５－６．OTP Transport and Traffic Development Master Plan
（Exective Summary Report）、及び OTP マスタープランマップ

Office of Transport and Traffic Policy and Planning
Ministry of Transport

The Study on Transport and Traffic Development Master Plan

Executive Summary Report

By

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FOREWORD

At present, the transportation sector has been facing changes in terms of economy, society, technology development, and participation in Asean Economic Community (AEC) in 2015. As a result, the preparation to connect the transportation network with that of neighboring countries and the development of infrastructure and services of transport system are all straetegies to enhance competitiveness of the country. In addition, the constant increasing of oil prices has directly affected economic sectors, trading, investment, and especially the cost structure that may increase the cost of transportation. Consequently, all of the aforementioned may discourage Thailand from competing with neighboring countries.

Once considering internal factors, external factors, changing situations and limitations on budget and resources, it is necessary to conduct national transport and traffic development master plan. This is to make the future development of transportation sector in the next 10 years more concrete and compliant with actual demands. Whereby, there should be revision and improvement of transportation information in the past in oder to make it in relation with the changing situations. Also, there should be the conduct of strategic plan of transport sector development, investment plans and operation plans, to satisfy the demand of passengers and cargo delivery.

The present transport and traffic development master plan has provided strategic development goals to make the transportation system more efficient, more convenient, quicker and safer; and to make the public services more accessible with reasonable prices. Besides the intrastructure services, the government encourages the private sectors to make an investment with an idea to maintain the public interest and to satisfy the need of all people. Furthermore, this transport and traffic development master plan is employed as a guideline for all agencies and members of the transportation section, both government and private sectors, to set up operation plans and to render integral cooperation among them.

This document is an Executive Summary Report conducted by the consulting group to present the study results of transport and traffic development master plan. Thereby, the consulting group hope that this report will be helpful to executives, policy makers, government and private sectors, as well as the relevant parties. The present report can also be applied as a guideline to further develop the domestic transport and traffic system of all sectors, both in the micro and macro levels.

Consulting Group
February 2011

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1.1 Background of the Project

Today, Thailand, due to the Globalization, is susceptible to the currents of changes in terms of economy, society, politics and development of technology. The transportation, which is the significant factor driving the economy, has been inevitably affected. For example, the fluctuation of oil prices leads to the increase of delivery costs, and the development of economic cooperation with neighboring countries forces Thailand to prepare itself for the link of transportation network to that of the neighboring countries, etc. Therefore, Ministry of Transportation, by Office of Transport and Traffic Policy and Planning, as a central agency drafting transportation development plan, has realized the importance and the urgent necessity to revise the situations concerning transport sections and to study the long-term transport development master plan. Thereby, the ministry has to revise and improve all database about the guidelines of transport development plan so that it would be in compliance with the changing situations. Also, the foundation of transport network development should be laid out cautiously in order to satisfy the actual demands in the levels of Agenda based, Area based and Function based. Then, all of the aforementioned is applied to conduct Transport and Traffic Development Master Plan and Strategic Plan for Transport Sector Development for the agencies within Ministry of Transportation. With common targets, there will be less redundancy in conducting plans and projects, leading to the decrease of unnecessary expenses under the limited budget. The said plans can be used as a framework for any agency within the ministry and the other members concerned to perform their tasks integrally and in the same direction.

1.2 Objectives of the Project

The objectives of the Transport and Traffic Development Master Plan are as follow:

(1) To provide any agency within the ministry and the other members responsible for the development of infrastructure and services of transport and traffic with tools, knowledge and fundamental database, all of which are needed for the proper decision on any practical plan and project; and to enable them to work integrally and accordingly with other developments of the country.

(2) To study, analyze and evaluate the plans and projects of all levels concerning the development of transport and traffic, both in the past and at present, so as to properly set up the guidelines of development strategy

(3) To study and analyze the factors as well as the impacts of transport and traffic development, policy support, international cooperation and links of domestic network with the regions, in order to comply with the area development strategy, logistics development strategy or important economic zones of the country; and rules and regulations encouraging the transport sections to support the enhancement of competitiveness and to upgrade the quality of life.

(4) To make investment plans and implementation plans in relation with the Transport and Traffic Development Master Plan, of which the objective is to implement the plan and link it with other plans of different levels, both ministry and agencies, but under the same context of development.

1.3 Conceptual Framework of the Project

The demand of transportation services exists as a result of other activities or factors. For instance, the demand of agricultural product delivery results from the production, the process and the consumption of agricultural products. These activities then lead to the need of transportation of products for the process and finally to the hands of consumers. Therefore, the demand of transportation services is different from that of other common products and services.

Transportation needs infrastructure, regulations, procedures and measures to render the efficient services. Besides, both government and private sectors have pivotal roles in transportation services. Generally, the government invests in massive infrastructure such as airports and major highways. Meanwhile, the private sectors usually provide vehicles and services, e.g. transport operators.

Transportation services have a special feature in that the cost per unit is decreased when the size of service increases (Economies of Scale: EOS). Hence, there exist such Monopoly businesses as port business and passenger car business. Furthermore, the cost of delivery is an important element of the whole costs incurred from the manufacture to the final stage of consumption. Therefore, the costs and the service charges of delivery are significant factors that not only define the competitiveness of the country but also determine the prices and the cost of living.

There are several factors that the making of Transport and Traffic Development Master Plan should take into account, e.g. quality of services, convenience, quickness, safety, energy consumption and the release of pollution; so that the said plan could be applied as a practical tool for both government agencies and private sectors to perform their functions consistently.

The conduct of Transport and Traffic Development Master Plan begins with the analysis of internal and external factors, statistical data of transport and traffic, analysis of SWOT of the transport nationwide. There is also a study of guidelines for conducting the previous plans by means of collecting and analyzing plans, study's results and obstacles hindering the achievement of master plan, all of which are applied as precious lessons for making the recent master plan. The results of making Transport and Traffic Development Master Plan will be presented in the forms of vision, goals, strategies, tactics, projects and measures, which are in turn employed as a guideline to conduct Strategic Plan for Transport Sector

Development (road, rail, water and air). Since either mode of transportation may have different strategies, there are a lot of different projects and measures. So, the results derived herein are further analyzed in order to conduct investment plans and implementation plans, as seen in figure 1.1-1

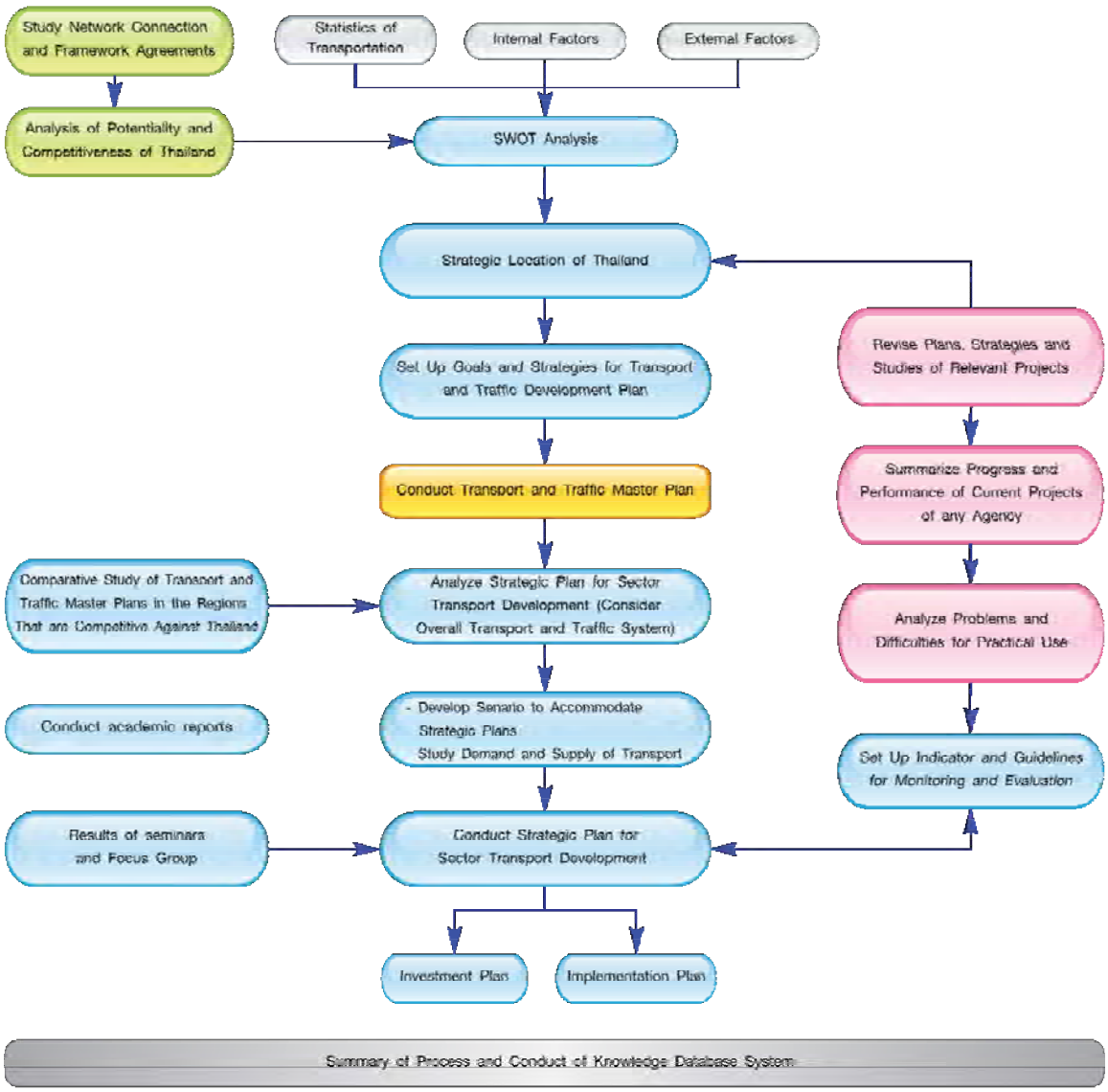


Figure 1.1-1 Conceptual Framework of the Project

Chapter 2
Overall situations of transportation in the past, at present and in the future

Chapter 2 Overall situations of transportation in the past, at present and in the future

2.1 Performance of the former transport and traffic plans and policies

In the past, the transport and traffic master plan of Thailand was always improved every two years in order to keep up with the changing situations. The transport and traffic master plan (2004-2011) is the most recent one that has been used to direct the development of transport and traffic of the country, and to enable the agencies to practically apply the higher-level strategic plan. However, the implementation of the plan has been facing some problems, such as insufficient budget, lack of concrete driving mechanism for the strategic plan, lack of efficient agenda-based management system within the agencies to pass on the goals to operation units. These lead to the lack of unity and the lack of achievement of master plan goals.

Nevertheless, even though the plan was actually implemented, all goals have not been achieved yet. This is because the agencies have performed separated management. In other words, the projects or the measures are not actually related to the strategic plan, and the presentation of projects or measures from the agencies in charge does not integrate with other sections or sometimes there is some overlapping among them, which is quite difficult to allocate the budget.

Another reason contributing to the failure of master plan implementation in the past is the lack of efficient monitoring and evaluation system. Once the operators are not able to realize the information needed for monitoring or adjusting the direction of projects or measures to appropriately comply with altering situations, the results of those projects or measures will not come out as expected.

2.2 Potentiality of Thailand

2.2.1 Evaluation of existing infrastructure potentiality, compared with that of the neighboring countries

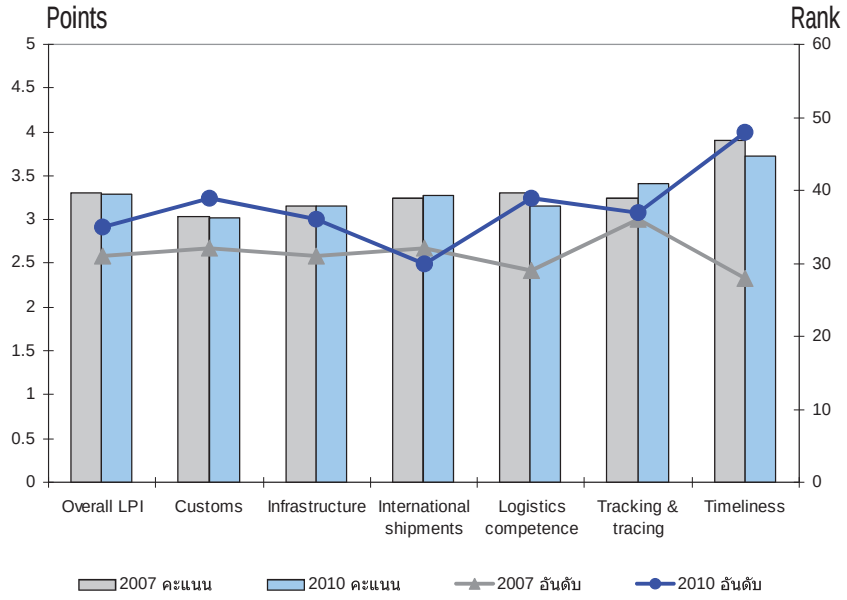
There is a revision of evaluation of existing infrastructure potentiality, compared with that of the neighboring countries, based on infrastructure information and supply of all modes of transportation. This is to realize the status and necessity of further improvement, and to enhance the competitiveness against neighboring countries.

Logistics industry has played a very important role in economy and society. Efficient logistics systems will help increase the competitiveness of the country. Thereby, the systems will also bring about the cost reduction, responsiveness and reliability.

In addition, logistics industry provides employment and distribution of income directly to the locals. As a consequence, the establishment of efficient logistics systems is another way to help the country maintain its competitiveness. So, the evaluation of logistics performance of the service providers is essential for the development of logistics systems. It indicates whether the development trends are correct or not. Logistics Performance Index (LPI) can help assess the performance thereof, which leads to the proper solution of defects and problems in the logistics systems.

