions so that the traffic of the road network in Chiang Mai city is less congested.					
10	Traffic Problem Improvement Project at Intersections (5 sub-projects)	7.41	7.41	-	-
11	Pavement Standards Improvement and Landscaping Project (10 sub-projects)	73.11	-	73.11	-
12	Safe Road Use Promotion Project (3 sub-projects)	3.25	1.25	2.00	-
13	Infrastructure Development Project to Support Public Transportation System (4 sub-projects)	22.00	-	9.00	13.00

7.4.5.2 Chiang Rai Province

The action plan for the development of the public transportation system and the urban traffic system development plan consists of 2 development approaches, 4 strategy, 4 objectives and 13 projects (45 sub-projects) with a total budget of 2,178.62 million baht. as follows:

(1) Development Guideline 1: Development of Public Transportation System in Regional Cities, Chiang Rai Province

1. Strategy 1.1 : Develop the public transportation network to cover the service area thoroughly and be able to connect travel with various modes of transportation. In the main regional cities of Thailand. it consists of 1 objectives, 3 projects (4 sub-projects), with a total budget of 1,104.06 million baht. There are important projects such as the bus route development project, the construction project of public bus stops, the construction of public bus stops, the construction of public bus stops, and the construction of public bus stops. Procurement of Electric Public Buses (EV BUS) Development and Construction of Maintenance Centers (Depots).
2. Strategy 1.2 : Develop a public transportation system with good service quality. There are standards and modernity. It consists of 1 objectives, 4 projects (7 sub-projects), with a total budget of 793.94 million baht. There are important projects such as the project to improve public bus safety standards. Technology and Smart System Installation Project Feasibility Study Project on Setting Appropriate Fare Rates and Using the Shared Ticket System Web Application and Mobile Application Study and Development Project.
3. Strategy 1.3 : Encourage the use and change of travel from private vehicles to public transportation in the main urban areas of Thailand. It consists of 1 objective, 2 projects (4 sub-projects), with a total amount of 125.00 million baht. There are important projects such as the feasibility study project for land acquisition and construction of parking buildings, TDM measures in administration and operation.

(2) Development Approach 2: Development of Urban Traffic System, Chiang Rai Province

1. Strategy 2.1 : Improve and develop infrastructure to support the city's public transportation system, consisting of 1 objective, 4 projects (30 sub-projects), with a total budget of 155.62 million baht. There are important projects such as the project to improve traffic problems at intersections. Safe Road Use Promotion Project Infrastructure Development Project to Support Public Transportation.

However, If the project under the Public Transportation Development Plan and the Traffic System Development Plan in Chiang Rai Province can be driven into practice according to the specified time frame, it will make the public's access to public transportation more convenient, which will encourage the public to switch to public transportation services. Reduce traffic problems and reduce air pollution problems.

Table 7.4-2 Summary of development guidelines according to the Public Transportation Development Plan and Traffic System Development Plan in Chiang Rai City

project	list	Investment Budget (Million Baht)	Budget (Million Baht)		
			Short-term 2026 - 2032	Medium Term 2033 - 2037	Long Term 2038 - 2046
Development Guideline 1: Development of Public Transportation System in Regional Cities, Chiang Rai Province					
Strategy 1.1 : Develop the public transportation network to cover the service area thoroughly and be able to connect travel with various modes of transportation. In the main regional cities of Thailand.					
Objective 1 : To have a public transportation network system that covers the service area thoroughly and can connect travel with various modes of transportation. In the main regional cities of Thailand.					
1	Bus Route Development Project	0.06	0.06	-	-
2	Bus Users' Travel Facilitation Project (2 sub-projects)	1,004.00	779.00	225.00	-
3	Development and Construction of Maintenance Center (Depot)	100.00	100.00	-	-
Strategy 1.2 : Develop a public transportation system with good service quality. It is standardized, modern, convenient and safe, and has reasonable and fair fares in major cities and regions of Thailand.					
Objective 2 : To have a public transportation system with good service quality. It is standardized, modern, convenient and safe, and has reasonable and fair fares in major cities and regions of Thailand.					
4	Public Bus Safety Standards Improvement Project (4 sub-projects)	753.94	172.19	209.15	372.60
5	Technology and Smart System Installation Project	10.00	10.00	-	-
6	Feasibility Study Project on Setting Appropriate Fare Rates and Using the Shared Ticket System	15.00	15.00	-	-
7	Study and develop web applications and mobile applications to be used as databases for planning and decision-making in the choice of routes and public transportation.	15.00	-	15.00	-
Strategy 1.3: Encourage the use and change of travel from private vehicles to public transportation in the main urban areas of Thailand.					
Objective 3 : The development of public transportation can encourage the use and change of travel from private vehicles to public transportation in the main urban areas of Thailand.					
8	Feasibility Study Project for Land Acquisition and Construction of Parking and Parking Buildings (2 sub-projects)	10.00	10.00	-	-
9	TDM Measures in Administration and Implementation (2 sub-projects)	115.00	36.00	24.00	55.00
Development Approach 2: Development of Urban Traffic System, Chiang Rai Province					
Strategy 2.1 : Improve and develop infrastructure to support urban public transportation					
Objective 4 : Alleviating traffic conditions so that the traffic of the road network in Chiang Rai city is less congested.					
10	Traffic Problem Improvement Project at Intersections (5 sub-projects)	1.50	1.50	-	-
11	Pavement Improvement Project Landscaping and traffic surfaces (18 sub-projects)	128.87	-	128.87	-
12	Safe Road Use Promotion Project (3 sub-projects)	3.25	1.25	2.00	-
13	Infrastructure Development Project to Support Public Transportation System (4 sub-projects)	22.00	-	9.00	13.00

7.4.5.3 Phitsanulok Province

The action plan for the development of the public transportation system and the urban traffic system development plan consists of 2 development approaches, 4 strategy, 4 objectives and 13 projects (46 sub-projects) with a total budget of 2,888.80 million baht. as follows:

(1) Development Guideline 1: Development of Public Transportation System in Regional Cities, Phitsanulok Province

1. Strategy 1.1 : Develop the public transportation network to cover the service area thoroughly and be able to connect travel with various modes of transportation. In the main regional cities of Thailand, it consists of 1 objective, 3 projects (4 sub-projects), with a total amount of 1,498.61 million baht. There are important projects such as the bus route development project, the construction project of public bus stops, the construction of public bus stops, the construction of public bus stops, and the construction of public bus stops. Procurement of Electric Public Buses (EV BUS) Development and Construction of Maintenance Centers (Depot)
2. Strategy 1.2 : Develop a public transportation system with good service quality. There are standards and modernity. It consists of 1 objective, 4 projects (7 sub-projects), with a total amount of 1,119.70 million baht. There are important projects such as the project to improve public bus safety standards. Technology and Smart System Installation Project Feasibility Study Project on Setting Appropriate Fare Rates and Using the Shared Ticket System Web Application and Mobile Application Study and Development Project
3. Strategy 1.3: Encourage the use and change of travel from private vehicles to public transportation in the main urban areas of Thailand. It consists of 1 objective, 2 projects (4 sub-projects), with a total amount of 125.00 million baht. There are important projects such as the feasibility study project for land acquisition and construction of parking buildings, TDM measures in administration and operation.

(2) Development Guideline 2 : Development of Urban Traffic System in Phitsanulok Province

1. Strategy 2.1 : Improve and develop infrastructure to support the city's public transportation system, consisting of 1 objective, 4 projects (31 sub-projects), with a total budget of 145.49 million baht. There are important projects such as the project to improve traffic problems at intersections. Safe Road Use Promotion Project Infrastructure Development Project to Support Public Transportation

However, If the project is under the Public Transportation Development Plan and the Urban Traffic System Development Plan, Phitsanulok Province. It will make the public's access to public transportation more convenient, which will motivate the public to switch to public transportation services and reduce the use of personal vehicles. Reduce traffic problems and reduce air pollution problems.

Table 7.4-3 Summary of development guidelines according to the Public Transportation Development Plan and Traffic System Development Plan in Phitsanulok City

project	list	Investment Budget (Million Baht)	Budget (Million Baht)		
			Short-term 2026 - 2032	Medium Term 2033 - 2037	Long Term 2038 - 2046
Development Guideline 1: Development of Public Transportation System in Regional Cities, Phitsanulok Province					
Strategy 1.1 : Develop the public transportation network to cover the service area thoroughly and be able to connect travel with various modes of transportation. In the main regional cities of Thailand.					
Objective 1 : To have a public transportation network system that covers the service area thoroughly and can connect travel with various modes of transportation. In the main regional cities of Thailand.					
1	Bus Route Development Project	0.11	0.11	-	-
2	Bus Users' Travel Facilitation Project (2 sub-projects)	1,398.50	1,098.50	300.00	-
3	Development and Construction of Maintenance Center (Depot)	100.00	100.00	-	-
Strategy 1.2 : Develop a public transportation system with good service quality. It is standardized, modern, convenient and safe, and has reasonable and fair fares in major cities and regions of Thailand.					
Objective 2 : To have a public transportation system with good service quality. It is standardized, modern, convenient and safe, and has reasonable and fair fares in major cities and regions of Thailand.					
4	Public Bus Safety Standards Improvement Project (4 sub-projects)	1,079.70	251.80	297.35	530.55
5	Technology and Smart System Installation Project	10.00	10.00	-	-
6	Feasibility Study Project on Setting Appropriate Fare Rates and Using the Shared Ticket System	15.00	15.00	-	-
7	Study and develop web applications and mobile applications to be used as databases for planning and decision-making in the choice of routes and public transportation.	15.00	-	15.00	-
Strategy 1.3: Encourage the use and change of travel from private vehicles to public transportation in the main urban areas of Thailand.					
Objective 3 : The development of public transportation can encourage the use and change of travel from private vehicles to public transportation in the main urban areas of Thailand.					
8	Feasibility Study Project for Land Acquisition and Construction of Parking and Parking Buildings (2 sub-projects)	10.00	10.00	-	-
9	TDM Measures in Administration and Implementation (2 sub-projects)	115.00	36.00	24.00	55.00
Development Guideline 2 : Development of Urban Traffic System in Phitsanulok Province					
Strategy 2.1 : Improve and develop infrastructure to support urban public transportation					
Objective 4 : Alleviate traffic conditions so that the traffic of the road network in Phitsanulok city is less congested.					
10	Traffic Problem Improvement Project at Intersections (3 sub-projects)	1.35	1.35	-	-
11	Pavement Improvement Project Landscape and Traffic Surface (21 sub-projects)	118.89	-	118.89	-
12	Safe Road Use Promotion Project (3 sub-projects)	3.25	1.25	2.00	-
13	Infrastructure Development Project to Support Public Transportation System (4 sub-projects)	22.00	-	9.00	13.00