According to the details and LPI of Thailand, it is found that Thailand has got the lowest score points of customs, 3.02, whereas it has got the highest points of 3.73 in terms of timeliness.

In spite of the highest points, the timeliness has got the worst rank, 48th, once compared with other items. Moreover, when comparing LPI of Thailand of the year 2010 and 2007, only international shipments has got the better rank while the others have receive the lower rank and are subjected to the trend as seen in the **figure 2.2-1.**



Source: Collected from World Bank (2007 and 2010)

Figure 2.2-1 Scores and LPI ranks of Thailand in 2007 and 2010

Furthermore, according to the primary study of analytical report of the World Bank and Office of the National Economic and Social Development Board (NESDB), it is found that the logistics development of Thailand is on the way to the level of Internally Integrated Logistics. After analyzing logistics in Thailand, the facts of transport and traffic system can be summarized as below:

- Infrastructure is enough in certain extent
- Modes of transportation and the links are not efficient
- Quality of infrastructure of ports and airports is quite good

- Cargo delivery network system in the country is based mainly on the roads, which has problems of congestion and bottleneck, especially around Laem Chabang area

As to further analysis, Thailand still lacks of comprehensive information and knowledge in logistics management. Not only that, the technology used to connect all organizations together is still limited, with no strict enforcement of rules and regulations.

Referring to The Global Competitiveness Report 2009-2010, the overall competitiveness of Thailand increased with the rank of 36th in 2009-2010 (34th in 2008-2009). Meanwhile, the competitiveness in terms of infrastructure of Thailand also drastically increased to the rank of 40th in 2009-2010 (29th in 2008-2009).

2.2.2 Evaluation of potentiality in transportation of Thailand

According to the analysis of transportation in Thailand from the past until now and in the future, and the analysis of internal and external factors and SWOT, the potentiality in transportation of Thailand is evaluated on the basis of following transportation modes:

(1) Potentiality in Road Transportation

- The quality of highway network in Thailand is of universal standard, whereby in 2009 it was ranked 35th out of 133 countries by WEF Global Competitiveness Report 2009-2010.
- The quality of highway network in Thailand is excellent, compared with that of other countries in the same region; thereby Thailand has good-conditioned highway with International Road Index (IRI) of 3.5-4.5.
- Thailand has a wide, comprehensive and practical highway network and the readiness of road infrastructure is quite good with satisfactory maintenance. According to the information from UNESCAP, it is found that most road network in Asian Highway of Thailand is in Class I of Asian Highway Classification and Design Standards.
- Thailand also has advantages of location because it is bordered with several countries nearby. So, it can deliver any cargo via different Economic Corridors, saving much of delivery time.
- Thailand has a great number of prompt vehicles. As a manufacturing country, the cars and the motorbikes in Thailand are quite cheap once compared with those of other countries in the same region.
- Thailand has the largest amount of road transportation, i.e. 84%.
- Major problems found in road transportation include bottleneck of road network around gateway and borders, incomplete road network without any connection with the main route.

- Cargo delivery of every transportation mode is mostly conducted in the central part of the country, especially Bangkok Metropolitan Region. This leads to traffic congestion on some parts of the road. Traffic volume is almost over the road capacity at the highway number 1 around the entrance to Mueng District, Nakhon Sawan Province, the gateway to the north; and the highway number 3 around the entrance to Mueng District, Chon Buri Province, the gateway to the east. The road with traffic jam and with traffic volume over capacity is the highway number 2, from Saraburi Province to Nakhon Ratchasima Province.
- Road public transportation, e.g. buses, has been in service for too many years; the bus lines and services do not match with demand thereof; and the overall quality of services are not quite satisfactory.
- As to the study of Asian Development Bank (ADB), Thailand is ranked the 3rd in ASEAN and the 6th of the world in terms of road mortality rate. According to the study in 2008 of Road Safety Group Thailand (RSG), the average number of death toll in road accident in Thailand was 12,000, whereas the said numbers in England and France were 3,200 and 4,600, respectively. Since the three countries have almost the same number of population, it is obvious that the transport and traffic safety standard of Thailand is in crisis and under standard.
- There are not certain services for road transportation such as Rest Area and Repair Spot. There are rest areas on only 4 routes and all of them are view points. Thus, the trucks cannot enter there and the drivers have to stop beside the roads, leading to problems of theft.
- There is serious damage on the road structure due to the lack of strict control and enforcement of the laws against overweight trucks, leading to the high budget of maintenance.
- There are not enough equipment and infrastructure, e.g. guard rail, road markings, signs, in some areas.
- The road markings and traffic signs of Thailand and neighboring countries do not share the same standard.

(2) Potentiality in Rail Transportation

- No connection with other Multi-Modal Transport.
- No double-track railway (over 93% is single track)
- The basic structure of the rail tracks is not standardized nationwide. Since the State Railway of Thailand is responsible for a great deal of investment and maintenance

cost, over 60% of the tracks have been used for over 30 years and only 65% of locomotives, most of which are very old, are ready for use.

- Lack of railway network linking Thailand and southern China, leading to incomplete North-South Economic Corridor.
- No development of mass transit in the regional cities; and no high-speed trains linking between Bangkok and other major cities.
- The number of locomotives and container chassis is not enough; so the delivery is often delayed. As a result, most carriers, especially those dealing with perishable goods, resort to other modes of transport that are more punctual and more flexible.
- The development of urban mass transit does not cover wide areas, and neither does it link with other types of transport, in terms of both network and services such as common tickets for the convenience of users.
- The quality of services and safety are not quite satisfactory. In addition, most trains are not punctual due to the shunts because most rail tracks are single track and are located at Grade Crossing.
- The number of passengers is increased only 2% but the State Railway of Thailand has burden of both commercial and social services. Therefore, the costs, especially those for the social service, are much higher than the income.
- Referring to the survey of satisfaction from the users of public services, 58.7% said the overall service of railway is in crisis with the average satisfaction scores of only 2.6 (out of 10); and 40.5% said the quality of railway service, especially in the 1st and 2nd classes, should be improved in terms of standard and punctuality.
- According to Railways and Hi-speed Train Development Master Plan Study, the first priority that the passengers want SRT to conduct is to increase the speed of trains, followed by the improvement of frequency of services, locations of stations and punctuality, respectively.

(3) Potentiality in Water Transportation

- Although Laem Chabang port is located in the east of the Gulf of Thailand, which is inferior to that of neighboring countries, we have more Hinterland that links to 4 countries nearby and provides connecting routes of land transportation to other countries in the same region.
- Review of Maritime Transport 2007 conducted the ranking of 35 countries with large commercial ship divisions; and Thailand was ranked at 34th. It means our commercial ship division is smaller than several countries in ASEAN such as Singapore, Indonesia, Malaysia, Philippines and Vietnam.

- As to the ranking conducted by World Economic Forum in 2008-2009, the quality of Thai ports was ranked at 47th with scores of 4.7 out of 7. The score is above average (3.9) and better than Vietnam. However, Thailand has got fewer scores than major competitors in this region, i.e. Singapore and Malaysia.
- Most of the Thai ships (31.66%) are old and have been used for 20-24 years.
- Almost all shipping business owners in Mekong River are Chinese.
- The quantity of goods through Laem Chabang port during the year 2005-2009 has an annual growth rate of 13.6%.
- Laem Chabang port is mostly composed of international berths, and this results in the inconvenience of the coastal ships.
- The loading of containers among large ships at Laem Chabang port is charged with rather high Double Handling, which in turn makes the overall costs higher.
- Bangkok port (Klong Toey port) is a port on Chaophraya River. This port is connected with road and rail transportation; however, the size of ships is limited to not longer than 172 metres; the load must not over 12,000 Dead Weight Ton; and they must have a draught not over 8.2 metres. The government launched a policy to decrease the role of Bangkok port by limiting the quantity of loaded containers not over 1.34 million TEU a year, meanwhile it launched a campaign supporting the use of Laem Chabang port.
- At present, the shipyards and other relevant businesses are rather small.
- There are still some problems that hinder the water transportation, i.e. the height of bridges and the shallowness at some parts of Chaophraya River.
- The staffs of maritime business have difficulties of languages when they are working in foreign ships.
- Problems of laws, disciplines, regulations, customs, and tax measures have prevented maritime businesses of Thailand from competing with other countries.

(4) Potentiality in Air Transportation

- Suvarnabhumi Airport is a standardized airport with some honoable awards, e.g. the 3rd most outstanding airport of the world from the voting of Smart Travel magazine in 2010; and the 10th of The World's Best Airports in 2010 by SKYTRAX.
- The international airports are of high standard and high quality of services for both passengers and cargo. According to the Global Competitiveness Index in terms of Quality of air transport infrastructure, Thailand was ranked at 26th out of 133 countries, with good airlines (13th out of 133) and air network (26th out of 133).

- Since Thailand is located in the center of air routes among America, Europe, Middle East and Asia Pacific, it has advantages over the others as a connecting point of air transportation. It is suitable for airlines with long range flights to stop for petrol or transit; whereby it takes quite shorter time, compared with other locations, to fly toward North Asia, Middle East, Australia and New Zealand.
- Thai Airways has got the best safety level of "A" based on cumulative statistics since the year 1970 by Air Rankings Online. Besides, in 2010, Thai Airways got the 1st rank of Best Airline First Class Lounge, and the 1st rank of Best Airport Services from Skytrax, which is an organization conducting surveys from worldwide passengers.
- According to the statistics of Airports Council International in 2009, Suvarnabhumi Airport was ranked the 16th airport with the highest number of passengers.
- Once compared with airports of neighboring countries, Suvarnabhumi Airport has more passengers than Changi Airport of Singapore, and it has twice as many cargos as the airport in Malaysia. Nevertheless, from Global Competitiveness Index in 2008-2009, the quality of Thai airport (28th) was lower than that of Singapore (1st), Hong Kong (2nd) and Malaysia (20th).
- The air freight charge in Thailand is much higher than that in Singapore. Today, there is no announcement of aircraft parking space in Suvarnabhumi Airport; so the service charges are not clear.
- Several airports in the country are out of service because there is such small demand that the airlines do not care to provide any service. Some airports available now have too small number of passengers. Moreover, some airports are not employed at their full potentiality.
- According to Customer Satisfaction Survey in terms of Seating Products and In-flight Entertainment by IATA GAP, the results of satisfaction are quite low because the products and the in-flight entertainment system are very old with average 11.8 years of service. Therefore, it leads to the higher costs of operation.
- For the last 5 years, the number of routes and the frequency of flights of THAI has been increasing a little, whereas the said number of its competitors, i.e. Singapore Airline and Cathay Pacific, has increased a lot (from 442 to 758 flights for Singapore Airline, and from 351 to 609 flights for Cathay Pacific). At the same time, airlines from the Middle East and Singapore Airline have extended their services in terms of fleet and the number of routes.

- The efficiency of services of Thai airports is still lower than that of other countries in the same region. Suvarnabhumi Airport of Thailand was ranked 24th in Airport Service Quality Awards by ACI, just better than the rank of 28th in 2008 and 41st in 2007.
- The Landing Fee, the Passenger Service Charge or Airport Tax, the charge of Landing, Parking, Aerobridge, Check-in counter for each passenger in Thai airports are higher than those of Malaysia and Philippines, but lower than those in Singapore and Hong Kong. These factors have an effect on the amount of passenger's trip.
- As to the report of air traffic trend conducted by Airport Council International (ACI), it is said that, during 2006-2025, the number of passengers through worldwide airports is about to be doubled; and within 15 years or by 2025, Asia will have got the highest growth rate of air passengers of not less than 9% annually. Considering air routes likely to grow in the future, it is found that the route from Southeast Asia to the South Asia has the highest growth rate of 9.8%.
- The amount of air freight is likely to increase. The Boeing Company expected that the Cargo Growth Rate worldwide in the next 20 years (2009-2029) will have a growth rate of 5.9%, and 6.8% for the Asia Pacific region.
- The air transportation is likely to expand thanks to the government policies to develop Suvarnabhumi Airport, Thai Tourism policies to extend new tourism markets, and agreement among the countries within ASEAN to open Free Flight and launch state deregulation.
- The low-cost airlines are expected to grow up due to the Free Flight policy, economic and international trade extension, new innovative technology of aircraft manufacture and competition in the aviation market, which leads to the cheaper ticket fares and more accessibility to the air transportation.

2.3 Conditions of transport and traffic at present and in the future

The analysis of overall transportation, from the past to the present and in the future, requires the revision of factors that have influence on the said issue. The said factors include economic and social situations, land use, transport development plans/projects, impacts of international cooperation, etc. These factors, form the past to the present, will affect the trends and expectations of transport in the future, in terms of both international and national transport and traffic (between cities and areas nearby). The knowledge of overall situation of transport, from the past to the present and in the future, can then be applied to the SWOT analysis of transportation in Thailand.

2.3.1 Economic condition

Referring to the Gross Domestic Product during 1999-2008, Thai economy grew up by 4.6% annually; and according to the report of Office of the National Economic and Social Development Board, the economy in 2010 would grow up by 3.5-4.5 annually.

Once considering the relation between the growth of GDP and that of transport section which is the value of products and services of the year, it is found that both of them have proceeded in the same direction even though the transport and communication sections are growing less quickly.

The expansion or contraction of international trade in the future will have an effect on the amount of trip and international and domestic transport. Generally, the direction of economic growth in Thailand is dependent on the following factors:

- The growth of world economy. Thailand has relied on the export and foreign investment. Although the world economy has recovered since 2009, IMF expected that in the next five years the world economy would grow up in a slower manner than it did before the time world economic crisis.
- The unrest of Thai politics, which is seemed to continue for many years and will badly affect the tourism section and foreign investment.
- Government policies; for instance, Strong Thailand Scheme, which will stimulate Thai economy to expand in certain extent.
- Oil prices in the world markets are likely to continually increase, leading to the higher costs of product and transport.
- The fluctuation of agricultural products' prices in the world markets.

Form the aforementioned situations, National Institute of Development Administration, together with Office of the National Economic and Social Development Board and Energy Policy and Planning office, expected that during 2010-2024 Thailand will have economic growth rate 4.27% annually. For the section of transportation, it is expected to have the growth rate of 3.69% annually, or 6% of GDP in 2015 and 5.9% of GDP in 2024.

2.3.2 The number of population and tourism

The number of population is an important factor for the travelling; the more population, the more travelling and transportation as well as other relevant activities. The whole population of Thailand, as of 31 December 2009 as to the announcement of Central Registration Office, Department of Provincial Administration, Ministry of Interior, is 63,525,062. Considering on the regional basis, the northeast region has the highest population of 20,491,492 since it has the largest area. Next is the central region (excluding Bangkok) with the population of 19,191,856, followed by the north region 8,821,176 and the south region 9,317,943. Bangkok has the population of 5,702,595 with the highest average population density of 3,635 per square kilometer. The north region has the lowest population density of 52 per square kilometer; and the

population here is likely to decrease every year because of the steady move to the capital city in search of better job.

The number of population in the future, based on the data of National Statistical Office, Department of Provincial Administration, is expected to be 68 million in 2022 in case the growth rate thereof is 0.50 annually. In the next ten years (2011-2020), the population in the central region is still crowded and is likely to highly expand. However, the population density in the major cities is expected to go up as well.

For the growth of tourism during the last 10 years, the number of passengers is doubled, and every year it brings about the income of over 500,000 million baht and more than 13 million tourists (in 2008) to Thailand. It is also expected that the number of tourists is still increasing. The World Tourism Organization predicted that in the next 10 years or in 2020, there will be approximately 1.6 trillion tourists, 378 million of whom are of the long trip. Furthermore, as to the prediction on a regional basis, Asia Pacific will have a growth rate of tourists about 6.5% per year whereas the growth rate of worldwide tourists is 4.1% per year.

2.3.3 Land use and Urban Expansion

The proper land use for the area of urban expansion and area of development has resulted from the change of population and the expansion of economy and industry. In the past, Thailand was an agricultural country in which the population lived in small agricultural communication such as villages. After that, there was a migration toward the city in order to find other jobs as selling, services, industry; that was called Urbanization. Then, the travelling was more convenient due to the road network and cars in the early BE 2500.

Nevertheless, during the past 30 years, there has been more and more expansion of community; and more main roads have been built on peripheral areas. The routes leading to the provinces nearby, especially to Bangkok, have been developed first. Since there has been no strict enforcement of land use and people desire to have convenient residence and business center, the development is proceeding in a style of Ribbon Development. Hence, the distance of travel on daily basis from the residence to the workplace, school, downtown, hospital or other necessary places, is getting longer and longer; and it takes more time and more expenses in terms of energy consumption. Thereby, the trend of land use and urban expansion in different areas of Thailand is as follow:

(1) The land use of Thailand began to change when Bangkok Metropolitan Region became the sole center as shown in figure 2.3-1. The rest is Hinterland. It is called the development of major cities in the regions, beginning with self-development as a center of activities for hinterland.

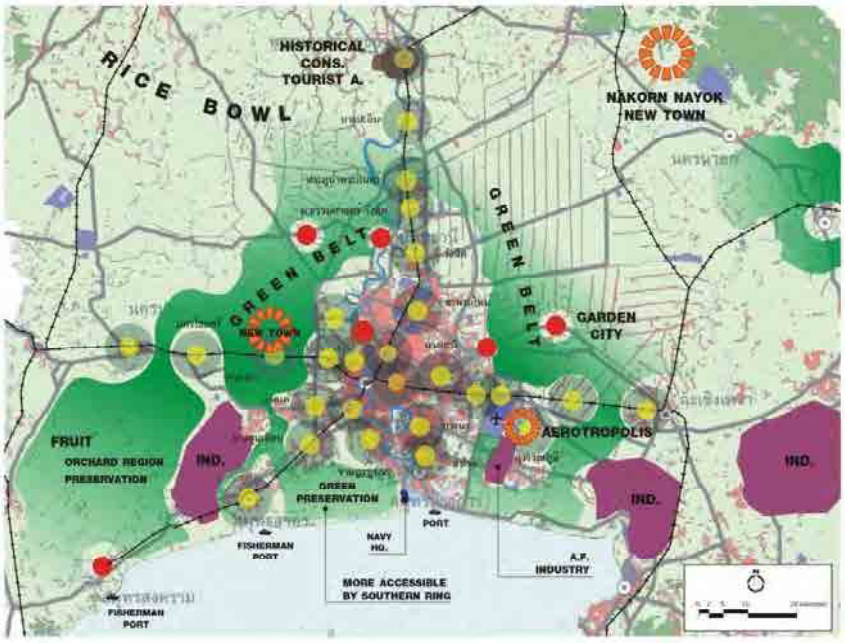


Figure 2.3-1 Map of Industrial Areas around Bangkok and Eastern region

(2) In the cities of main regions, the infrastructure of transportation has been developed, bringing about more economic activity, trading and tourism.

(3) There have been connection points to the neighboring countries to open the gateway. In the future, it is expected that there will obviously be more travel along the borders and regions.

(4) The development of Economic Corridors around the country facilitates the travel and cargo delivery through Thailand to further modes of transportation.

Bangkok Metropolitan Region is in the infancy of Mass Rapid Transit and it can be expanded more and more. Therefore, it is advisable to plan the link systems with other modes of transport. In addition, Bangkok should be adjusted to become multi-center urban system, in which each center should be located near the main stations of mass transit, as shown in figure 2.3-2. There should also be improvement of the linkage facilities by means of strict enforcement of City Planning Act and Land Reform Act.

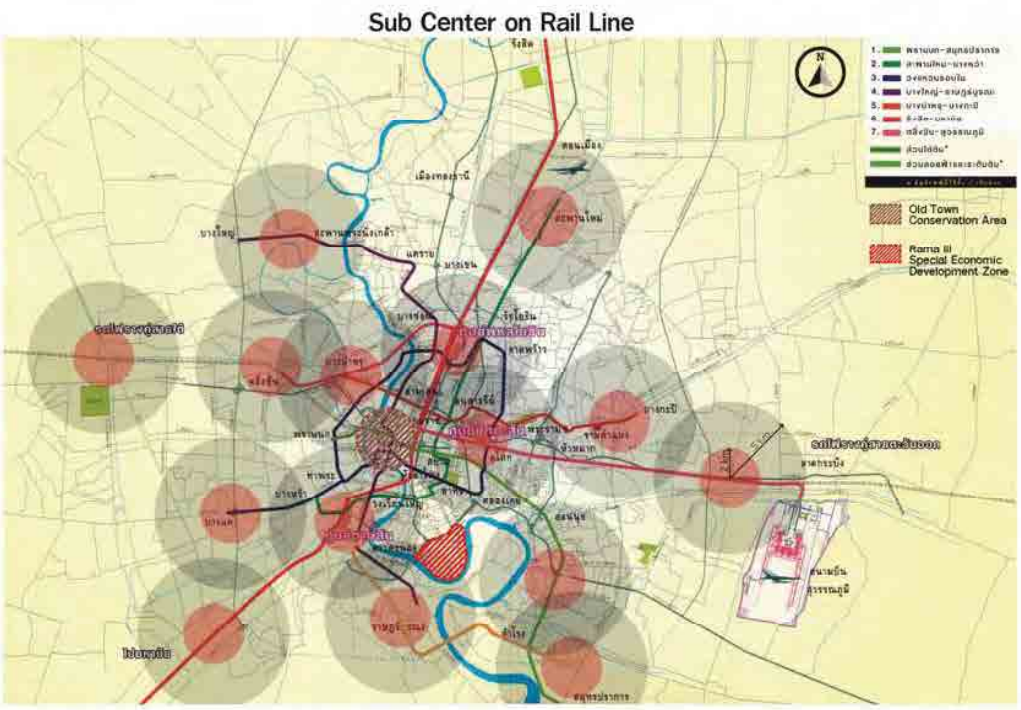


Figure 2.3-2 City Plan of Bangkok Metropolitan Region

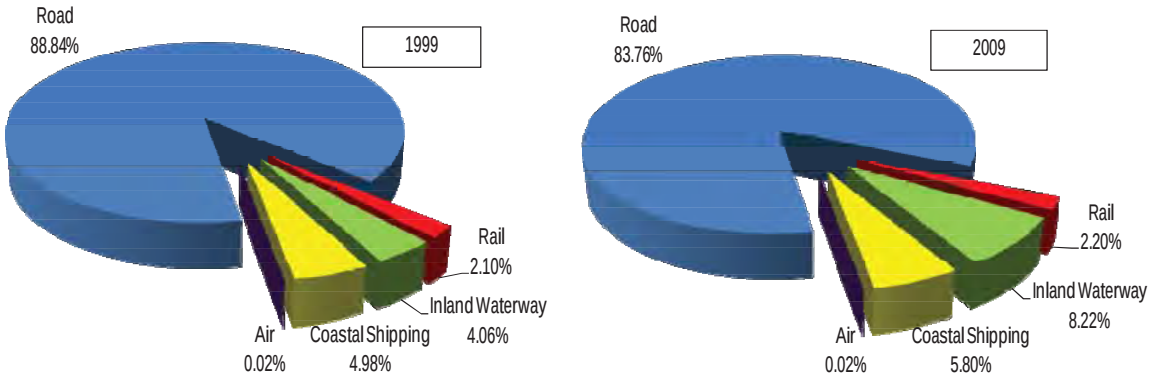
The provinces with major cities of the regions are on the first stage of development as to the principle city plan. The said major cities are likely to have the same trend of development as Bangkok, in which there are centers of provincial administration, trading, industry, transportation and tourism. There also exists an idea of using cars and road network as a way to decentralize towards the areas of activities. If there is an adjustment of new city plan such as Compact City and Self Sufficient Sub Center to match with a new system of transport, the system of land use will be more suitable to the future transportation.

2.3.4 Transportation

In addition to the revision and the analysis of factors affecting transportation, the revision of the said data in terms of demand and supply from the past to present as well as the development plans/policies is helpful to predict the future demand of transportation, problems and other impacts thereof.

2.3.4.1 Domestic Transport and Traffic

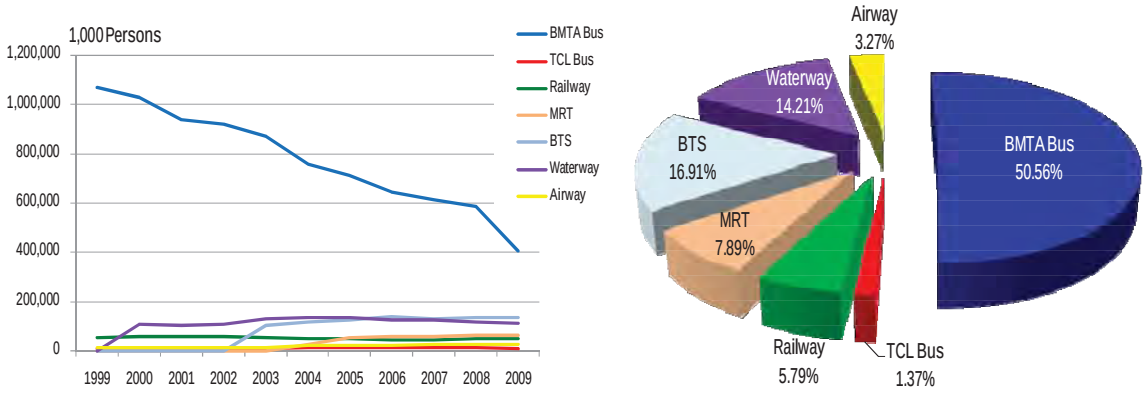
In the whole, it is found that Thailand has the largest amount of road transportation; in 2009, the said amount was 424 million tons a year or 83.76% of all transport. Yet, the expansion rate per year of this transport from 1999 to 2009 is the lowest or 0.70% compared with other modes of transportation. Once considering the proportion of transport 10 years ago (1999), it is found that the proportion is almost similar to that in 2009 as seen in **figure** 2.3-3. However, it is also found that water transportation, both domestic and coastal, always has more growth rate than any other mode, followed by rail transportation with the growth rate of 3.17% annually. Although road transportation has the highest proportion with its advantage of door-to-door service, it is necessary to take into account the development of water and rail transportation to accommodate the future expansion thereof.



Source: Information and Communication Technology Center, Office of the Permanent Secretary, Ministry of Transportation

Figure 2.3-3 Ratio of different forms of cargo delivery in 1999 and 2009

Regarding to the statistics of Ministry of Transportation from 1999 to 2009, figure 2.3-4, the travel by BMTA buses available mainly in Bangkok has the highest number of passengers or 50.6%. Nevertheless, the number is continually decreasing every year like that of rail transport. On the other hand, the travel by BTS and MRT has significantly been growing up every year. Once the urban passengers have realized the bad traffic condition, delayed travel, waste of energy in traffic jam, and pollution from the private cars, they turn to use mass transit which render more certainty of services. In the future, there will be a plan to extend the network thereof so as to cover more and more areas. For the air transportation, the passengers within the country, including those of low-cost airlines, are likely to increase by 6.85% a year, although the proportion of these passengers is only 3.27% of the total.