7.4.5.4 Udon Thani Province

The action plan for the development of the public transportation system and the urban traffic system development plan consists of 2 development approaches, 4 strategy, 4 objectives and 13 projects (48 plans) with a total budget of 3,029.92 million baht. as follows:

(1) Development Guideline 1: Development of Public Transportation System in Regional Cities, Udon Thani Province

1. Strategy 1.1 : Develop the public transportation network to cover the service area thoroughly and be able to connect travel with various modes of transportation. In the main regional cities of Thailand, it consists of 1 objective, 3 projects (4 sub-projects) with a total budget of 1,574.12 million baht. There are important projects such as the bus route development project. Public Bus Stop Construction Project Procurement of Electric Public Buses (EV BUS) Development and Construction of Maintenance Centers (Depots)
2. Strategy 1.2 : Develop a public transportation system with good service quality. It consists of 1 objective, 4 projects (7 sub-projects) with a total budget of 1,032.08 million baht. There are important projects such as the project to improve public bus safety standards. Technology and Smart System Installation Project Feasibility Study Project on Setting Appropriate Fare Rates and Using the Shared Ticket System Web Application and Mobile Application Study and Development Project
3. Strategy 1.3: Encourage the use and change of travel from private vehicles to public transportation in the main urban areas of Thailand. It consists of 1 objective, 2 projects (4 sub-projects), with a total budget of 125.00 million baht. There are important projects such as the feasibility study project for land acquisition and construction of parking buildings, TDM measures in administration and operation.

(2) Development Guideline 2: Development of Urban Traffic System, Udon Thani Province

1. Strategy 2.1 : Improve and develop infrastructure to support the city's public transportation system, consisting of 1 objective, 4 projects (33 sub-projects), with a total budget of 298.72 million baht. There are important projects such as the project to improve traffic problems at intersections. Safe Road Use Promotion Project Infrastructure Development Project to Support Public Transportation

However, If the project is under the public transportation development plan and the urban traffic system development plan, Udon Thani Province. It will make the public's access to public transportation more convenient, which will motivate the public to switch to public transportation services and reduce the use of personal vehicles. Reduce traffic problems and reduce air pollution problems.

Table 7.4-4 Summary of development guidelines according to the Public Transportation Development Plan and the Traffic System Development Plan in Udon Thani City

project	list	Investment Budget (Million Baht)	Budget (Million Baht)		
			Short-term 2026 - 2032	Medium Term 2033 - 2037	Long Term 2038 - 2046
Development Guideline 1: Development of Public Transportation System in Regional Cities, Udon Thani Province					
Strategy 1.1 : Develop the public transportation network to cover the service area thoroughly and be able to connect travel with various modes of transportation. In the main regional cities of Thailand.					
Objective 1 : To have a public transportation network system that covers the service area thoroughly and can connect travel with various modes of transportation. In the main regional cities of Thailand.					
1	Bus Route Development Project	0.12	0.11	0.01	-
2	Bus Users' Travel Facilitation Project (2 sub-projects)	1,374.00	1,006.50	367.50	-
3	Development and Construction of Maintenance Center (Depot)	200.00	200.00	-	-
Strategy 1.2 : Develop a public transportation system with good service quality. It is standardized, modern, convenient and safe, and has reasonable and fair fares in major cities and regions of Thailand.					
Objective 2 : To have a public transportation system with good service quality. It is standardized, modern, convenient and safe, and has reasonable and fair fares in major cities and regions of Thailand.					
4	Public Bus Safety Standards Improvement Project (4 sub-projects)	992.08	207.88	282.01	502.20
5	Technology and Smart System Installation Project	10.00	10.00	-	-
6	Feasibility Study Project on Setting Appropriate Fare Rates and Using the Shared Ticket System	15.00	15.00	-	-
7	Study and develop web applications and mobile applications to be used as databases for planning and decision-making in the choice of routes and public transportation.	15.00	-	15.00	-
Strategy 1.3: Encourage the use and change of travel from private vehicles to public transportation in the main urban areas of Thailand.					
Objective 3 : The development of public transportation can encourage the use and change of travel from private vehicles to public transportation in the main urban areas of Thailand.					
8	Feasibility Study Project for Land Acquisition and Construction of Parking and Parking Buildings (2 sub-projects)	10.00	10.00	-	-
9	TDM Measures in Administration and Implementation (2 sub-projects)	115.00	36.00	24.00	55.00
Development Guideline 2: Development of Urban Traffic System, Udon Thani Province					
Strategy 2.1 : Improve and develop infrastructure to support urban public transportation					
Objective 4 : Reduce traffic conditions so that the traffic of the road network in Udon Thani city is less congested.					
10	Traffic Problem Improvement Project at Intersections (2 sub-projects)	0.60	0.60	-	-
11	Improvement of Pavement, Landscape and Traffic Surface Standards (28 sub-projects)	272.87	-	272.87	-
12	Safe Road Use Promotion Project (3 sub-projects)	3.25	1.25	2.00	-
13	Infrastructure Development Project to Support Public Transportation System (4 sub-projects)	22.00	-	9.00	13.00

7.4.5.5 Khon Kaen Province

The action plan for the development of the public transportation system and the urban traffic system development plan consists of 2 development approaches, 4 strategy, 4 objectives and 13 projects (45 sub-projects) with a total budget of 4,444.43 million baht. as follows

(1) Development Guideline 1: Development of Public Transportation System in Regional Cities, Khon Kaen Province

1. Strategy 1.1 : Develop the public transportation network to cover the service area thoroughly and be able to connect travel with various modes of transportation. In the main regional cities of Thailand, it consists of 1 objective, 3 projects (7 sub-projects) with a total amount of 2,454.20 million baht. There are important projects such as the bus route development project, the construction project of public bus stops, the construction of public bus stops, the construction of public bus stops, and the construction of public bus stops. Procurement of Electric Public Buses (EV BUS) Development and Construction of Maintenance Centers (Depots)
2. Strategy 1.2 : Develop a public transportation system with good service quality. There are standards and modernity. It is convenient and safe, and has reasonable and fair fares in major cities and regions of Thailand, it consists of 1 objective, 4 projects (7 sub-projects) with a total budget of 1,737.86 million baht. There are important projects such as the project to improve public bus safety standards. Technology and Smart System Installation Project Feasibility Study Project on Setting Appropriate Fare Rates and Using the Shared Ticket System Web Application and Mobile Application Study and Development Project.
3. Strategy 1.3: Encourage the use and change of travel from private vehicles to public transportation in the main urban areas of Thailand.It consists of 1 objective, 2 projects (4 sub-projects), with a total amount of 125.00 million baht. There are important projects such as the feasibility study project for land acquisition and construction of parking buildings, TDM measures in administration and operation.

(2) Development Guideline 2 : Development of Urban Traffic System in Khon Kaen Province

1. Strategy 2.1 : Improve and develop infrastructure to support the city's public transportation system, consisting of 1 objective, 4 projects (27 sub-projects), with a total budget of 127.37 million baht. There are important projects such as the project to improve traffic problems at intersections. Safe Road Use Promotion Project Infrastructure Development Project to Support Public Transportation.

However, If the project is under the public transportation development plan and the urban traffic system development plan, Khon Kaen Province. It will make the public's access to public transportation more convenient, which will motivate the public to switch to public transportation services and reduce the use of personal vehicles. Reduce traffic problems and reduce air pollution problems.

Table 7.4-5 Summary of development guidelines according to the Public Transportation Development Plan and the Traffic System Development Plan in Khon Kaen City

project	list	Investment Budget (Million Baht)	Budget (Million Baht)		
			Short-term 2026 - 2032	Medium Term 2033 - 2037	Long Term 2038 - 2046
Development Guideline 1: Development of Public Transportation System in Regional Cities, Khon Kaen Province					
Strategy 1.1 : Develop the public transportation network to cover the service area thoroughly and be able to connect travel with various modes of transportation. In the main regional cities of Thailand.					
Objective 1 : To have a public transportation network system that covers the service area thoroughly and can connect travel with various modes of transportation. In the main regional cities of Thailand.					
1	Bus Route Development Project (2 sub-projects)	0.20	0.20	-	-
2	Bus Users' Travel Facilitation Project (3 sub-projects)	2,254.00	1,736.50	517.50	-
3	Development and Construction of Maintenance Center (Depot) (2 sub-projects)	200.00	200.00	-	-
Strategy 1.2 : Develop a public transportation system with good service quality. It is standardized, modern, convenient and safe, and has reasonable and fair fares in major cities and regions of Thailand.					
Objective 2 : To have a public transportation system with good service quality. It is standardized, modern, convenient and safe, and has reasonable and fair fares in major cities and regions of Thailand.					
4	Public Bus Safety Standards Improvement Project (4 sub-projects)	1,697.86	383.56	471.91	842.40
5	Technology and Smart System Installation Project	10.00	10.00	-	-
6	Feasibility Study Project on Setting Appropriate Fare Rates and Using the Shared Ticket System	15.00	15.00	-	-
7	Study and develop web applications and mobile applications to be used as databases for planning and decision-making in the choice of routes and public transportation.	15.00	-	15.00	-
Strategy 1.3: Encourage the use and change of travel from private vehicles to public transportation in the main urban areas of Thailand.					
Objective 3 : The development of public transportation can encourage the use and change of travel from private vehicles to public transportation in the main urban areas of Thailand.					
8	Feasibility Study Project for Land Acquisition and Construction of Parking and Parking Buildings (2 sub-projects)	10.00	10.00	-	-
9	TDM Measures in Administration and Implementation (2 sub-projects)	115.00	36.00	24.00	55.00
Development Guideline 2 : Development of Urban Traffic System in Khon Kaen Province					
Strategy 2.1 : Improve and develop infrastructure to support urban public transportation					
Objective 4 : Alleviate traffic conditions so that the traffic of the road network in Khon Kaen city is less congested.					
10	Traffic Problem Improvement Project at Intersections (4 sub-projects)	1.15	1.15	-	-
11	Sidewalk, Landscape and Traffic Surface Improvement Project (18 sub-projects)	100.97	-	100.97	-
12	Safe Road Use Promotion Project (3 sub-projects)	3.25	1.25	2.00	-
13	Infrastructure Development Project to Support Public Transportation System (4 sub-projects)	22.00	-	9.00	13.00