Note: * Service began in July 2004

** Excluding information of cruisers in 1999-2002

Source: Information and Communication Technology Center, Office of the Permanent Secretary, Ministry of Transportation

Figure 2.3-4 Statistics of domestic passengers in different modes of traveling during 1999-2009

(1) Road transportation

Based on Highway Act (No. 2) BE 2549, section 6, Thai highway is classified into 5 categories: special highway, national highway, rural road, local road and concession highway. The length of all is 204,201 kilometres, classified as concrete surface 38,092 kilometres, asphalt surface 145,739 kilometres, temporary surface 20,227 kilometres, and other surfaces 143 kilometres. Figure 2.3-5 illustrates Highway Network of Thailand according to the types thereof.

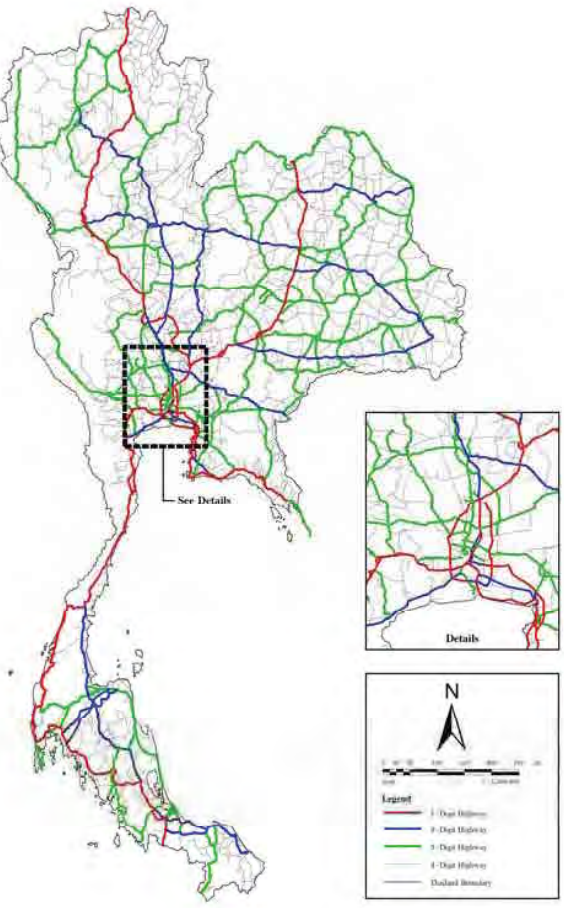
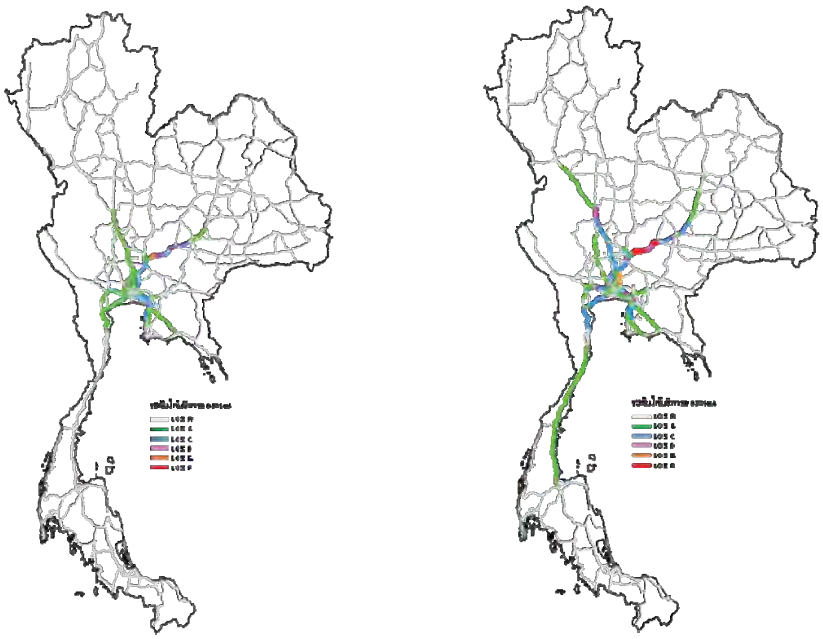


Figure 2.3-5 Highway Network of Thailand according to the types thereof

The national trend of road transportation, in case of no additional road network development, shows that in 2010 there were 2.4 million person trips per day, and it will be 3.07 million person trips per day in 2020. Meanwhile, the average travel speed is likely to reduce from 77.5 km/hr in 2010 to 74.5 km/hr in 2020.

Once taking into account the traffic condition on the road network nationwide, the nearer to urban communities and Bangkok Metropolitan Region via Primary highways no. 1, 2, 3 and 4 and motorways between the cities, the more congested the traffic will get.

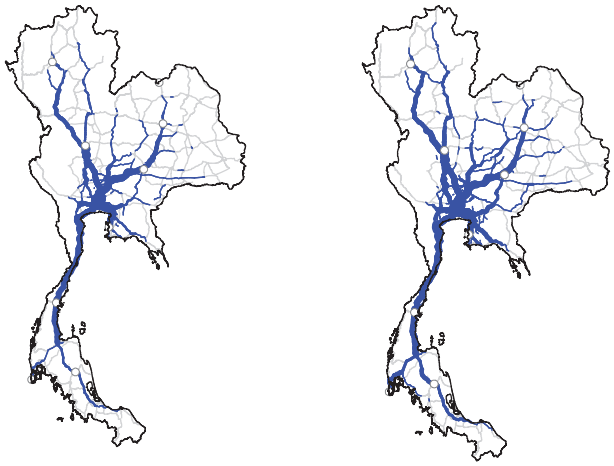
In 2020, the amount of travel on the road is expected to increase from the year 2010, resulting in the increase of traffic volume per capacity and the decrease in Level of Service. In 2010, most of the main roads linking among regions have level of service at B and C, and it will plunge to C and D in 2020. Some parts of the roads even has the level E (traffic is congested and traffic volume per capacity is 0.89-1.00), i.e. Highway no. 1 at the entrance to Mueng District, Nakhon Sawan Province, which is a gateway to the north; and Highway no. 3 at the entrance to Mueng District, Chonburi Province, which is a gateway to the east. The road that has level of service at F (traffic is congested and traffic volume per capacity is over 1.00) is Highway no. 2 around the part that leads from Saraburi Province to Nakhon Ratchasima Province. Thereby, the level of service of the road in the future is shown in figure 2.3-6.



2011 2020

Figure 2.3-6 Highway Level of Service in 2011 and 2020

The amount of cargo delivery via roads in 2010 was 1.5 million tons per day, and it will increase to 2-3 million tons per day in 2020. Whereby, the future road transportation is illustrated in figure 2.3-7.



2011 2020

Figure 2.3-7 Amount of cargo delivery via trucks on highway network in 2011 and 2020

(2) Rail Transportation

The railway network at present covers the total distance of 4,043 kilometres, covering service areas of 47 provinces as seen in figure 2.3-8. Most of the network, 3,763 kilometres or 93%, is single track; double-track is 173 kilometres or 4%; and triple-track is 107 kilometres or 3%. So, most of the time is wasted while waiting for the switching of tracks and most tracks are very old without maintenance or additional improvement. Over 60% of the tracks have been used for over 30 years and only 65% of locomotives, most of which are very old, are ready for use. Besides, there are some tracks at grade crossing averagely every 2 kilometres.

The railway network of Thailand today is divided into 5 main routes. All of them start from Bangkok and lead to different regions, i.e. North, Northeast, East, South and Mae Klong. In addition, there are some connection points to the neighboring countries such as the routes of northeast and south. The first one opened, in March 2009, the extension point from Nong Khai station across the border to Tha Na Laeng station, Laos. For the southern route, Hat Yai-Padang Besar junction is linked with the network of Malaysia and it ends in Singapore. Hat Yai-Sungai Kolok junction is also connected with railway network of Malaysia.

It may be said that these limitations have partly caused accidents and prevent locomotives from making higher speed. Looking to the statistical data, there have frequently been railroad accidents. For instance, in a year there are 100 derailment, 3,000 stops on the way, and approximately 500 accidents, leading to both injury and death.

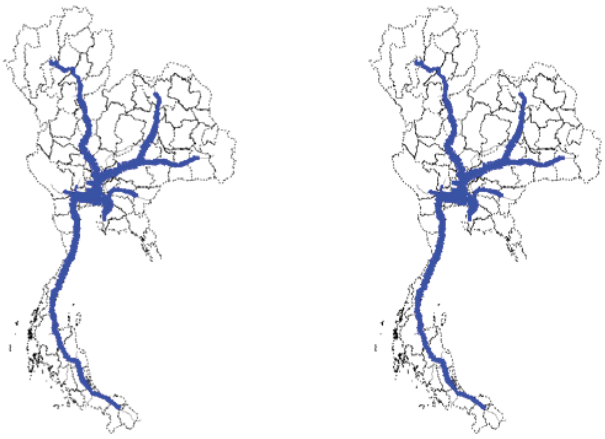
Source: Railways and Highway Speed Train Development Master Plan Study (BE 2553), Office of Transport and Traffic Policy and Planning (OTP)

Figure 2.3-8 Railway Network at present

Due to the said limitation, the State Railway of Thailand (SRT) has to improve and develop double-track railways in order to solve the problems of capacity and speed of cargo delivery.

At present, SRT has a project to build double-track railways. The one that is under construction is Eastern Coast Line, from Chachoengsao-Sriracha-Laem Chabang, with distance of 78 kilometres. The construction progress is 41.19% (as of 31 August 2009).

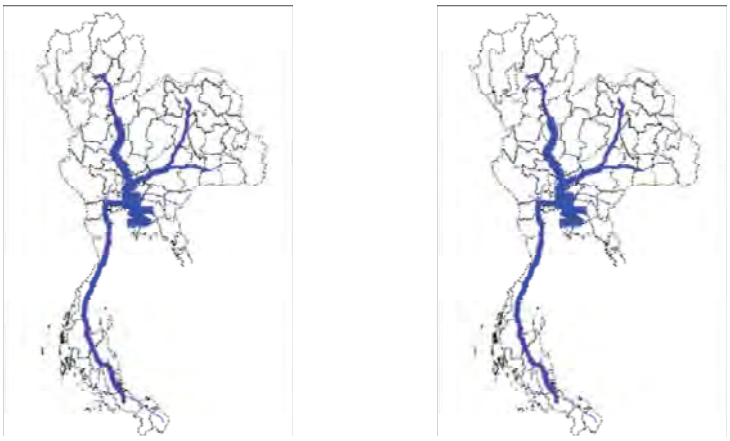
Most of the travel of both passengers and cargo delivery via rail transportation is from Bangkok to other regions, and vice versa. In 2010, there were 147,000 person trips per day, and the number will increase to be 182,000 person trips per day in 2020. The trend of Rail Transportation is illustrated in **figure 2.3-9**.



2011 2020

Figure 2.3-9 Routes and amount of railway travel in 2011 and 2020

The cargo delivery via railway has shorter distance than the travel of passengers. In 2010, there was cargo delivery of 34,586 tons a day, and it will go up to 47,126 tons a day in 2020. The trend of Rail Transportation is reflected in **figure 2.3-10**.



2011 2020

Figure 2.3-10 Routes and amount of cargo delivery via railway in 2011 and 2020

(3) Water Transportation

The present water transportation is divided into 2 modes: Inland Waterway Transportation and Coastal Transportation. The Inland Waterway Transportation consists of 2 routes, i.e. domestic transportation and overseas transportation, as shown in figure 2.3-11. The route of overseas transportation is Mekong River, through which the cargo is delivered among China, Burma, Thailand and Laos (Economic Quadrangle). The main routes for domestic transportation include Chaophraya River, Pasak River, Bangpakong River, Mae Klong River and Tha Chin River. Thereby, the transportation via Chaophraya River can be conducted throughout the year to Mueng District, Ang Thong Province.

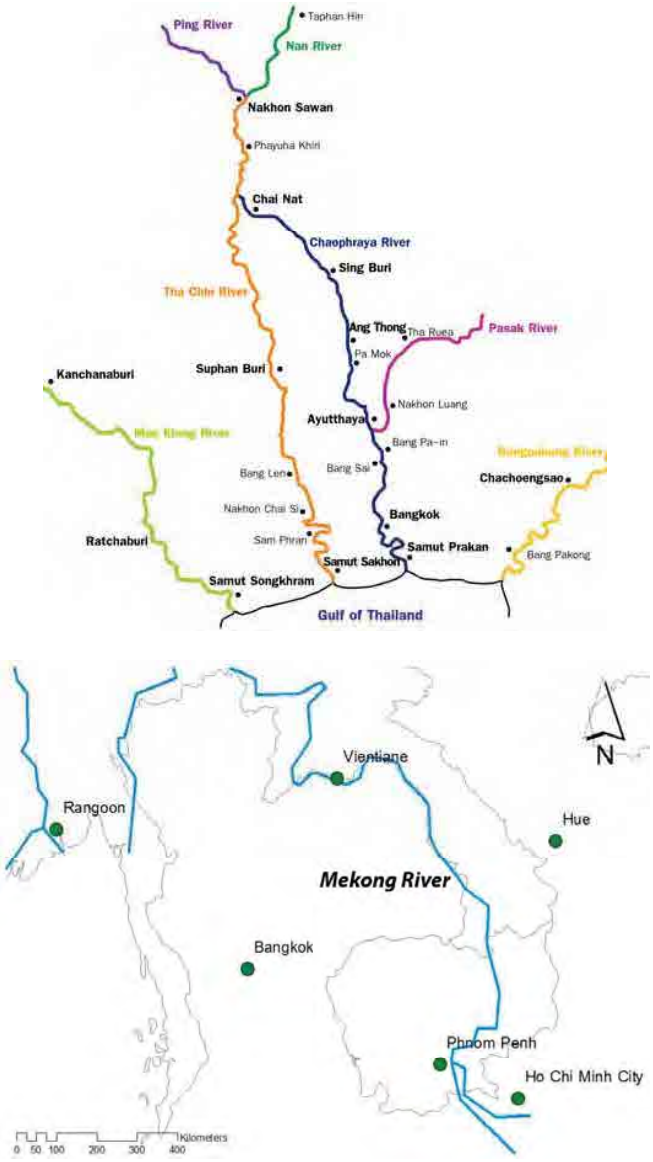


Figure 2.3-11 Network of cargo delivery via water transportation, both in and out of the country

Moreover, there is still water transportation in the river within Bangkok Metropolitan Region, which is one of the most significant alternatives for the passengers here. The said transportation includes Chao Phraya Express and the travelling through the main canals such as San Sab canal, as shown in figure 2.3-12. Water travel services in Bangkok are very essential; not only do they help transport the passengers into Bangkok, but they also relieve the problem of traffic congestion during rush hour.