7.4.5.6 Nakhon Ratchasima Province

The action plan for the development of the public transportation system and the urban traffic system development plan consists of 2 development approaches, 4 strategy, 4 objectives and 13 projects (45 sub-projects) with a total budget of 5,255.20 million baht. as follows:

(1) Development Guideline 1: Development of Public Transportation System in Regional Cities, Nakhon Ratchasima Province

1. Strategy 1.1 : Develop the public transportation network to cover the service area thoroughly and be able to connect travel with various modes of transportation. In the main regional cities of Thailand, it consists of 1 objective, 3 projects (8 sub-projects) with a total budget of 2,832.66 million baht. There are important projects such as the bus route development project, the construction project of public bus stops, the construction of public bus stops, the construction of public bus stops, and the construction of public bus stops. Procurement of Electric Public Buses (EV BUS) Development and Construction of Maintenance Centers (Depots).
2. Strategy 1.2 : Develop a public transportation system with good service quality. There are standards and modernity. It is convenient and safe, and has reasonable and fair fares in the main cities and regions of Thailand, it consists of 1 objective, 4 Projects (7 sub-projects) with a total budget of 2,094.40 million baht. There are important projects such as the project to improve public bus safety standards. Technology and Smart System Installation Project Feasibility Study Project on Setting Appropriate Fare Rates and Using the Shared Ticket System Web Application and Mobile Application Study and Development Project.
3. Strategy 1.3: Encourage the use and change of travel from private vehicles to public transportation in the main urban areas of Thailand, It consists of 1 objective, 2 projects (4 sub-projects), with a total amount of 125.00 million baht. There are important projects such as the feasibility study project for land acquisition and construction of parking buildings, TDM measures in administration and operation.

(2) Development Guideline 2: Development of Urban Traffic System in Nakhon Ratchasima Province

1. Strategy 2.1 : Improve and develop infrastructure to support the city's public transportation system, consisting of 1 objective, 4 projects (26 sub-projects), with a total budget of 203.14 million baht. There are important projects such as the project to improve traffic problems at intersections. Safe Road Use Promotion Project Infrastructure Development Project to Support Public Transportation.

However, If the project under the Public Transportation Development Plan and the Urban Traffic System Development Plan, Nakhon Ratchasima Province It will make the public's access to public transportation more convenient, which will motivate the public to switch to public transportation services and reduce the use of personal vehicles. Reduce traffic problems and reduce air pollution problems.

Table 7.4-6 Summary of development guidelines according to the Public Transportation Development Plan and the Traffic System Development Plan in Nakhon Ratchasima City

project	list	Investment Budget (Million Baht)	Budget (Million Baht)		
			Short-term 2026 - 2032	Medium Term 2033 - 2037	Long Term 2038 - 2046
Development Guideline 1: Development of Public Transportation System in Regional Cities, Nakhon Ratchasima Province					
Strategy 1.1 : Develop the public transportation network to cover the service area thoroughly and be able to connect travel with various modes of transportation. In the main regional cities of Thailand.					
Objective 1 : To have a public transportation network system that covers the service area thoroughly and can connect travel with various modes of transportation. In the main regional cities of Thailand.					
1	Bus Route Development Project (3 sub-projects)	0.16	0.16	-	-
2	Bus Users' Travel Facilitation Project (3 sub-projects)	2,632.50	2,025.00	607.50	-
3	Development and Construction of Maintenance Center (Depot) (2 sub-projects)	200.00	200.00	-	-
Strategy 1.2 : Develop a public transportation system with good service quality. It is standardized, modern, convenient and safe, and has reasonable and fair fares in major cities and regions of Thailand.					
Objective 2 : To have a public transportation system with good service quality. It is standardized, modern, convenient and safe, and has reasonable and fair fares in major cities and regions of Thailand.					
4	Public Bus Safety Standards Improvement Project (4 sub-projects)	2,054.40	468.65	569.20	1,016.55
5	Technology and Smart System Installation Project	10.00	10.00	-	-
6	Feasibility Study Project on Setting Appropriate Fare Rates and Using the Shared Ticket System	15.00	15.00	-	-
7	Study and develop web applications and mobile applications to be used as databases for planning and decision-making in the choice of routes and public transportation.	15.00	-	15.00	-
Strategy 1.3: Encourage the use and change of travel from private vehicles to public transportation in the main urban areas of Thailand.					
Objective 3 : The development of public transportation can encourage the use and change of travel from private vehicles to public transportation in the main urban areas of Thailand.					
8	Feasibility Study Project for Land Acquisition and Construction of Parking and Parking Buildings (2 sub-projects)	10.00	10.00	-	-
9	TDM Measures in Administration and Implementation (2 sub-projects)	115.00	36.00	24.00	55.00
Development Guideline 2: Development of Urban Traffic System in Nakhon Ratchasima Province					
Strategy 2.1 : Improve and develop infrastructure to support urban public transportation					
Objective 4 : To alleviate traffic conditions so that the traffic of the road network in Nakhon Ratchasima city is less congested.					
10	Traffic Problem Improvement Project at Intersections (4 sub-projects)	1.20	1.20	-	-
11	Pavement, Landscape and Traffic Surface Standards Improvement Project (29 sub-projects)	176.69	-	176.69	-
12	Safe Road Use Promotion Project (3 sub-projects)	3.25	1.25	2.00	-
13	Infrastructure Development Project to Support Public Transportation System (4 sub-projects)	22.00	-	9.00	13.00

7.4.5.7 Ubon Ratchathani Province

The action plan for the development of the public transportation system and the urban traffic system development plan consists of 2 development approaches, 4 Strategy, 4 objectives and 13 projects (51 sub-projects) with a total budget of 3,573.44 million baht as follows:

(1) Development Guideline 1: Development of Public Transportation System in Regional Cities, Ubon Ratchathani Province

1. Strategy 1.1 : Develop the public transportation network to cover the service area thoroughly and be able to connect travel with various modes of transportation in major cities in Thailand, It consists of 1 objective, 3 projects (4 sub-projects), with a total budget of 1,902.67 million baht. There are important projects such as the bus route development project, the construction project of public bus stops, the construction of public bus stops, the construction of public bus stops, and the construction of public bus stops. Procurement of Electric Public Buses (EV BUS) Development and Construction of Maintenance Centers (Depots).
2. Strategy 1.2 : Develop a public transportation system with good service quality. There are standards and modernity. It consists of 1 objective, 4 projects (7 sub-projects), with a total budget of 1,284.40 million baht. There are important projects such as the project to improve public bus safety standards. Technology and Smart System Installation Project Feasibility Study Project on Setting Appropriate Fare Rates and Using the Shared Ticket System Web Application and Mobile Application Study and Development Project.
3. Strategy 1.3: Encourage the use and change of travel from private vehicles to public transportation in the main urban areas of Thailand. It consists of 1 objective, 2 projects (4 sub-projects), with a total budget of 125.00 million baht. There are important projects such as the feasibility study project for land acquisition and construction of parking buildings, TDM measures in administration and operation.

(2) Development Guideline 2 : Development of Urban Traffic System in Ubon Ratchathani Province

1. Strategy 2.1 : Improve and develop infrastructure to support the city's public transportation system, consisting of 1 objective, 4 projects (36 sub-projects), with a total budget of 261.37 million baht. There are important projects such as the project to improve traffic problems at intersections. Safe Road Use Promotion Project Infrastructure Development Project to Support Public Transportation.

However, If the project is under the Public Transportation Development Plan and the Urban Traffic System Development Plan, Ubon Ratchathani Province It will make the public's access to public transportation more convenient, which will motivate the public to switch to public transportation services and reduce the use of personal vehicles. Reduce traffic problems and reduce air pollution problems.

Table 7.4-7 Summary of development guidelines according to the Public Transportation Development Plan and Traffic System Development Plan in Ubon Ratchathani City

project	list	Investment Budget (Million Baht)	Budget (Million Baht)		
			Short-term 2026 - 2032	Medium Term 2033 - 2037	Long Term 2038 - 2046
Development Guideline 1: Development of Public Transportation System in Regional Cities, Ubon Ratchathani Province					
Strategy 1.1 : Develop the public transportation network to cover the service area thoroughly and be able to connect travel with various modes of transportation. In the main regional cities of Thailand.					
Objective 1 : To have a public transportation network system that covers the service area thoroughly and can connect travel with various modes of transportation. In the main regional cities of Thailand.					
1	Bus Route Development Project	0.17	0.17	-	-
2	Bus Convenience Project (2 sub-projects)	1,702.50	1,357.50	345.00	-
3	Development and Construction of Maintenance Center (Depot)	200.00	200.00	-	-
Strategy 1.2 : Develop a public transportation system with good service quality. It is standardized, modern, convenient and safe, and has reasonable and fair fares in major cities and regions of Thailand.					
Objective 2 : To have a public transportation system with good service quality. It is standardized, modern, convenient and safe, and has reasonable and fair fares in major cities and regions of Thailand.					
4	Public Bus Safety Standards Improvement Project (4 sub-projects)	1,244.40	290.23	342.62	611.55
5	Technology and Smart System Installation Project	10.00	10.00	-	-
6	Feasibility Study Project on Setting Appropriate Fare Rates and Using the Shared Ticket System	15.00	15.00	-	-
7	Study and develop web applications and mobile applications to be used as databases for planning and decision-making in the choice of routes and public transportation.	15.00	-	15.00	-
Strategy 1.3: Encourage the use and change of travel from private vehicles to public transportation in the main urban areas of Thailand.					
Objective 3 : The development of public transportation can encourage the use and change of travel from private vehicles to public transportation in the main urban areas of Thailand.					
8	Feasibility Study Project for Land Acquisition and Construction of Parking and Parking Buildings (2 sub-projects)	10.00	10.00	-	-
9	TDM Measures in Administration and Implementation (2 sub-projects)	115.00	36.00	24.00	55.00
Development Guideline 2 : Development of Urban Traffic System in Ubon Ratchathani Province					
Strategy 2.1 : Improve and develop infrastructure to support urban public transportation					
Objective 4 : Alleviating traffic conditions so that the traffic of the road network in Ubon Ratchathani city is less congested.					
10	Traffic Problem Improvement Project at Intersections (5 sub-projects)	6.95	6.95	-	-
11	Pavement Improvement Project Landscape and Traffic Surface (27 sub-projects)	229.17	-	229.17	-
12	Safe Road Use Promotion Project (3 sub-projects)	3.25	1.25	2.00	-
13	Infrastructure Development Project to Support Public Transportation System (4 sub-projects)	22.00	-	9.00	13.00