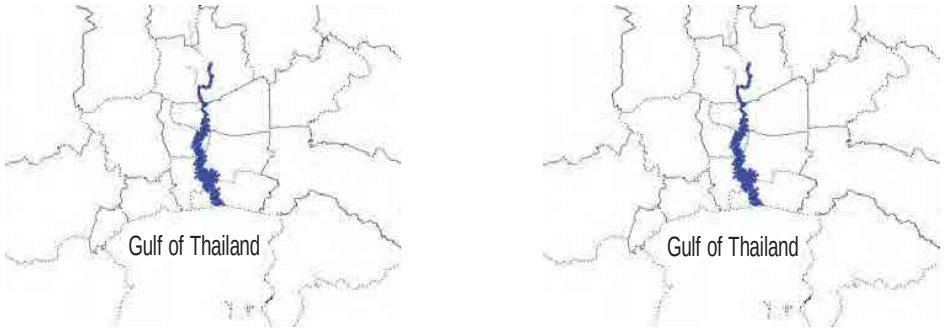
Figure 2.3-12 Traveling in San Sab Canal

The important sea ports of Thailand are Laem Chabang port, Ko Sichang Anchorage Area, Maptaphut port, Ranong port, Songkhla port and Phuket port, including significant private ports such as Prachuab port and Sriracha Habour port.

Bangkok port (Klong Toey port) is a port on Chaophraya River. This port is connected with road and rail transportation; however, the size of ships is limited to not longer than 172 metres; the load must not over 12,000 Dead Weight Ton; and they must have a draught not over 8.2 metres. The government launched a policy to decrease the role of Bangkok port by limiting the quantity of loaded containers not over 1.34 million TEU a year, meanwhile it launched a campaign supporting the use of Laem Chabang port.

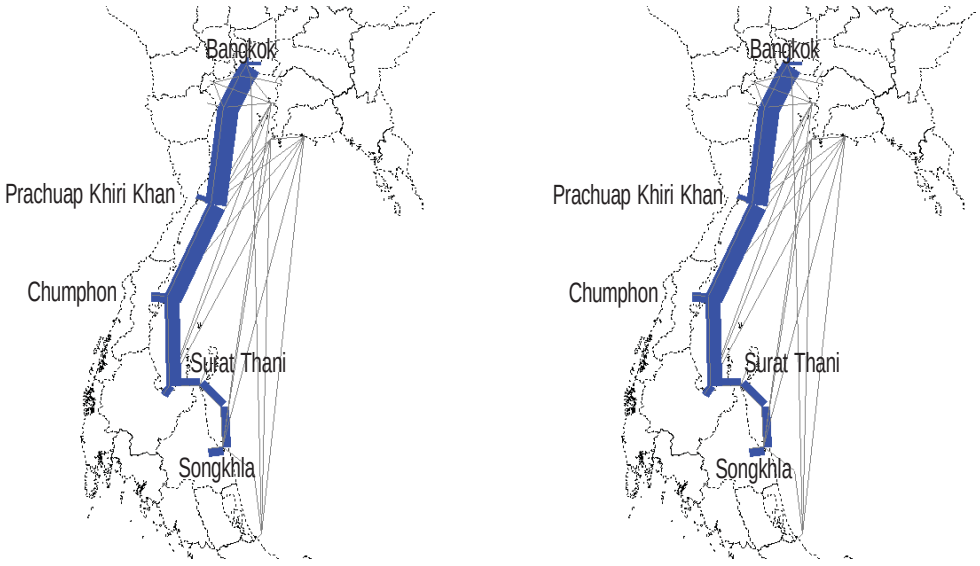
Most important private ports on Chaophraya River are clustered in Bangkok Metropolitan Region. There are 61 private ports that can accommodate seagoing ships of over 500 gross tons. These ports are located along the banks of Chaopuraya River, most of which accommodate the cargo carried by cargo ships which are loaded from Bangkok port, Ko Sichang Anchorage Area, small seagoing ships or important ports along Chaophraya River.

Water transportation is mostly used to deliver the cargo, both inland waterway and coastal transportation. In 2010, the amount of cargo delivery was 194,000 tons per day, and it will increase to 269,000 tons per day in 2020. Figure 2.3-13 illustrates the future water transportation based on inland waterway transportation and coastal transportation.



2011 2020

Inland Waterway Transportation along Chaophraya River



2011 2020

Coastal Transportation

Figure 2.3-13 Routes and amount of cargo delivery via water in 2011 and 2020

(4) Air Transportation

There are totally 57 airports in Thailand, 35 airports of which are commercial airports. There are 9 international airports; 6 of them are under the supervision of Airports of Thailand (AOT), i.e. Suvarnabhumi Airport, Don Muang Airport, Chiang Mai Airport, Hat Yai Airport, Phuket Airport and Mae Fah Luang-Chiang Rai Airport. Two international airports are supervised by

Department of Civil Aviation, i.e. Krabi Airport and Udon Thani Airport. Samui International Airport is under the control of Bangkok Airways Co., Ltd. Besides, there are other 26 domestic airports as seen figure 2.3-14.

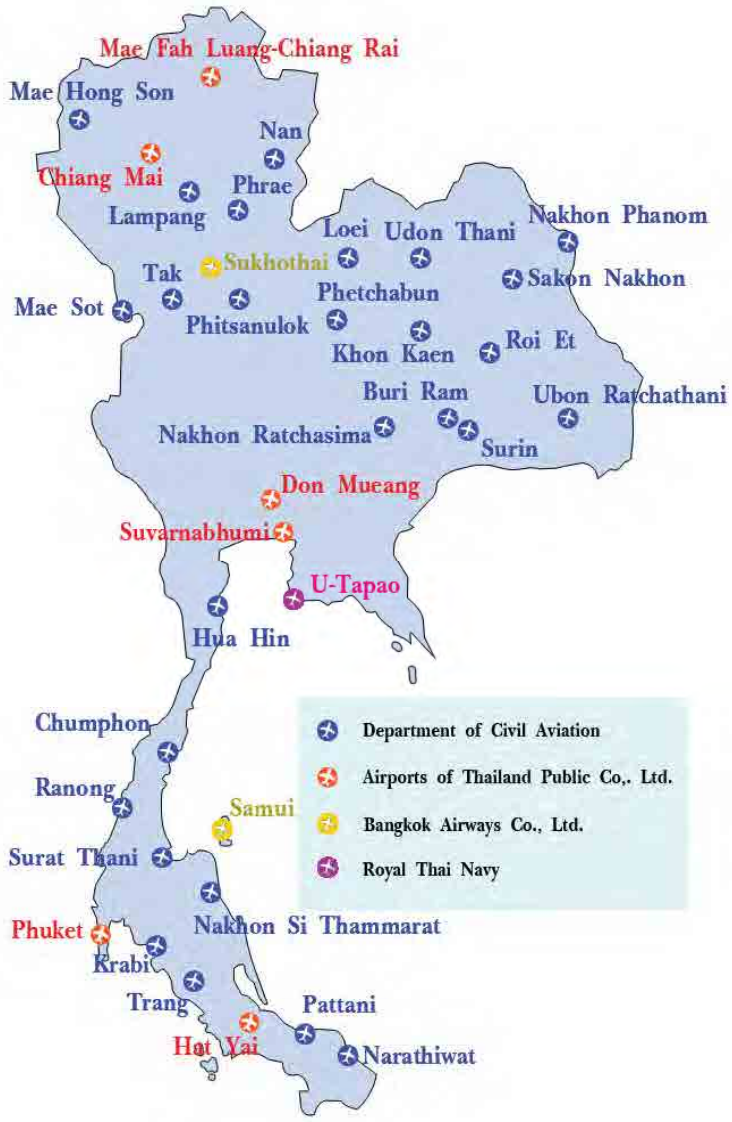
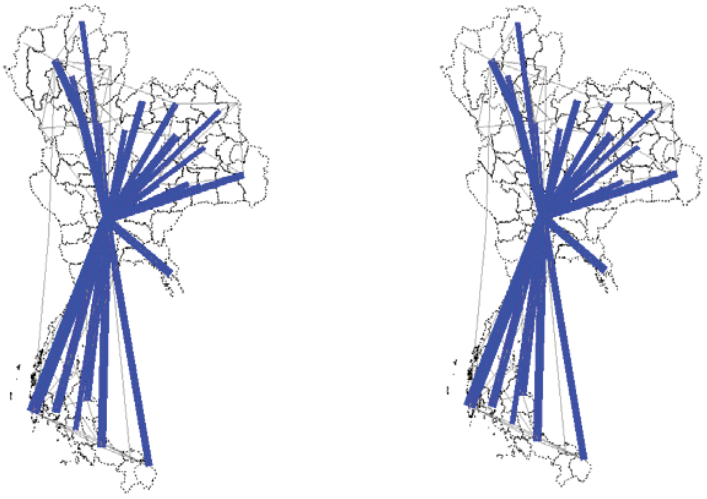


Figure 2.3-14 Location of airports in Thailand based on the agencies in charge

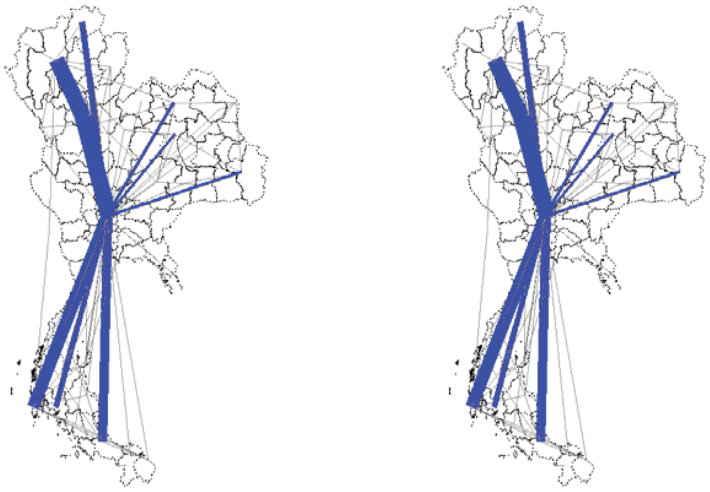
Most of air transportation is the travel from Bangkok to other regions, and vice versa. In 2010, there were 84,450 person trips per day, and it will increase to 108,923 person trips per day in 2020. The future air transportation is portrayed in figure 2.3.15.



2011 2020

Figure 2.3-15 Desired Line of Air travel in 2011 and 2020

Air cargo delivery in 2010 was responsible for the cargo of 303 ton per day, and the number will go up to 396 ton per day in 2020. Thereby, the future air transportation is presented in figure 2.3-16.

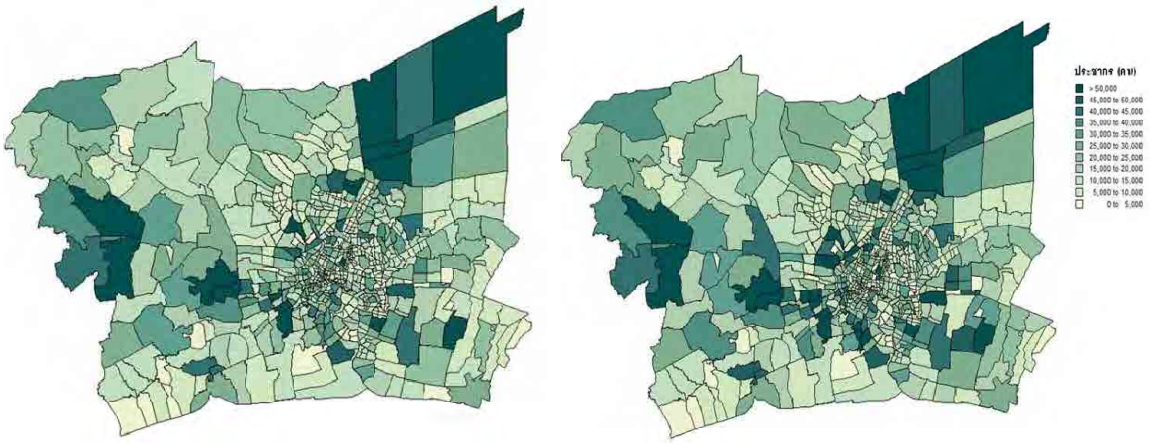


2011 2020

Figure 2.3-16 Desired Line of Air cargo delivery in 2011 and 2020

(5) Transport and Traffic in Bangkok Metropolitan Region

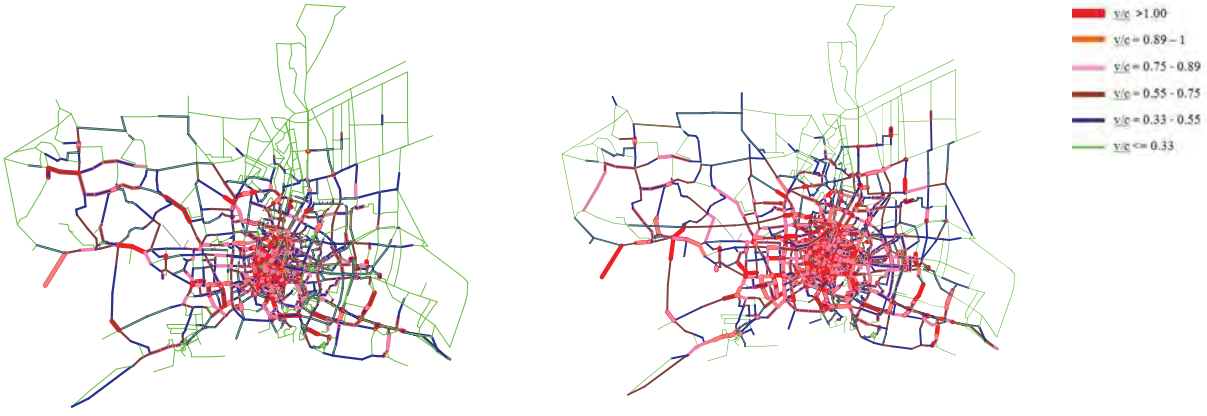
According to the analysis of Bangkok Metropolitan Region population growth rate, it is found that in 2010 the area had the population of 11.49 million; and the number will increase to 12.73 million in 2020 or 1.01% annually, as seen in figure 2.3-17.



2011 2020

Figure 2.3-17 Changes of population in different areas of Bangkok Metropolitan Region during 2011-2020

The increase of population contributes to the increase of travelling. Meanwhile, the Mass Rapid Transit System does not cover wide areas of Bangkok Metropolitan Region. Therefore, most travelling still relies on road transportation, and the traffic congestion is likely to get worse and worse. It is found that the V/C Ratio during rush hour is over 1.00, and this phenomenon is expected to extend toward the suburban of Bangkok, according to the more red lines in figure 2.3-18.



2011 2020

Figure 2.3-18 V/C Ratio in Bangkok Metropolitan Region in 2011 and 2020

The amount of travel within Bangkok Metropolitan Region tends to get higher. The amount of travel in 2010, 17.84 million person trips per day, will increase to 23.18 million person trips per day in 2020. In other words, the amount is increasing 2.0% annually. For the daily average travel speed within Bangkok Metropolitan Region, it is likely to reduce from 28.31 km/hr in 2010 to 13.64 km/hr in 2020.

Due to the reduction of the said speed and the assessment of Central Business District (CBD), the total areas in Bangkok Metropolitan Region where the travel is possible within 1 or 2 hours in 2020 will cover only 2% and 25% of such area, respectively, as seen in figure 2.3-19.

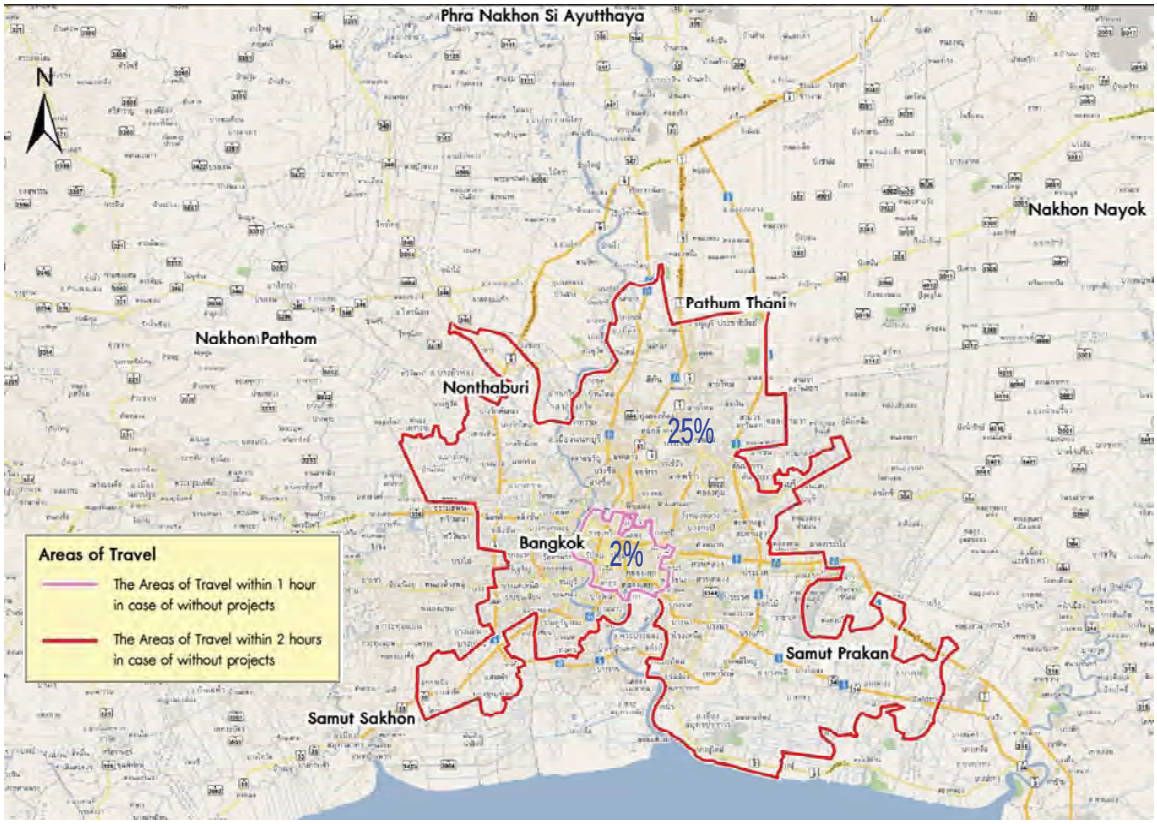
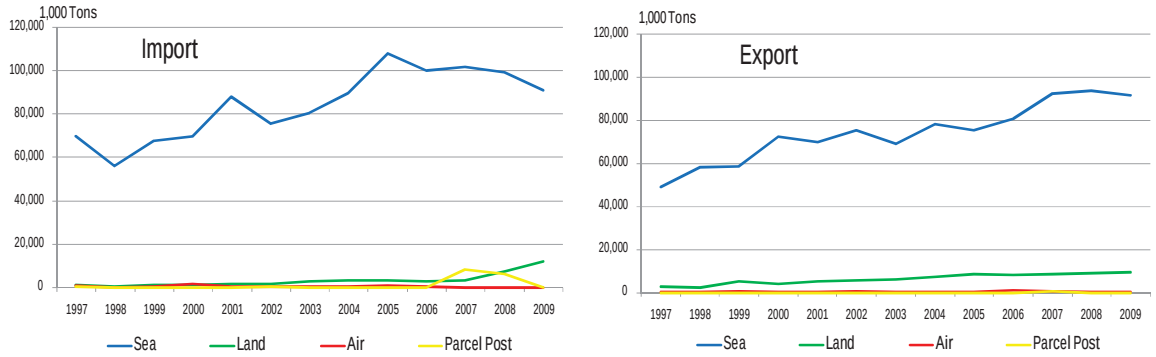


Figure 2.3-19 Areas where the travel is possible within 1 or 2 hours in 2020

2.3.4.2 International Transport and Traffic

The statistics of international cargo delivery is divided into import and export as shown in figure 2.3-20. Most of the cargo delivery is conducted via water transportation; whereby in 2009 the import was 88% and the export was 91%. This is because the sea transportation can accommodate a great deal of cargo delivery, and the costs of transport per unit are quite low. Regarding to the analysis of expansion rate during 1997-2009, it is found that the cargo delivery, both import and export, via this mode of transportation had growth rate of 4% - 5% annually.



Source: Information and Communication Technology Center, Office of the Permanent Secretary, Ministry of Transportation

Figure 2.3-20 Statistics of Import and Export during 1997-2009

According to the ASEAN Economic Community (AEC) Framework Agreement, there have been some agreements in terms of different transportation. For instance, there have been preparation to open free trade in many sections, ASEAN Framework Agreement for the Facilitation of Inter-State Transport, ASEAN Framework Agreement on the Facilitation of Goods in Transit, and ASEAN Framework Agreement on Multimodal Transport. All of these agreements will support the efficiency of door-to-door cargo delivery and the delivery across the borders. There has also been attempt to develop the structure and services of land transportation network in order to enhance, in national and international levels, its connection to the gateway of sea and air transportation. At this time, some of the said agreements have already been signed, and the others are on the process. Once all of the agreements have been achieved among the members, the international transportation will be much more convenient in accordance to the concept of Single Market.

Chapter 3
Essence of Transport and Traffic Development Master Plan 2011-2020

Chapter 3 Essence of Transport and Traffic Development Master Plan 2011-2020

3.1 Challenges of Transport and Traffic Development

Challenging issues of the country in general, obtained from a series of seminars with stakeholders in various parts of Thailand and taken into consideration for Transport and Traffic Development Master Plan 2011-2020 or in the next 10 years, are summarized as follows:

(1) Increasing demand for transport due to domestic and international economic growth

(2) Increase in competitive capacity of the country

(3) Changes in transport demand owing to changed economic and social conditions

(4) Response corresponding to transport demand

(5) Level of services and the sufficiency of infrastructure

(6) Integration of Multi-modal Transport (MT)

(7) Balancing of transport and traffic system and equal accessibility to public services

(8) Effects to environment and community

(9) Safety increase and accident reduction

(10) Decrease in pollution from transport sector

(11) Energy reduction in transport sector

(12) Energy savings and promotion of using alternative and clean energy

(13) Ways forward to develop Sustainable Transport system

However, the preparation of Transport and Traffic Development Master Plan not only considers on the above challenging issues, but also focuses on trying to solve or mitigate problems derived from the past to the present, including the expected future problems as follows:

3.1.1 Traffic Congestion

The growth and expansion of the centralized cities, especially in the area of High Rise Buildings, leads to an increased transport demand at the same time during the morning and evening rush hours. As the traffic management still lacks of efficiency, it causes traffic congestion and needs more time on the road. This can be observed from the traffic conditions from the past to the present. Despite of the construction of Mass Rapid Transit System, the traffic conditions have not yet been improved, resulting in the

unnecessary fuel consumption and the negative effects to the investment atmosphere and the expansion of economy, trades and services. Therefore, the development of Transport and Traffic Development Master Plan should consider on transport demand in various types which are likely to change and increase in the future, including encourage people to use more public transport as well as transport connection and implement Travel Demand Management to reduce traffic congestion on the road.

3.1.2 Safety

Statistics on accidents in the country during 2004-2009 showed that the number of the accidents and injured people have been continuously decreased, 8.3% in average and the number of the dead people is likely to be decreased as well, 4.2% per year in average. In 2009, 12,000 persons were killed from the accidents or equivalent to the death rate of 18.23 persons per 100,000 populations. More than 99% of the accidents were from road transport and followed by rail transport, respectively. In general, more than 80% of the accidents were caused by human behavior and mostly with motorcycle and 25% of the dead people from motorcycle accidents aged less than 20 years. If considering from only road accidents, more than 50% occurred in Bangkok and Metropolitan area while 95% of people were killed from the accidents in provinces.

In the case of Thailand, the important challenging issue is the damage value caused by accidents on highways, which is 2.8% of GDP higher than other countries. Normally, this figure should be not more than 1%. The study on economic damage value caused by deaths from road accidents conducted by the Prince of Songkla University showed the damage value of 6 million Baht per person.

In addition, the study of the Asian Development Bank (ADB) showed that Thailand was in the third place among the ASEAN countries on death rate from road accidents and the sixth place of the world. The study from Road Safety Group (RSG) in 2008 indicated that Thailand had an average death toll of 12,000 persons from road accidents, compared to countries that had the approximate number of population, (3,200 persons in the United Kingdom and 4,600 persons in France). These show that the safety standard of transport in Thailand is in the critical level.

3.1.3 Mobility

In the past, demand for transport was mostly in the same direction as the economic growth. Most of the travelers had a tendency to travel more often and had a capacity to pay more on transport. There were also changes in transport volume due to globalization, movement and distribution of production base and demand of skilled labor. Considering from the pressure from these increasing demands, Transport and Traffic Development Master Plan should be developed on sustainable basis which can respond to the changing transport demand of the current livings and is friendly to the environment. The development of transport system should guide or serve various demands of transport and can be equally accessed by all people. In 2010, the road transport was used by 2.4 million people per trip per day and it is expected to be increased to 3.07 million people per trip per day in 2020.

The increase in demand for transport also leads to the development and improvement of the existing infrastructure, one of the challenging issues. The development and improvement of infrastructure should be harmonious and sufficient for transport demand in order to upgrade the level of services and reduce foreseeable traffic congestion, to prevent bottleneck problems and solve the problems of lacking transportation network. For example, in 2010, most regional linking roads had the Level of Service (LOS) B and C. However, if there is no suitable development of infrastructure and facilities, the Level of Service may decrease to C and D, which implies that traffic will be more congested in 2020.

3.1.4 Energy Consumption in Transport Sector

The consumption of energy of Thailand in general has been thoroughly corresponded to the economic condition during the last 10 years before the economic crisis in 1997. The energy consumption of the country has been increased every year at approximately 9% in average while Thai economy (measured by GDP) has been relatively much increased every year at approximately 9% in average as well.

The consumption of energy in transport sector has also changed in the same direction as that of the country in total, which means it rapidly increased before the economic crisis in 1997, decreased during the crisis 1998-2000 and then increased again but not relatively high, not more than 3%, since 2005.

Considering from the energy consumed by various economic sectors, the transport sector has the high proportion of consuming energy, approximately 35-43%. The second place is the industrial sector, which has a tendency to consume more energy during the past 4-5 years and already becomes the sector that consume energy close to the transport sector. Both sectors together highly consume energy at almost three fourth of the overall energy consumption of the country.