7.4.5.8 Ayutthaya Province

The action plan for the development of the public transportation system and the urban traffic system development plan consists of 2 development approaches. 4 strategy, 4 objectives and 13 projects (37 sub-projects) with a total budget of 3,828.48 million baht. as follows:

(1) Development Guideline 1: Development of Public Transportation System in Regional Cities, Ayutthaya Province

1. Strategy 1.1 : Develop the public transportation network to cover the service area thoroughly and be able to connect travel with various modes of transportation. In the main regional cities of Thailand, it consists of 1 objective, 3 projects (4 sub-projects) with a total budget of 2,032.67 million baht. There are important projects such as the bus route development project, the construction project of public bus stops, the construction of public bus stops, the construction of public bus stops, and the construction of public bus stops. Procurement of Electric Public Buses (EV BUS) Development and Construction of Maintenance Centers (Depots).
2. Strategy 1.2 : Develop a public transportation system with good service quality. There are standards and modernity. It consists of 1 objective, 4 projects (7 sub-projects), with a total budget of 1,510.66 million baht. There are important projects such as the project to improve public bus safety standards. Technology and Smart System Installation Project Feasibility Study Project on Setting Appropriate Fare Rates and Using the Shared Ticket System Web Application and Mobile Application Study and Development Project.
3. Strategy 1.3: Encourage the use and change of travel from private vehicles to public transportation in the main urban areas of Thailand. It consists of 1 objective, 2 projects (4 sub-projects), with a total amount of 125.00 million baht. There are important projects such as the feasibility study project for land acquisition and construction of parking buildings, TDM measures in administration and operation.

(2) Development Guideline 2 : Development of Urban Traffic System in Ayutthaya Province

1. Strategy 2.1 : Improve and develop infrastructure to support the city's public transportation system, consisting of 1 objective, 4 projects (22 sub-projects), with a total budget of 160.15 million baht. There are important projects such as the project to improve traffic problems at intersections. Safe Road Use Promotion Project Infrastructure Development Project to Support Public Transportation.

However, If the project is under the public transportation development plan and the urban traffic system development plan, Ayutthaya Province. It will make the public's access to public transportation more convenient, which will motivate the public to switch to public transportation services and reduce the use of personal vehicles. Reduce traffic problems and reduce air pollution problems.

Table 7.4-8 Summary of development guidelines according to the Public Transportation Development Plan and the Traffic System Development Plan in Ayutthaya City

project	list	Investment Budget (Million Baht)	Budget (Million Baht)		
			Short-term 2026 - 2032	Medium Term 2033 - 2037	Long Term 2038 - 2046
Development Guideline 1: Development of Public Transportation System in Regional Cities, Ayutthaya Province					
Strategy 1.1 : Develop the public transportation network to cover the service area thoroughly and be able to connect travel with various modes of transportation. In the main regional cities of Thailand.					
Objective 1 : To have a public transportation network system that covers the service area thoroughly and can connect travel with various modes of transportation. In the main regional cities of Thailand.					
1	Bus Route Development Project	0.17	0.17	-	-
2	Bus Convenience Project (2 sub-projects)	1,832.50	1,412.50	420.00	-
3	Development and Construction of Maintenance Center (Depot)	200.00	200.00	-	-
Strategy 1.2 : Develop a public transportation system with good service quality. It is standardized, modern, convenient and safe, and has reasonable and fair fares in major cities and regions of Thailand.					
Objective 2 : To have a public transportation system with good service quality. It is standardized, modern, convenient and safe, and has reasonable and fair fares in major cities and regions of Thailand.					
4	Public Bus Safety Standards Improvement Project (4 sub-projects)	1,470.66	339.64	406.07	724.95
5	Technology and Smart System Installation Project	10.00	10.00	-	-
6	Feasibility Study Project on Setting Appropriate Fare Rates and Using the Shared Ticket System	15.00	15.00	-	-
7	Study and develop web applications and mobile applications to be used as databases for planning and decision-making in the choice of routes and public transportation.	15.00	-	15.00	-
Strategy 1.3: Encourage the use and change of travel from private vehicles to public transportation in the main urban areas of Thailand.					
Objective 3 : The development of public transportation can encourage the use and change of travel from private vehicles to public transportation in the main urban areas of Thailand.					
8	Feasibility Study Project for Land Acquisition and Construction of Parking and Parking Buildings (2 sub-projects)	10.00	10.00	-	-
9	TDM Measures in Administration and Implementation (2 sub-projects)	115.00	36.00	24.00	55.00
Development Guideline 2 : Development of Urban Traffic System in Ayutthaya Province					
Strategy 2.1 : Improve and develop infrastructure to support urban public transportation					
Objective 4 : Alleviate traffic conditions so that the traffic of the road network in Ayutthaya Province is less congested.					
10	Traffic Problem Improvement Project at Intersections (4 sub-projects)	1.70	1.70	-	-
11	Pavement Standards Improvement and Landscaping Project (12 sub-projects)	133.20	-	133.20	-
12	Safe Road Use Promotion Project (3 sub-projects)	3.25	1.25	2.00	-
13	Infrastructure Development Project to Support Public Transportation System (4 sub-projects)	22.00	-	9.00	13.00

7.4.5.9 Surat Thani Province

The action plan for the development of the public transportation system and the urban traffic system development plan consists of 2 development approaches. 4 strategy 4 objectives and 13 projects (35 sub-projects) with a total budget of 2,223.26 million baht. as follows:

(1) Development Guideline 1: Development of Public Transportation System in Regional Cities, Surat Thani Province

1. Strategy 1.1 : Develop the public transportation network to cover the service area thoroughly and be able to connect travel with various modes of transportation. In the main regional cities of Thailand, it consists of 1 objective, 3 projects (4 sub-projects) with a total amount of 1,133.07 million baht. There are important projects such as the bus route development project, the construction project of public bus stops, the construction of public bus stops, the construction of public bus stops, and the construction of public bus stops. Procurement of Electric Public Buses (EV BUS) Development and Construction of Maintenance Centers (Depots).
2. Strategy 1.2 : Develop a public transportation system with good service quality. There are standards and modernity. It consists of 1 objective, 4 projects (7 sub-projects), with a total budget of 809.33 million baht. There are important projects such as the project to improve public bus safety standards. Technology and Smart System Installation Project Feasibility Study Project on Setting Appropriate Fare Rates and Using the Shared Ticket System Web Application and Mobile Application Study and Development Project.
3. Strategy 1.3: Encourage the use and change of travel from private vehicles to public transportation in the main urban areas of Thailand. It consists of 1 objective, 2 projects (4 sub-projects), with a total amount of 125.00 million baht. There are important projects such as the feasibility study project for land acquisition and demolition of parking buildings, TDM measures in administration and operation.

(2) Development Guideline 2: Development of Urban Traffic System, Surat Thani Province

1. Strategy 2.1 : Improve and develop infrastructure to support the city's public transportation system, consisting of 1 objective, 4 projects (20 sub-projects), with a total budget of 155.86 million baht. There are important projects such as the project to improve traffic problems at intersections. Safe Road Use Promotion Project Infrastructure Development Project to Support Public Transportation.

However, If the project is under the Public Transportation Development Plan and the Urban Traffic System Development Plan, Surat Thani Province. It will make the public's access to public transportation more convenient, which will motivate the public to switch to public transportation services and reduce the use of personal vehicles. Reduce traffic problems and reduce air pollution problems.

Table 7.4-9 Summary of development guidelines according to the Public Transportation Development Plan and the Traffic System Development Plan in Surat Thani City

project	list	Investment Budget (Million Baht)	Budget (Million Baht)		
			Short-term 2026 - 2032	Medium Term 2033 - 2037	Long Term 2038 - 2046
Development Guideline 1: Development of Public Transportation System in Regional Cities, Surat Thani Province					
Strategy 1.1 : Develop the public transportation network to cover the service area thoroughly and be able to connect travel with various modes of transportation. In the main regional cities of Thailand.					
Objective 1 : To have a public transportation network system that covers the service area thoroughly and can connect travel with various modes of transportation. In the main regional cities of Thailand.					
1	Bus Route Development Project	0.07	0.07	-	-
2	Bus Convenience Project (2 sub-projects)	1,033.00	800.50	232.50	-
3	Development and Construction of Maintenance Center (Depot)	100.00	100.00	-	-
Strategy 1.2 : Develop a public transportation system with good service quality. It is standardized, modern, convenient and safe, and has reasonable and fair fares in major cities and regions of Thailand.					
Objective 2 : To have a public transportation system with good service quality. It is standardized, modern, convenient and safe, and has reasonable and fair fares in major cities and regions of Thailand.					
4	Public Bus Safety Standards Improvement Project (4 sub-projects)	769.33	174.94	213.70	380.70
5	Technology and Smart System Installation Project	10.00	10.00	-	-
6	Feasibility Study Project on Setting Appropriate Fare Rates and Using the Shared Ticket System	15.00	15.00	-	-
7	Study and develop web applications and mobile applications to be used as databases for planning and decision-making in the choice of routes and public transportation.	15.00	-	15.00	-
Strategy 1.3: Encourage the use and change of travel from private vehicles to public transportation in the main urban areas of Thailand.					
Objective 3 : The development of public transportation can encourage the use and change of travel from private vehicles to public transportation in the main urban areas of Thailand.					
8	Feasibility Study Project for Land Acquisition and Construction of Parking and Parking Buildings (2 sub-projects)	10.00	10.00	-	-
9	TDM Measures in Administration and Implementation (2 sub-projects)	115.00	36.00	24.00	55.00
Development Guideline 2: Development of Urban Traffic System, Surat Thani Province					
Strategy 2.1 : Improve and develop infrastructure to support urban public transportation					
Objective 4 : Reduce traffic conditions so that the traffic of the road network in Surat Thani city is less congested.					
10	Traffic Problem Improvement Project at Intersections (3 sub-projects)	0.95	0.95	-	-
11	Pavement Improvement Project Landscape and traffic surface arrangement (15 sub-projects)	129.66	-	129.66	-
12	Safe Road Use Promotion Project (3 sub-projects)	3.25	1.25	2.00	-
13	Infrastructure Development Project to Support Public Transportation System (4 sub-projects)	22.00	-	9.00	13.00

7.4.5.10 Phuket Province

The action plan for the development of the public transportation system and the urban traffic system development plan consists of 2 development approaches, 4 strategy, 4 objectives and 13 projects (42 sub-projects) with a total budget of 6,741.53 million baht. as follows:

(1) Development Guideline 1: Development of Public Transportation System in Regional Cities, Phuket Province

1. Strategy 1.1 : Develop the public transportation network to cover the service area thoroughly and be able to connect travel with various modes of transportation. In the main regional cities of Thailand, it consists of 1 objective, 3 projects (7 sub-projects) with a total budget of 3,612.60 million baht. There are important projects such as the bus route development project, the construction project of public bus stops, the construction of public bus stops, the construction of public bus stops, and the construction of public bus stops. Procurement of Electric Public Buses (EV BUS) Development and Construction of Maintenance Centers (Depots).
2. Strategy 1.2 : Develop a public transportation system with good service quality. There are standards and modernity. It consists of 1 objective, 4 projects (7 sub-projects), with a total budget of 2,698.93 million baht. There are important projects such as the project to improve public bus safety standards. Technology and Smart System Installation Project Feasibility Study Project on Setting Appropriate Fare Rates and Using the Shared Ticket System Web Application and Mobile Application Study and Development Project.
3. Strategy 1.3: Encourage the use and change of travel from private vehicles to public transportation in the main urban areas of Thailand. It consists of 1 objective, 2 projects (4 sub-projects), with a total budget of 125.00 million baht. There are important projects such as the feasibility study project for land acquisition and construction of parking buildings, TDM measures in administration and operation.

(2) Development Guideline 2: Development of Urban Traffic System, Phuket Province

1. Strategy 2.1 : Improve and develop infrastructure to support the city's public transportation system, consisting of 1 objective, 4 projects (24 sub-projects), with a total budget of 305.00 million baht. There are important projects such as the project to improve traffic problems at intersections. Safe Road Use Promotion Project Infrastructure Development Project to Support Public Transportation.

However, If the project is under the Public Transportation Development Plan and the Urban Traffic System Development Plan, Phuket Province It can be driven to practice according to the set time frame. This is an incentive for people to switch to public transportation services and reduce the use of private vehicles. Reduce traffic problems and reduce air pollution problems.

Table 7.4-10 Summary of development guidelines according to the Public Transportation Development Plan and Traffic System Development Plan in Phuket Province

project	list	Investment Budget (Million Baht)	Budget (Million Baht)		
			Short-term 2026 - 2032	Medium Term 2033 - 2037	Long Term 2038 - 2046
Development Guideline 1: Development of Public Transportation System in Regional Cities, Phuket Province					
Strategy 1.1 : Develop the public transportation network to cover the service area thoroughly and be able to connect travel with various modes of transportation. In the main regional cities of Thailand.					
Objective 1 : To have a public transportation network system that covers the service area thoroughly and can connect travel with various modes of transportation. In the main regional cities of Thailand.					
1	Bus Route Development Project (2 sub-projects)	0.10	0.10	-	-
2	Travel Facilitation Project for Bus Users (3 sub-projects)	3,212.50	2,425.00	787.50	-
3	Development and Construction of Maintenance Center (Depot) (2 sub-projects)	400.00	400.00	-	-
Strategy 1.2 : Develop a public transportation system with good service quality. It is standardized, modern, convenient and safe, and has reasonable and fair fares in major cities and regions of Thailand.					
Objective 2 : To have a public transportation system with good service quality. It is standardized, modern, convenient and safe, and has reasonable and fair fares in major cities and regions of Thailand.					
4	Public Bus Safety Standards Improvement Project (4 sub-projects)	2,658.93	605.90	736.78	1,316.25
5	Technology and Smart System Installation Project	10.00	10.00	-	-
6	Feasibility Study Project on Setting Appropriate Fare Rates and Using the Shared Ticket System	15.00	15.00	-	-
7	Study and develop web applications and mobile applications to be used as databases for planning and decision-making in the choice of routes and public transportation.	15.00	-	15.00	-
Strategy 1.3: Encourage the use and change of travel from private vehicles to public transportation in the main urban areas of Thailand.					
Objective 3 : The development of public transportation can encourage the use and change of travel from private vehicles to public transportation in the main urban areas of Thailand.					
8	Feasibility Study Project for Land Acquisition and Construction of Parking and Parking Buildings (2 sub-projects)	10.00	10.00	-	-
9	TDM Measures in Administration and Implementation (2 sub-projects)	115.00	36.00	24.00	55.00
Development Guideline 2: Development of Urban Traffic System, Phuket Province					
Strategy 2.1 : Improve and develop infrastructure to support urban public transportation					
Objective 4 : Reduce traffic conditions so that the traffic of the road network in Phuket Town is less congested.					
10	Traffic Problem Improvement Project at Intersections (3 sub-projects)	0.45	0.45	-	-
11	Landscape and Traffic Surface Standards Improvement Project (14 sub-projects)	279.30	-	279.30	-
12	Safe Road Use Promotion Project (3 sub-projects)	3.25	1.25	2.00	-
13	Infrastructure Development Project to Support Public Transportation System (4 sub-projects)	22.00	-	9.00	13.00

7.4.5.11 Songkhla Province (Hat Yai)

The action plan for the development of the public transportation system and the urban traffic system development plan consists of 2 development approaches, 4 strategy, 4 objectives and 13 projects (42 sub-projects) with a total budget of 2,568.15 million baht. as follows:

(1) Development Guideline 1: Development of Public Transportation System in Regional Cities, Songkhla Province

1. Strategy 1.1 : Develop the public transportation network to cover the service area thoroughly and be able to connect travel with various modes of transportation in the main cities and regions of Thailand, consisting of 1 objective, 3 projects (8 sub-projects), with a total budget of 1,370.59 million baht. There are important projects such as the bus route development project, the construction project of public bus stops, the construction of public bus stops, the construction of public bus stops, and the construction of public bus stops. Procurement of Electric Public Buses (EV BUS) Development and Construction of Maintenance Centers (Depots).
2. Strategy 1.2 : Develop a public transportation system with good service quality. There are standards and modernity. It consists of 1 objective, 4 projects (7 sub-projects), with a total budget of 921.52 million baht. There are important projects such as the project to improve public bus safety standards. Technology and Smart System Installation Project: A feasibility study project to determine appropriate fares and use the shared fare system. Web Application and Mobile Application Study and Development Project.
3. Strategy 1.3: Encourage the use and change of travel from private vehicles to public transportation in the main urban areas of Thailand. It consists of 1 objective, 2 projects (4 sub-projects) with a total budget of 125.00 million baht. There are important projects such as the feasibility study project for land acquisition and construction of parking buildings, TDM measures in administration and operation.

(2) Development Approach 2: Development of Urban Traffic System, Songkhla Province

1. Strategy 2.1 : Improve and develop infrastructure to support the city's public transportation system, consisting of 1 objective, 4 projects (23 sub-projects), with a total budget of 151.04 million baht. There are important projects such as the project to improve traffic problems at intersections. Safe Road Use Promotion Project Infrastructure Development Project to Support Public Transportation.

However, If the project under the Public Transportation Development Plan and the Urban Traffic System Development Plan in Songkhla Province can be driven into practice according to the specified time frame, it will make the public's access to public transportation more convenient, which will motivate the public to switch to public transportation services. Reduce traffic problems and reduce air pollution problems.

Table 7.4-11 Summary of development guidelines according to the Public Transportation Development Plan and Traffic System Development Plan in Hat Yai City

project	list	Investment Budget (Million Baht)	Budget (Million Baht)		
			Short-term 2026 - 2032	Medium Term 2033 - 2037	Long Term 2038 - 2046
Development Guideline 1: Development of Public Transportation System in Regional Cities, Songkhla Province					
Strategy 1.1 : Develop the public transportation network to cover the service area thoroughly and be able to connect travel with various modes of transportation. In the main regional cities of Thailand.					
Objective 1 : To have a public transportation network system that covers the service area thoroughly and can connect travel with various modes of transportation. In the main regional cities of Thailand.					
1	Bus Route Development Project (3 sub-projects)	0.09	0.09	-	-
2	Travel Facilitation Project for Bus Users (3 sub-projects)	1,170.50	923.00	247.50	-
3	Development and Construction of Maintenance Center (Depot) (2 sub-projects)	200.00	200.00	-	-
Strategy 1.2 : Develop a public transportation system with good service quality. It is standardized, modern, convenient and safe, and has reasonable and fair fares in major cities and regions of Thailand.					
Objective 2 : To have a public transportation system with good service quality. It is standardized, modern, convenient and safe, and has reasonable and fair fares in major cities and regions of Thailand.					
4	Public Bus Safety Standards Improvement Project (4 sub-projects)	881.52	205.13	243.04	433.35
5	Technology and Smart System Installation Project	10.00	10.00	-	-
6	Feasibility Study Project on Setting Appropriate Fare Rates and Using the Shared Ticket System	15.00	15.00	-	-
7	Study and develop web applications and mobile applications to be used as databases for planning and decision-making in the choice of routes and public transportation.	15.00	-	15.00	-
Strategy 1.3: Encourage the use and change of travel from private vehicles to public transportation in the main urban areas of Thailand.					
Objective 3 : The development of public transportation can encourage the use and change of travel from private vehicles to public transportation in the main urban areas of Thailand.					
8	Feasibility Study Project for Land Acquisition and Construction of Parking and Parking Buildings (2 sub-projects)	10.00	10.00	-	-
9	TDM Measures in Administration and Implementation (2 sub-projects)	115.00	36.00	24.00	55.00
Development Approach 2: Development of Urban Traffic System, Songkhla Province					
Strategy 2.1 : Improve and develop infrastructure to support urban public transportation					
Objective 4: Alleviating traffic conditions so that the traffic of the road network in Songkhla city is less congested.					
10	Traffic Problem Improvement Project at Intersections (6 sub-projects)	1.30	1.30	-	-
11	Pavement Improvement Project Landscape and Traffic Surface (19 sub-projects)	124.49	-	124.49	-
12	Safe Road Use Promotion Project (3 sub-projects)	3.25	1.25	2.00	-
13	Infrastructure Development Project to Support Public Transportation System (4 sub-projects)	22.00	-	9.00	13.00

7.5 Details of the estimated costs and revenues of the interim public transportation system

7.5.1 Estimated Costs

A summary of the estimated costs for the interim public transportation systems in 11 metropolitan provinces is detailed in the public transportation development plans of each province. A summary of the costs for all 11 provinces is shown in **Table 7.5-1**.