Total energy consumed in the transport sector is in the form of petroleum products, except electric energy which is used for underground trains but only in a small amount. Approximately half of energy consumed is diesel fuel used in trucks, passenger cars, vans and pickups. Around one fourth is in the form of benzene which is mostly used in private vehicles. Another 16% is fuel for airplanes and around 5-6% is fuel oil used in ships. The rest are liquid petroleum gas and natural gas which are more highly demanded in the transport sector as these kinds of energy can be replaced of benzene and diesel fuel in various types of cars.

In general, the energy consumption in the transport sector in Thailand has a relatively high rate and the proportion of the energy consumption during the past 20 years has rarely changed. 75-80% of energy is used for land transport (almost on roads) and approximately 14-17% for air transport and around 4-7% for water transport. Therefore, Thailand is the country that depends on fuel importation from abroad. As fuel price in the world market, which is considered as an external factor, is fluctuable and is likely to increase and the production volume of the leading petroleum exporting countries is increasing limited, energy savings should be taken into consideration, including the promotion of adopting various alternative energy sources which are friendlier to the environment. This can be seen from the public policies implemented to encourage using more alternative energy such as Biodiesel Development Plan 2008-2022.

Objectives in the energy consumption in the transport sector should be clearly defined, for example, the fossil consumption in the transport sector should be 2% reduced per year in 10 years and the use of alternative energy should be 10% increased in 10 years.

3.1.5 Effects to Environment

One of the environmental problems from transport is global warming due to the emission of greenhouse gases, particularly CO_2 from vehicle's exhaust pipe, resulting in an increase of world temperature. In addition, transport vehicles also cause noise and air pollution, found mostly in Bangkok and Metropolitan area where the traffic condition is very congested. Passenger cars, both regular and non-regular, are the group of vehicles that produce noise which exceeds the noise standard level at 100 decibels A. Besides are other types of vehicles and trucks or large vehicles that produce the noise level close to the standard. However, the problem on noise pollution is not only derived from vehicles or road transport. The accumulated data on noise effects along the canals produced by passenger boats in Bangkok area according to the Situation Report on Air and Noise Pollution Management in 2008, which used the same standard noise level of not more than 100 decibels, indicated that the noise level in every canal and from every type of boats is higher than the defined standard level, especially in Klong Bangkok Yai and Khong Sanam Chai. Long-tailed boat causes more noise than any other types of boats.

Regarding the air pollution, the problem is caused by the emission of Particulate Matter (PM), Carbon monoxide (CO), Hydrocarbon (HC), Carbon dioxide (CO_2) and black smoke. In Bangkok and Metropolitan area, the existence of PM_{10} is found in the area along the road where vehicles pass by and the value measured from the past exceeds the standard (average standard for 1 year, not more than 50 micrograms per cubic centimeter). In the provinces, this problem is mostly found in Saraburi (exceeding the standard), Ratchaburi, Pra Nakhon Si Ayutthaya, Lampang, Chiang Mai, Nakhon Ratchasima, Nakhon Sawan and Rayong, respectively.

The current situation and data from the Pollution Control Department during 2004-2009 showed that large cities, Bangkok Metropolitan Region in particular, had the volume of air pollution relatively higher than the standard level. Small diesel vehicles (pickups, vans, inter-provincial public buses, public buses of Bangkok Mass Transit Authority (BMTA), non-regular public buses, trucks and minibuses) had the average volume of black smoke much higher than the standard level. This tendency is also likely to be higher as a whole. However, this situation occurs not only in the cities. The emission of Carbon monoxide (CO), Hydrocarbon (HC), including black smoke from vehicles in the provinces of Thailand is likely to be higher but not higher than that in Bangkok Metropolitan Region. The provinces, where the emission of polluted gas is in the high level, are major transport hubs for passenger vehicles and trucks, such as Nakhon Ratchasima, Saraburi, Phitsanulok, Songkhla, etc.

The emission of Carbon dioxide (CO_2) has a high tendency to occur as well. In 2009, CO_2 emitted from the transport sector is equivalent to 50.196 million tons from the total of 196.022 million tons or 25.61%, higher than the industrial sector which emitted CO_2 of 45.149 million tons or 23.03%. The change of transport mode to water and rail transport, including the promotion of using of energy-saving

vehicles, clean energy technology and alternative energy, can reduce pollution and is friendly to the environment.

The capability to travel leads to the living in community. As the transport of human or goods incurs the travel costs, both financial costs and social and environmental costs, we should realize that the development of transport system which promotes mobility and accessibility must reduce effects to people, society, health and environment in the present and in the future. We should consider on the land utilization and the location of centers or areas which bring about large transport activities such as ports, industrial estate, etc., where we may need to set up a green space as buffer zone.

Nowadays, global warming is the world's big problem and makes obvious changes in the world's and Thailand's environment. Pollution from the transport sector affects health and the transport sector takes great part in causing global warming by emitting carbon dioxide gas. Therefore, the reduction of the volume of carbon dioxide and other pollutions in the future is one of the challenges that pave a way forward to the development of sustainable transport.

3.1.6 Competitiveness

According to the Free Trade Agreement, Thailand should take preparations not only on the development of infrastructure and facilities and transport connection, but Thailand should also create immunity and promote transport entrepreneurs to increase competitive capacity. Strong monitoring mechanism should also be implemented. Laws that are considered as obstacle to business operations should be improved. Not only the preventive measures are put in place, but business network should also be established to enable Thai entrepreneurs to compete in the world market. Creating good atmosphere in doing business and building transport competitiveness in every aspect should be promoted as well.

3.2 Directions of Development as to Transport and Traffic Development Master Plan

In response to Sustainable Transportation Development under Thailand's driving framework based on Sufficiency Economy in the Eleventh National Economic and Social Development Plan (2012-2016), which put an emphasis on the balance of the three main development areas: economy, society and environment, transport is used as a tool in creatively stimulating the economy in order for Thailand to be able to compete in international stage. In addition, transport and traffic system is also a basic system that urges various activities of the people of the country, resulting in improved standard of living and livable society. However, the environmental condition, the reduction of pollution and undesired things and the importance given to the global warming (the world ecosystem) should also be taken into consideration. Therefore, goals of the development of transport system must focus on the three aspects, economy, society and environment at the same time and develop to create balance by aiming towards sustainable transportation as shown in Figure 3.2-1.

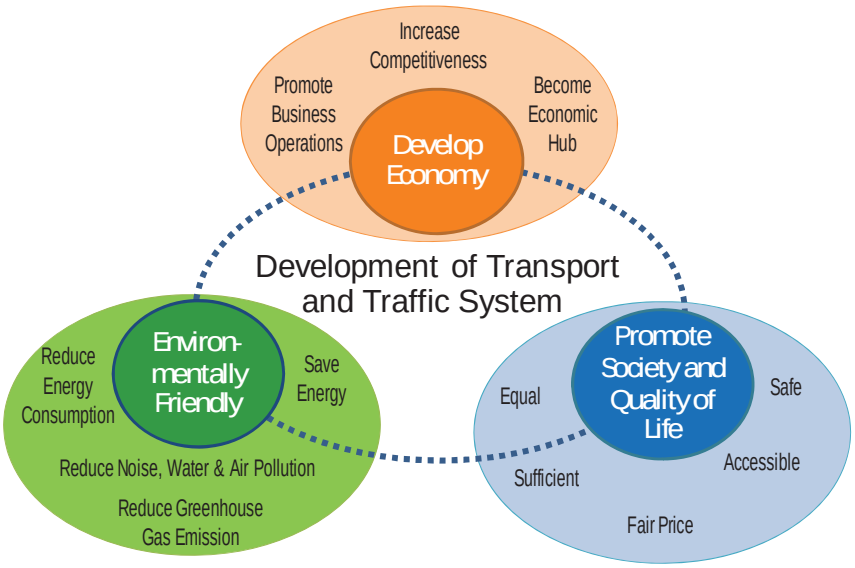


Figure 3.2-1 Essence of Strategy

Transport and Traffic Development Master Plan, which is used to define the directions of the development of Transport and Traffic System in the next 10 years (2011-2020), obtained from the accumulation and the analysis of various data, including the opinions and comments from the stakeholders, leads to define vision, goals, strategies, impacts, outcomes and important key performance indicators as follows:

3.2.1 Vision

Vision for the development of transport system of Thailand for the upcoming 10 years (2011-2020)

"Towards Sustainable Transport"

3.2.2 Goals, Strategies, Outcomes and Impacts

Six goals of Transport and Traffic Development Master Plan are as follows:

Strategies, outcomes and impacts according to the goals of Transport and Traffic Development Master Plan 2011-2020 have been summarized in Table 3.2-1.

Table 3.2-1 Goals, Strategies, Outcomes and Impacts according to Transport and Traffic Development Master Plan 2011-2020

Goals	Strategies	Outcomes	Impacts
G1) To make Thailand a Hub for Connectivity	1.1 Development and improvement to increase network capacity to become international transport hub 1.2 Strengthening of competitive capacity of Thai entrepreneurs	• Increased volume of transport via Thailand • Increased volume of goods transport via Thailand	• Increased GDP • Expansion of international trade • Thailand's increased economic role in the region
G2) To provide efficient transport system, good level of service and accessibility to economic zones and community	2.1 Development and improvement of transport system efficiency to promote the expansion of development area to the region	• More convenient , fast and reliable transport on main routes linking economic zones • Increased level of satisfaction of transport users	• Fast and sustainable growth of economy in the region • Increased opportunities in business operations
G3) To improve and increase safety in travel and transport	3.1 Improvement of infrastructure, vehicle standards and environment to provide qualified and safe transport 3.2 Adjustment of behavior of concerned people to have knowledge, understanding, consciousness and skills on transport safety	• Decreased number of accidents from transport • Decreased number of dead people from transport accidents	• Improved standard of living • Decreased economic and social loss from accidents

Table 3.2-1 Goals, Strategies, Outcomes and Impacts according to Transport and Traffic Development Master Plan 2011-2020 (Continued)

Goals	Strategies	Outcomes	Impacts
G4) To promote energy savings and environmentally friendly transport	4.1 Encouragement and support to shift mode of transport to rail and water transport 4.2 Promotion and development of technology to provide a use of clean and environmentally friendly energy and vehicles	• Decreased ratio and volume of energy consumption in the transport sector • Decreased pollution from the transport sector	• Reduce impacts to global warming • Reduce fuel import dependence • Increase competitive capacity
G5) To upgrade the accessibility and increase the use of public transport	5.1 Development of infrastructure and equal accessibility to public transport	• Increased number of passengers using public transport	• Increase social equality • Improved standard of living • Better community living
G6) To increase mobility in travel and transport	6.1 Improvement and development of infrastructure to reduce bottleneck and traffic problems 6.2 Increase in efficiency of Traffic Management	• Better average speed in travel and transport	• Alleviate traffic congestion • Decrease economic loss from transport and traffic problems

Important key performance indicators (KPI) as shown in Table 3.2-2 will be used to monitor and assess the Master Plan and the relation between the goals of the Master Plan and the goals of Sector Transport is shown in Figure 3.2-2.

Table 3.2-2 Important key performance indicators (KPI) classified by goals of Transport and Traffic Development Master Plan 2011-2020

Goals	Key Performance Indicators (KPI)	Base Line*	Target						Source of indicators
			2011	2012	2013	2014	2015	2016-2020	
Goal 1 : To make Thailand a Hub for Connectivity	Volume of goods transport at border checkpoints (Million tons)	1.10	1.33	1.46	1.60	1.77	1.94	3.13	Statistics from Customs Checkpoints at Nong Khai, Mukdahan, Nakhon Panom, Mae Sai, Chiang Khong, Mae Sot, Sangkhlaburi, Aranyaprathet, Padang Besar and Sadao, Thai Customs Department
	- Nong Khai Checkpoint	0.39	0.47	0.52	0.57	0.63	0.69	1.12	
	- Mukdahan Checkpoint	0.39	0.47	0.52	0.57	0.63	0.69	1.11	
	- Nakhon Phanom Checkpoint	0.26	0.32	0.35	0.38	0.42	0.46	0.51	
	- Mae Sai Checkpoint	0.60	0.73	0.80	0.88	0.97	1.07	1.72	
	- Chiang Khong Checkpoint	0.72	0.87	0.95	1.05	1.15	1.27	2.04	
	- Mae Sot Checkpoint	8.58	10.39	11.42	12.57	13.82	15.21	24.49	
	- Sangkhlaburi Checkpoint	1.28	1.55	1.71	1.88	2.07	2.27	3.66	
	- Aranyaprathet Checkpoint	0.90	1.08	1.19	1.31	1.44	1.59	2.55	
	- Padang Besar Checkpoint	2.62	3.17	3.49	3.84	4.23	4.65	7.49	
	- Sadao Checkpoint								
	Volume of goods transport via Laem Chabang Port (Million TEU)	4.6	5.4	5.9	6.5	7.1	7.8	12.6	Laem Chabang Port and Information Technology and Communication Center, Office of the Permanent Secretary, Ministry of Transport
	Volume of goods transport via Chiang Saen Port 2, Chiang Rai (Million tons)**	-	-	0.52	0.61	0.72	0.84	2.61	Chiang Saen Port

Table 3.2-2 Important key performance indicators (KPI) classified by goals of Transport and Traffic Development Master Plan 2011-2020 (Continued-1)