Table 7.5-1 Summary of Estimated Costs for the Transitional Public Transportation System in 11 Urban Areas

Year	Cost of the Public Transportation System (million baht)					
	CMI	CRI	PLK	UDN	KKN	NMA
2027	510	173	236	204	346	388
2028	519	175	239	207	351	394
2029	528	178	243	210	357	401
2030	537	181	247	214	362	408
2031	546	184	251	217	368	415
2032	556	187	255	221	374	422
2033	912	268	366	357	557	623
2034	928	272	372	363	566	634
2035	945	277	378	369	576	645
2036	962	282	384	375	585	657

Note: Details of the analysis are presented in the public transportation development plan report for each province.

Table 7.5-1 Summary of Estimated Costs for the Transitional Public Transportation System in 11 Urban Areas (Cont.)

Year	Cost of the Public Transportation System (million baht)				
	UBN	AYA	SNI	PKT	SKA
2027	267	298	175	476	195
2028	271	303	178	484	198
2029	275	308	181	492	201
2030	280	313	184	501	205
2031	284	318	187	510	208
2032	289	323	190	519	212
2033	415	470	273	770	299
2034	421	478	278	783	304
2035	428	486	283	797	309
2036	436	494	287	812	314

Note: Details of the analysis are presented in the public transportation development plan report for each province.

7.5.2 Estimated Revenues

A summary of the estimated revenues for the interim public transportation systems in 11 metropolitan provinces is detailed in the public transportation development plans of each province. A summary of the estimated revenues for all 11 provinces is shown in **Table 7.5-2**.

Table 7.5-2 Summary of Estimated Revenues for the Transitional Public Transportation System in 11 Urban Areas

Year	Estimated Total Revenue (million baht/year)					
	CMI	CRI	PLK	UDN	KKN	NMA
2027	219	37	48	125	146	133
2028	331	41	64	141	168	173
2029	443	44	80	157	190	212
2030	554	48	96	173	211	251
2031	666	51	112	190	233	291
2032	778	55	128	206	255	330
2033	802	59	134	214	265	342
2034	808	60	135	216	267	345
2035	815	61	137	218	269	347
2036	821	62	138	220	271	349

Note: Details of the analysis are presented in the public transportation development plan report for each province.

Table 7.5-2 Summary of Estimated Revenues for the Transitional Public Transportation System in 11 Urban Areas (Cont.)

Year	Estimated Total Revenue (million baht/year)				
	UBN	AYA	SNI	PKT	SKA
2027	97	74	20	160	40
2028	116	84	34	296	85
2029	134	94	48	432	131
2030	153	103	62	568	176
2031	171	113	76	704	222
2032	190	122	90	840	267
2033	197	131	95	865	272
2034	199	133	96	877	274
2035	200	134	96	890	275
2036	202	136	97	902	277

Note: Details of the analysis are presented in the public transportation development plan report for each province.

7.6 Results of Economic and Financial Analysis

7.6.1 Results of Economic Analysis

Summary of Economic Analysis Results for the Project for a 25-year period (2027-2051) for all 11 provinces, with details presented in the public transportation development plan report for each province. The summary of economic analysis results for all 11 provinces is shown in **Table 7.6-1**.

Table 7.6-1 Summary of Economic Analysis Results for the Project for a 25-year period (2027-2051) for all 11 provinces

	Economic Analysis Results of the Project					
	CMI	CRI	PLK	UDN	KKN	NMA
Economic Discount Rate	7%	7%	7%	7%	7%	7%
E-NPV	12,887 million baht	925 million baht	3,294 million baht	2,707 million baht	12,951 million baht	11,441 million baht
E-B/C Ratio	2.182	1.280	1.737	1.621	2.889	2.479
EIRR	30.5%	12.5%	19.3%	19.0%	33.0%	30.1%

Note: Details of the analysis are presented in the public transportation development plan report for each province.

Table 7.6-1 Summary of Economic Analysis Results for the Project for a 25-year period (2027-2051) for all 11 provinces (Cont.)

	Economic Analysis Results of the Project				
	UBN	AYA	SNI	PKT	SKA
Economic Discount Rate	7%	7%	7%	7%	7%
E-NPV	3,967 million baht	13,521 million baht	860 million baht	2,883 million baht	2,091 million baht
E-B/C Ratio	1.761	3.335	1.256	1.300	1.547
EIRR	19.7%	35.9%	12.6%	14.4%	19.1%

Note: Details of the analysis are presented in the public transportation development plan report for each province.

7.6.2 Results of Financial Analysis

Summary of Financial Analysis Results for the Project for a 25-year period (2027-2051) for all 11 provinces, with details presented in the public transportation development plan report for each province. The summary of financial analysis results for all 11 provinces is shown in **Table 7.6-2**.

Table 7.6-2 Summary of Financial Analysis Results for the Project for a 25-year period (2027-2051) for all 11 provinces

	Financial Analysis Results of the Project					
	CMI	CRI	PLK	UDN	KKN	NMA
Financial Discount Rate	7%	7%	7%	7%	7%	7%
F-NPV	165 million baht	-1,928 million baht	-2,105 million baht	-907 million baht	-2,378 million baht	-2,273 million baht
F-B/C Ratio	1.019	0.267	0.414	0.732	0.561	0.625
FIRR	8.8%	Cannot be calculated	Cannot be calculated	Cannot be calculated	Cannot be calculated	Cannot be calculated

Note: Details of the analysis are presented in the public transportation development plan report for each province.

Table 7.6-2 Summary of Financial Analysis Results for the Project for a 25-year period (2027-2051) for all 11 provinces (Cont.)

	Financial Analysis Results of the Project				
	UBN	AYA	SNI	PKT	SKA
Financial Discount Rate	7%	7%	7%	7%	7%
F-NPV	-1,809 million baht	-3,066 million baht	-1,667 million baht	1,637 million baht	-62 million baht
F-B/C Ratio	0.553	0.333	0.378	1.219	0.979
FIRR	Cannot be calculated	Cannot be calculated	Cannot be calculated	22.9%	5.7 %

Note: Details of the analysis are presented in the public transportation development plan report for each province.

7.7 Government Subsidy Required

Summary of the required government subsidy for the transitional public transportation system in 11 urban areas. Details are presented in the public transportation development plan report for each province. The summary of the required government subsidy for all 11 provinces is shown in **Table 7.7-1**.

Table 7.7-1 Summary of Required Government Subsidy for All 11 Provinces

	Government Subsidy Required					
	CMI	CRI	PLK	UDN	KKN	NMA
Throughout the concession period (25 years)	576 million baht	5,966 million baht	6,515 million baht	3,282 million baht	7,821 million baht	7,546 million baht
Average per year	23 million baht	239 million baht	261 million baht	131 million baht	313 million baht	302 million baht

Note: Details of the analysis are presented in the public transportation development plan report for each province.

Table 7.7-1 Summary of Required Government Subsidy for All 11 Provinces (Cont.)

	Government Subsidy Required				
	UBN	AYA	SNI	PKT	SKA
Throughout the concession period (25 years)	5,812 million baht	9,651 million baht	5,103 million baht	-4,348 million baht	184 million baht
Average per year	232 million baht	386 million baht	204 million baht	-174 million baht	7 million baht

Note: Details of the analysis are presented in the public transportation development plan report for each province.

Revenue from the public transportation system in Phuket Province exceeds the operational costs, meaning the government does not need to provide additional subsidies.

7.8 Integration of the public transportation system development plan and the urban traffic system development plan into practice.

In order to drive the plan into practice, an action plan should be prepared and coordinated with various agencies from the national level. This will make the implementation of the plan It is continuous, concrete, and can be opened according to the specified time frame.

For driving to put it into practice. There are many relevant agencies that need to act in an integrated manner. Therefore, it is necessary to understand the roles and operational duties of each department, which agencies are responsible for carrying out which sub-tasks, and which agencies must coordinate with each other so that the development plan of the public transportation and traffic system can be concrete. The operational roles and duties of each agency will be related to the process of driving the plan to lead to action. After the completion of the project study, when considering the mission and specific relevant laws/regulations of each agency as detailed above. It can be grouped into 3 levels: 1) Policy Maker, 2) Supervisory Agency, and 3) Operational/Service Agency.

7.8.1 Roles and Duties of Government Agencies at Each Level

1) Policy Maker

It plays a role in determining policy directions and goals for the development of the public transportation system in line with the national development strategy and overall transportation management. It serves to frame long-term strategies and goals, such as the master plan for the development of the intercity transportation system and the master plan for the development of rail transportation. The Ministry of Transport is also responsible for allocating budgets to its affiliated agencies and supporting the implementation of large-scale transportation projects. Provide information and guidelines for policy development to the Ministry of Transport. It serves as a data link between regulatory agencies and operational agencies, including the Ministry of Transport. Office of Transport and Traffic Policy and Planning, etc.

2) Regulator

To control and monitor the operation of agencies or companies providing public transportation services. By enacting relevant laws and regulations to ensure safe transportation. Quality and compliance with standards Determine the fare This includes supervising land transportation, including issuing licenses to operators such as public buses. Taxis and minibuses. It is also responsible for monitoring the quality and safety of transportation. For this project, which focuses on the development of public transportation systems, mainly electric buses (EV buses). Agencies that play such a role include the Department of Land Transport;

3) Operator

Responsible for providing public transportation services to the public in accordance with the prescribed policies and standards. Some of them are government agencies and some are concessionaires in the private sector, which are responsible for procuring, constructing, and developing public transportation systems in regional cities within the framework of policy makers and regulators.

7.8.2 The relationship between government agencies related to public transportation and collaboration.

The relationship between government agencies related to public transportation and collaboration is divided into three levels: policy makers, regulators, and operators, each of which has a clear role in the development of public transportation.

1. Planning and Formulating Policies: Policymakers such as the Ministry of Transport and the Ministry of Transport and It is responsible for setting strategic directions and long-term goals to develop a transportation system that is in line with national development. With the support of regulators and operators. This makes the master plan complete and can be put into practice.

2. Governance and Law Enforcement: Regulatory agencies such as the Department of Land Transport and the MRTA are responsible for controlling safety standards, service quality, and compliance with the law so that operators can provide standard services. Therefore, operators must strictly comply with the established regulations to maintain the quality and safety of services.

3. Operations and Reporting: Operators, such as the MRT and the BMT, are responsible for providing services directly to the public and reporting the performance to the supervisory authorities. This reporting allows regulators to monitor their performance and provide recommendations for improvement.

4. Cooperation in Problem Solving and System Development: The three levels are coordinated to solve operational problems such as traffic problems and infrastructure challenges, as well as to collaborate in the development of new systems that are in line with the needs of the people and economic growth.

This kind of collaboration helps to develop the public transport system efficiently and sustainably. All levels have a role to play in supporting each other.

From the relationship of government agencies related to public transportation, the responsibilities and responsibilities for the development of public transportation systems in regional cities can be summarized as follows:

Table 7.8-1 Summary of responsibilities for the development of public transportation systems in regional cities

bureau	Responsibilities
Office of Transport and Traffic Policy and Planning	Formulate a plan for the development of the public transportation system.
Department of Land Transport	Proceed to arrange bus stations/concessions for bus operations/routes.
Local Government Organizations (Municipalities, Provincial Administrative Organizations)	Operate buses, bus stations, Skytrain, BTS Station/Fare

7.8.3 The organizational model of public transportation development according to the authority and duties of local government organizations.

An important feature of local government organizations is that they are close to the area because local administrators come from the local people and have a good understanding of the area and the needs of the local people. The provision of public services in infrastructure and transportation services will be in line with the needs and more beneficial to the area. By reducing the roles and duties of the central and regional administrative governments to only the tasks that must be done as necessary, and increasing the role of the BOT. Especially in the provision of local public services, that is, the central and regional governments will carry out the tasks that are the collective work of the country. The OAT is responsible for tasks related to people's livelihoods. In order for public services to meet the needs of the people thoroughly, quickly and in accordance with the conditions of each local problem, the option of having the local government organization responsible for the project is one of the important choices.

The models that local government organizations can use to carry out their operations include the local government organization itself. Local government organizations invest with the private sector,and local government organizations establish ad hoc juristic persons. (SPV) can be considered as follows:

7.8.3.1 Local government organizations prepare their own

In the provision of local public services, the local government organization should be the one who invests and receives the final benefit or the risk of the profit or loss in the operation. The budget that local governments invest in infrastructure and transportation services can come from many sources. The sources of income of local government organizations include:

1) Revenue collected and distributed by the government (state allocated tax) such as value-added tax, specific business tax, liquor and excise tax. The tax allocated by the state is the value-added tax that the state allocates to the DOT. According to the Act, the plan and procedures for decentralization of power are prescribed.
2) Subsidies are divided into general subsidies and ad hoc subsidies.
3) The revenue collected by the localities themselves includes house and land tax, local maintenance tax (which later became land and building tax). Stamp tax, slaughter tax. Eagle's nest duty, fees, license fees, fines, local maintenance tax collected from tobacco, oil, hotel accommodation fees.

The local government organization invests in preparing it itself. The private sector may participate through a procurement contract with a local government organization in which the private sector is paid to operate without taking risks from the business.

In addition, in investing and operating by local government organizations, there are also issues worth considering. In other words, the fact that the local government organization is self-prepared may be initiated by the local government organization itself, or it may be transferred from a government agency according to the law establishing the plan and procedure for decentralization. However, it may

be in collaboration with government agencies, state enterprises, or other local government organizations. as follows:

7.8.3.2 Local government organizations receive the transfer of tasks from government agencies.

The Act on Decentralization of Powers to Local Government Organizations, B.E. 2542 (1999) stipulates that there is a plan for decentralization of power to local government organizations by transferring the public service tasks that the State is undertaking. In particular, those responsible for government agencies and have the following characteristics for local government organizations:

- Missions that are repeated between the State and local government organizations, or missions that are provided by the State in the territory of the local government organization.
- Missions provided by the State in the area of the local government organization and affecting other local government organizations.
- The mission is to implement the government's policy.

The Committee on Decentralization of Authority to Local Government Organizations has announced the Decentralization Plan for Local Government Organizations and the Action Plan for Decentralization of Authority for Local Government Organizations No. 1 (B.E. 2545) and No. 2 (B.E. 2551). The mission group is divided into two groups: the Land Mission Group, which consists of the construction and maintenance of roads and bridges, bus stations, land traffic engineering, and the Water Mission Group, which consists of water maintenance. Construction and maintenance of water transport stations Transportation and Water Navigation.

Example of Transfer of Tasks under the Act Prescribing Plans and Procedures for Decentralization to Local Government Organizations, B.E. 2542 (1999) The mission of transferring the bus station according to the announcement of the Decentralization Committee to the local government organization. Re: Action Plan for Decentralization of Authority for Local Government Organizations No. 1, B.E. 2545 (2002) has set out the transferred tasks. as follows[1]

The tasks transferred are: 1) a bus station in the area of the local government organization, and 2) permission to establish a bus station in the province or permission to permit a transportation concession in the provincial area (with the participation of a representative of the local government organization as a director).

7.8.3.3 Local government organizations invest with the private sector.

The ability to give to the private sector to operate is to allow the private sector to invest in the affairs of local government organizations.

In determining whether a local government organization can provide public services to the private sector, it is necessary to consider whether the business is within the authority and duties of the

[1] Notification of the Committee on Decentralization of Authority to Local Government Organizations Re: Action Plan for Determining the Decentralization Procedure for Local Government Organizations (No. 1), pp. 16 - 17.

local government organization, and therefore whether the law allows the local government organization to provide public services to the private sector.

The provision of public services in the field of infrastructure and transportation services within the purview of local government organizations is widespread. and the ability of local government organizations to provide public services on their behalf. When considering the Act on Decentralization of Plans and Procedures for Local Government Organizations, B.E. 2542 (1999) has stipulated as a basic principle regarding the ability of local government organizations to authorize the private sector to provide public services in accordance with Section 1999. 22 Sayings

"Local government organizations may assign private individuals to carry out their powers and duties on their behalf. This is in accordance with the rules. Methods and conditions specified in the Ministerial Regulation."

However, The Law on the Establishment of Certain Types of Local Government Organizations stipulates the details of such principles, namely the Provincial Administrative Organization, with the following details:

Provincial Administration Organization Act, B.E. 2540 (1997)

"Section 49 The Provincial Administrative Organization may assign the private sector to carry out the business which is within the authority and duties of the Provincial Administrative Organization and charge a fee. Service fees or related remuneration on behalf of the provincial administrative organization. However, it must be approved by the Council of Provincial Administrative Organizations and the Provincial Governor first."

7.8.3.4 Local government organizations set up public enterprises (ad hoc juristic persons).

Because large-scale public transportation services, such as the BTS business, will be specialized in management, which requires personnel with specialized expertise in system management, as well as the need to be quick in managing and solving various problems that may arise in order to ensure that such public services can be operated continuously and are safe for the public to use the service. If there is a need to repair or modify the computer system or the electric train, as well as any other system, it will not be possible to do it quickly. This should not happen in large public transportation services, and local government organizations may not have personnel who are experts in such public services.

Therefore, if a local government organization can establish an ad hoc juristic person, which means the establishment of a private legal entity with a specific purpose. There is a private management system but it is also under the supervision of local government organizations because it is an enterprise of a local government organization to take over the mission of infrastructure and transportation system services. The System Manager is responsible for supervising the BTS operator, which is an option to increase the efficiency of public services in the public transportation system.

When considering the current Law on the Establishment of Local Government Organizations, it gives the authority to local government organizations to do business with other persons by establishing a company or holding shares in a company, or it can be called the power to establish a public enterprise of a local government organization of the company type. It was found that the law

establishing local government organizations in cities and regions that gave such powers would only Municipal Act B.E. 2496 (1953)

From the above provisions, the criteria for the establishment of public enterprises of local government organizations that appear in the current law can be summarized as follows:

1) A local government organization can do business with other persons by establishing a company or holding shares in a company only for a limited company with the purpose of public utility business. The definition of public utilities The Decree Committee (1st Committee) explained:

The 1999 edition of the Royal Academy of Sciences Dictionary defines the word "public utility" as a public service that is provided to benefit the public in terms of necessities for the public to provide necessities to the public. In addition, in Clause 3 of the Revolutionary Council Announcement No. 58 dated January 26 , 1972, the types of public utilities such as railways, trams, canal digging, etc. Air Navigation, Water Supply, Irrigation Electricity Authority Production for the sale or distribution of gas by pipeline system to buildings and other businesses that affect the safety or well-being of the public as specified in the Royal Decree[2]. In determining which business is a public utility business, it must be considered based on the nature of the business itself whether it is an operation to provide public services or is provided for the general public to use directly.[3]

According to Section 57 Tri Paragraph of the Municipal Act B.E. 2496 (1953), which has an exception in the case of a municipality, if a limited liability company co-founded or held by the municipality shall not be allowed to do so. There is no private shareholding. The Company will not be limited to the purpose of public utilities only. However, the business must be within the authority and duties of the municipality.

1) A local government organization must hold shares in excess of fifty percent of the company's registered capital. In the event that any other government agency, government agency, state enterprise or local government organization holds shares in the same company, the shares held shall be counted together.
2) The local council has resolved to approve.
3) Approved by the Minister of Home Affairs.

[2] Opinion of the Decree Committee on Completed Matter No. 264/2011

[3] Opinion of the Decree Committee (6th Panel) Completed Matter No. 108/2534

For the case of Pattaya City. Provincial Administration Organization and Sub-district Administration Organization The law of incorporation of the three organizations does not appear to have any provision that gives the authority to do business with other persons in establishing a company or holding shares in a company. This is because the establishment of a public enterprise to act as an ad hoc legal entity (SPV) is an act of establishing a new legal entity that a state organization can act must have the authority of the law to be able to do so.[4]

When a local government organization capable of setting up a public enterprise has established a company as its own public enterprise. Such a company will have the status of a separate legal entity from the local government organization. Have the ability to make legal contracts. The ownership of assets or liabilities belongs to the company itself. The operation is in accordance with the Company's objectives which the local government organization can assign the Company to operate the business within its authority.

As for the relationship between the local government organization and the company in the assignment of work, it will not be for the private sector to invest in the state enterprise according to the Act on Private Participation in State Enterprises B.E. 2562 (2019) because the company is under the supervision of the local government organization. This is not within the meaning of the private sector according to the law. The Company's operations must be aware that the scope of the company in which the local government organization can hold shares must be for the purpose of public utilities that are within the jurisdiction of the local government organization. If the company expands its objectives or has objectives that deviate from the conditions and the local government organization still holds shares, or the local government organization has assigned any business that is not a public utility business to the company while it still holds shares, it will cause problems with the legality of the operation.[5]

Example: Krungthep Thanakom Company Limited, a state enterprise under the local administrative organization (LAO), in which the Bangkok Metropolitan Administration (BMA) holds a 99.98% shareholding. The BMA has assigned Krungthep Thanakom Company Limited to implement projects related to public transportation services. This includes assigning the company to manage the system and contract private operators to operate the BTS mass transit system on behalf of the BMA. This reflects the institutional relationship between the Bangkok Metropolitan Administration and Krungthep Thanakom Company Limited.

7.8.3.5 Summary of the appropriate public transportation development implementation model

The consultant has analyzed the legal mandates, the jurisdictional scope of local administrative organizations, as well as the associated issues and limitations. The findings can be summarized as follows:

[4] Compare the case of the record on the establishment of a life insurance company of the Savings Bank. Decree Committee (3rd Panel) Completed Matter No. 92/2002

[5] Memorandum of the Decree Committee (1st Panel) - Completed Matter No. 0264/2011 Re: Business of Bangkok Metropolitan Government under Section 94 (1) of the Bangkok Metropolitan Government Administration Regulation Act, B.E. 2528 (1985)

- When considering the principle of benefits, the interests fall on the people in a particular locality, and the local government organization should be the one to carry it out. The Provincial Administrative Organization (PAO) is the most appropriate operator. There is a law to support the mission of public transportation. It can be responsible for the entire province. Potential in terms of financial resources. There are local government organizations at the level of The Municipal Authority provides support, access and understanding of the needs of the people in the area. There is no need to establish a cooperative or public enterprise, and the government can use the power to expropriate real estate (the national budget) for infrastructure construction, civil works, such as Depot (including charging stations) & OCC, Park & Ride.
- Considering the principles of performance and expertise in operation. It is also appropriate for the private sector to participate in investment.

7.8.4 Driving Steps to Lead to Operations

After the project study is completed, it will lead to the implementation of the plan to meet the set goals. as follows:

1) OTP submits the plan to NTC for approval, and subsequently presents it to the Cabinet for acknowledgment
2) OTP advances the plan into the Level 3 planning process through NESDC and the Cabinet, in order to obtain approval of the Level 3 plan and to mandate all relevant ministries and agencies to implement the projects in a unified and coordinated manner.
3) MOT/MOI shall adopt the policy and instruct the relevant LAOs, who are expected to jointly implement the project with MOT, to prepare for readiness.
4) MOT/MOI shall undertake initial preparations, including reviewing and analyzing the details of the public transport development plan, identifying appropriate sites for depot establishment, studying proposed routes, interchange locations, and bus stop placements, as well as exploring approaches for engaging private operators to provide public transport services.
5) MOT/MOI shall formulate a special budget allocation plan to finance the entire project investment.
6) MOT/MOI shall define the approach for negotiations and consultations with existing licensed public bus operators (if any), with the objective of reaching mutual understanding and preparing impact mitigation measures to address any potential effects on current license holders.
7) MOT/MOI shall procure land for the construction of a depot and undertake the procurement of contractors responsible for building the depot, related facilities, and necessary structures. The appointed contractors shall commence construction and complete the works within 270 days..
8) MOT/MOI shall procure private operators to provide public transport servicesTesting the system and commissioning the service .

9) The public transport service operator shall commence the procurement of EV buses along with all necessary systems, including the recruitment and training of personnel and drivers, and complete all preparations within 270 days.
10) MOT/MOI approve the route adjustment and the issuance of a new public bus operation license to a single operator, namely the Local Administrative Organization (PAO), which is designated to lead the project implementation.**Note: The designated Local Administrative Organization (PAO) will be the sole holder of all public bus operation licenses under the project.**
11) System testing and commissioning of public transport services
12) Commencement of official service

From the operation steps mentioned above. The guidelines for driving the roadmap into practice for the transitional public transportation system in the Chiang Mai urban area can be summarized. As shown in **Figure 7.8-1**

NO.	Activity	Operation period	Main responsible agency	Support agency
1	The project is completed.	Mar. 2025	OTP	Adv.
2	OTP submits the plan for approval from the National Economic and Social Development Council (NESDC) and presents it to the Cabinet for acknowledgment.	Apr. - May 2025	OTP	MOT
3	OTP drives the plan into the Level 3 planning process through the NESDC and the Cabinet. To approve the Level 3 plan and instruct all relevant agencies and ministries to drive the project in a unified manner.	Jun. 2025	OTP	NESDC/MOT
4	MOT/MOI receive the preparedness policy	Jun. 2025	MOT/MOI	-
5	MOT/MOI of Interior will make preliminary preparations, such as reviewing and understanding the details of the public transport development plan. Procure land for establishing depots, study the routes for vehicle operation, positions of interchanges, bus stop locations, and guidelines for sourcing private contractors to provide public transport services.	Jul. 2025	DLT/PPHO/LAO/PAO	MOT/MOI
6	MOT/MOI of Interior shall prepare a special budget allocation plan for the investment in the entire project.	Aug. - Sep. 2025	DLT/PPHO/LAO/PAO	MOT/MOI
7	MOT/MOI of Interior will establish guidelines for negotiations and understanding with current bus service license holders (if any) to prepare measures to mitigate various impacts on current license holders (if any) and negotiate and understand with current bus service license holders (if any) to prepare measures to mitigate various impacts on license holders.	Jul. - Feb. 2025	DLT/PPHO/LAO/PAO	MOT/MOI
8	MOT/MOI will procure land to build a depot and hire contractors to construct the depot, facilities, and necessary buildings. The contractor for the construction of the depot, facilities, and necessary buildings will commence work and complete it within 270 days.	Oct. - Dec. 2025	DLT/PPHO/LAO/PAO	MOT/MOI
9	MOT/MOI will procure a contractor to provide public transportation services.	Oct. - Dec. 2025	MOT/MOI (LAO)	MOT/MOI
10	The contractor providing public transportation services Start the procurement of EV Buses along with the necessary systems, including the provision and preparation of training for personnel and drivers, to be completed within 270 days.	Jan.- Sep. 2025	Public transportation service contractor	MOT/MOI (LAO)
11	MOT/MOI of Interior approved the route improvements and the issuance of a new public bus operation license for one entity, which will be the driving force behind the project (PAO)	Mar. - May 2025	MOT/MOI (PPHO/TRMO/CLTM)	MOT/MOI
12	Test the system and conduct a trial run (Commissioning)	Oct. - Nov. 2025	Public transportation service contractor	MOT (PPHO) / MOI (PAO)
13	Officially open for service	Dec. 2025	Public transportation service contractor	MOT (PPHO) / MOI (PAO)

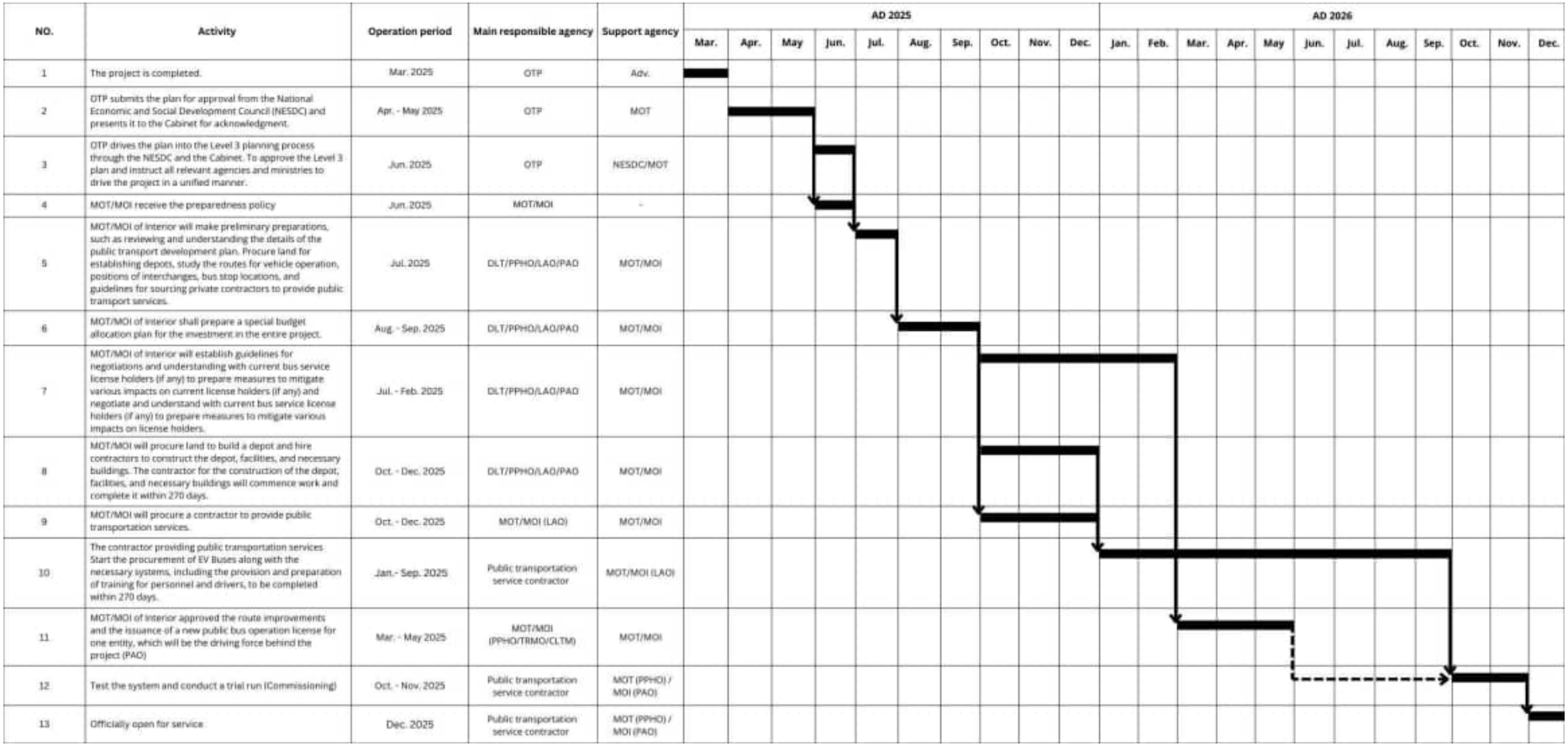


Figure 7.8-1 Guidelines for Driving the Plan into Practice