Goals	Key Performance Indicators (KPI)	Base Line*	Target						Source of indicators
			2011	2012	2013	2014	2015	2016-2020	
	Volume of passengers via Suvarnabhumi Airport (Million pax)	1.5	2.2	2.7	3.3	4.0	4.9	13.2	Annual Report, Airports of Thailand Public Co., Ltd.
	Volume of passengers at Suvarnabhumi Airport (Million pax)	40.5	47.4	50.8	54.3	57.6	61.0	77.3	Annual Report, Airports of Thailand Public Co., Ltd.
	Volume of goods transport via Suvarnabhumi Airport (Tons)	28,447	33,900	36,800	40,100	43,700	47,700	73,300	Annual Report, Airports of Thailand Public Co., Ltd.
	Volume of goods transport at Suvarnabhumi Airport (Million tons)	1.0	1.2	1.3	1.5	1.6	1.7	2.3	Annual Report, Airports of Thailand Public Co., Ltd.
Goal 2 : To provide efficient transport system, good level of service and accessibility to economic zones and community	Average speed of travel on major highway network during rush hours (kilometer per hour)**** - Highway Number 1 : Sector Bangkok-Phitsanulok - Highway Number 2 : Sector Bangkok-Nakhon Ratchasima - Highway Number 3 : Sector Bangkok-Chonburi - Highway Number 4 and 41 : Sector Bangkok-Surat Thani	N/A N/A N/A N/A	N/A N/A N/A N/A	N/A N/A N/A N/A	N/A N/A N/A N/A	N/A N/A N/A N/A	N/A N/A N/A N/A	N/A N/A N/A N/A	Department of Highways
	Satisfaction of people in using Highways not less than (%)	78	80	82	85	87	90	90	Department of Highways

Table 3.2-2 Important key performance indicators (KPI) classified by goals of Transport and Traffic Development Master Plan 2011-2020 (Continued-2)

Goals	Key Performance Indicators (KPI)	Base Line*	Target						Source of indicators
			2011	2012	2013	2014	2015	2016-2020	
	Satisfaction of users in Inter-city Public Transport System	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Department of Land Transport
	Satisfaction of transport users in Highways not less than (%)	100	100	100	100	100	100	100	Department of Rural Roads
	Average speed of normal trains (kilometer per hour)	47	50	60	70	80	85	90	State Railway of Thailand
	Average speed of special express trains (kilometer per hour)	61	72	75	82	89	95	100	State Railway of Thailand
	Average speed of goods trains (kilometer per hour)	35	41	44	47	53	55	65	State Railway of Thailand
	Punctuality of trains in social aspect (%)	52	58	61	66	74	84	90	State Railway of Thailand
	Punctuality of trains in commercial aspect (%)	50	60	65	70	78	88	90	State Railway of Thailand
	Punctuality of goods trains in general (%)	26	28	30	35	40	50	80	State Railway of Thailand
	Volume of domestic water transport (Million tons)								Information Technology and Communication Center, Office of the Permanent Secretary, Ministry of Transport
	- Via waterways	41.6	43.7	46.1	48.7	51.5	54.3	63.9	
	- Along the shorelines	29.3	30.9	32.6	34.5	36.4	38.4	45.2	
	Volume of domestic passengers at regional airports (Million pax)	26.18	28.48	29.70	30.98	32.31	33.70	41.59	Annual Report, Airports of Thailand Public Co., Ltd. and Department of Civil Aviation

Table 3.2-2 Important key performance indicators (KPI) classified by goals of Transport and Traffic Development Master Plan 2011-2020 (Continued-3)

Goals	Key Performance Indicators (KPI)	Base Line*	Target						Source of indicators
			2011	2012	2013	2014	2015	2016-2020	
Goal 3 : To improve and increase safety in travel and transport	- Number of dead people in road traffic accidents for the whole country (pax)	11,583	11,000	10,500	10,000	9,500	9,000	5,500	Department of Land Transport
	- Number of dead people in road traffic accidents in highway networks under the Ministry of Transport (pax)***	1,517	1,450	1,380	1,300	1,230	1,150	750	TRAM System Information Center, Ministry of Transport
	- Death rate from road traffic accidents for the whole country (pax per 100,000 population)	18.23	17.0	16.0	15.0	14.0	13.0	8.3	Department of Land Transport
	- Death rate from road traffic accidents in highway networks under the Ministry of Transport (pax per 100,000 population)	2.38	2.23	2.09	1.96	1.83	1.70	1.2	TRAM System Information Center, Ministry of Transport
	Number of rail transport accidents (times)	553	500	475	450	425	400	280	State Railway of Thailand
	Number of public water transport accidents (times)	14	13	12	11	10	9	7	Marine Department
Goal 4 : To promote energy savings and environmentally friendly transport	Ratio of volume of goods transport by rail (%)	2.2	2 .5	3.0	3.5	4.0	4.5	5.0	Information Technology and Communication Center, Office of the Permanent Secretary, Ministry of Transport

Table 3.2-2 Important key performance indicators (KPI) classified by goals of Transport and Traffic Development Master Plan 2011-2020 (Continued-4)

Goals	Key Performance Indicators (KPI)	Base Line*	Target						Source of indicators
			2011	2012	2013	2014	2015	2016-2020	
	Ratio of volume of water goods transport (%) - Via waterways - Along the shorelines	 8.2 5.8	 8.5 6.0	 8.8 6.2	 9.1 6.4	 9.4 6.6	 10.0 7.0	 10.5 7.5	Information Technology and Communication Center, Office of the Permanent Secretary, Ministry of Transport
	Energy Consumption Ratio in transport sector (%)	35	34	33	32	31	30	< 30	Thailand energy situation annual report, Department of Alternative Energy Development and Efficiency
	Volume of emission of greenhouse gases, such as CO_2 (Million tons)	50	49	48	47	46	45	40	Automotive Air Pollution Division, Air Quality and Noise Management Bureau, Pollution Control Department
Goal 5 : To upgrade the accessibility and increase the use of public transport	Ratio of public transport passengers to total passengers in Bangkok Metropolitan Region (%)	45	46	47	48	49	50	60	Office of Transport and Traffic Policy and Planning (OTP)
	Ratio of inter-city public transport passengers to total inter-city passengers (%) ****	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Office of Transport and Traffic Policy and Planning (OTP)

Table 3.2-2 Important key performance indicators (KPI) classified by goals of Transport and Traffic Development Master Plan 2011-2020 (Continued-5)

Goals	Key Performance Indicators (KPI)	Base Line*	Target						Source of indicators
			2011	2012	2013	2014	2015	2016-2020	
	Number of newly requested routes of inter-city public transport (route)	-	Increased from last year	Increased from last year	Increased from last year	Increased from last year	Increased from last year	Increased from last year	Ministry of Transport
	Satisfaction of public transport passengers (%)	N/A	70	70	70	70	70	70	Department of Land Transport
	Average speed of inter-city passenger buses (kilometer per hour)****	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Department of Land Transport
	Average speed of city passenger buses (including Bangkok Metropolitan Region) (kilometer per hour)****	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Department of Land Transport, Bangkok Mass Transit Authority and Traffic and Transportation Department (TTD), Bangkok
	Punctuality of inter-city passenger buses (%) ****	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Department of Land Transport
	Punctuality of city passenger buses (including Bangkok Metropolitan Region) (%) ****	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Department of Land Transport, Bangkok Mass Transit Authority and Traffic and Transportation Department (TTD), Bangkok

Table 3.2-2 Important key performance indicators (KPI) classified by goals of Transport and Traffic Development Master Plan 2011-2020 (Continued-6)

Goals	Key Performance Indicators (KPI)	Base Line*	Target						Source of indicators
			2011	2012	2013	2014	2015	2016-2020	
Goal 6 : To increase mobility in travel and transport	Average speed of travel in Bangkok Metropolitan Region during rush hours (kilometer per hour)	19.4	20	21	22	23	25	30	Traffic and Transportation Department (TTD), Bangkok and Office of Transport and Traffic Policy and Planning (OTP)
	Average speed of travel in regional city area during rush hours (kilometer per hour)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Office of Transport and Traffic Policy and Planning (OTP)

Remarks: Latest data as of 2008-2009

** Expectations from the study result of the Economic, Engineering and Environmental Feasibility Study and Detailed Design Project for the Construction of Chiang Saen Port 2, Marine Department, 2005.

*** Divisions under the Ministry of Transport, i.e. Department of Highways, Department of Rural Roads and Expressway Authority of Thailand

**** Future indicators in order for concerned divisions to implement and extend the results. Still no base line and target.

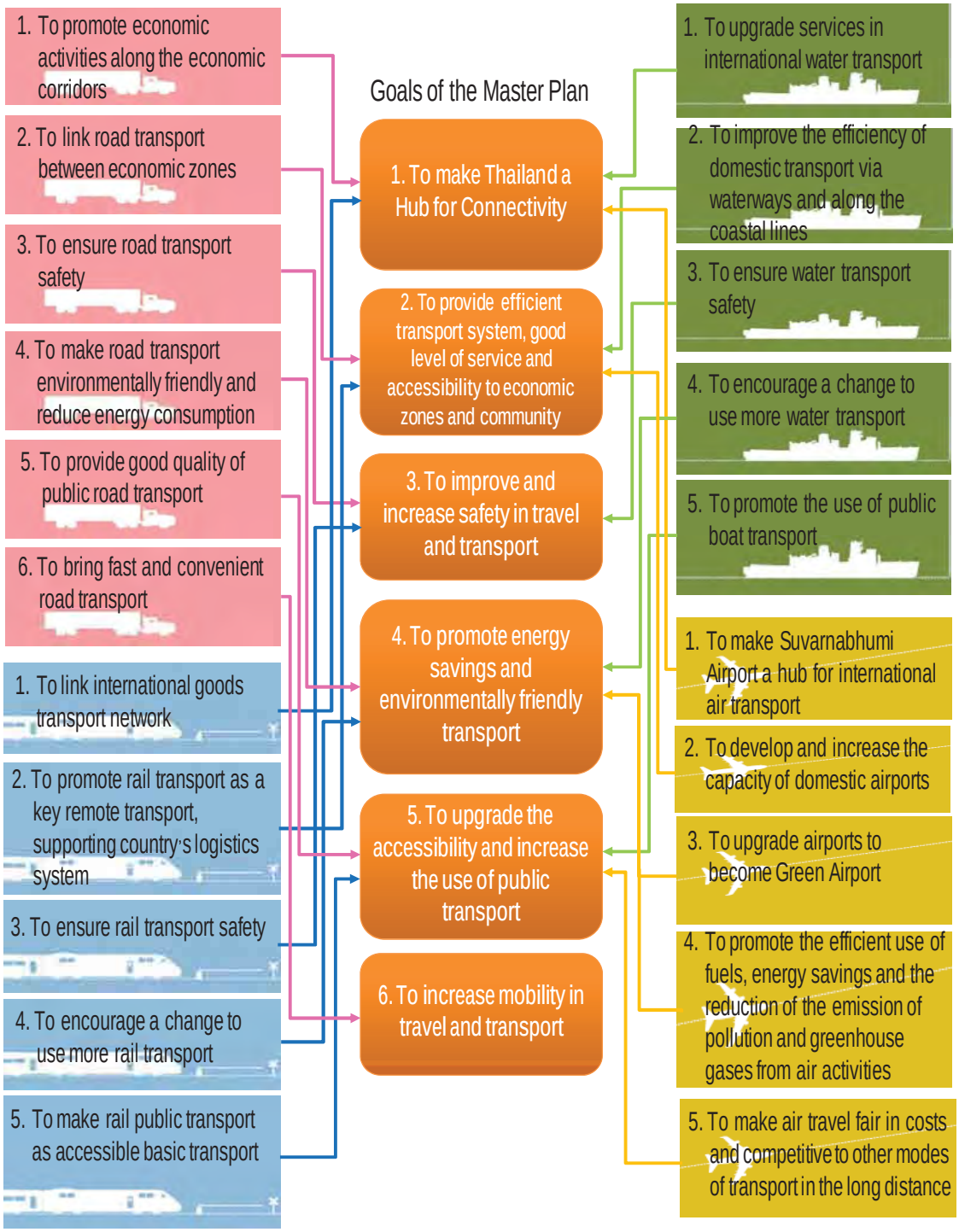


Figure 3.2-2 Relation between the goals of Transport and Traffic Development Master Plan and those of Strategic Plan of Transport Sector Development

Chapter 4
Strategic Plan of Transport Sector Development 2011-2020

Chapter 4 Strategic Plan of Transport Sector Development 2011-2020

To efficiently implement Transport and Traffic Development Master Plan, strategic plan of Transport and Traffic Development Master Plan needs to be made in depth to the level of strategies/measures of transport sector. This is because each transport sector has different contexts, level of development, user targets, responsible agencies, pattern of operations, management system and service forms. Strategic Plan of Transport Sector Development will be classified based on major sectors of transport, which are road transportation, rail transportation, water transportation and air transportation.

In addition, Strategic Plan of Transport Sector Development helps to more clearly set directions, goals and development framework for transport of various sectors. Responsible agencies or concerned people will together understand the operations of each transport sector, can define suitable development and can integrate the development of other related transport sector. This will lead to the appropriate development of transport system in Thailand as a whole, in line with transport demand of each sector and of the country by adopting the same goals and strategies of Transport and Traffic Development Master Plan

Therefore, the Ministry of Transport prepares Strategic Plan of Transport Sector Development 2011-2020 by identifying the operational directions according to Transport and Traffic Development Master Plan to serve the country's demand and bring about the integration of the roles of each transport sector and the planning between each sector to drive country's transport policy and provide all necessary measures needed to be implemented, resulting in the success of development as well as the efficient and clear operations.

4.1 Road Transportation

The development of road transportation faces important challenges in defining goals and development strategies. For example, the development of infrastructure of road networks along NSEW economic corridors to cover and link to the neighboring countries and between regional cities of the country in order to support the expansion of the economy. Road transportation, one of the factors in developing the country, still plays an important role in domestic transport in the form of door to door services and acts as a basis infrastructure that links to other sectors of transport (multi-modal transport) as well as a feeder system. Therefore, the efficient development of goods terminal station and goods distribution center will help to reduce logistics costs. The development of public transport system, particularly buses, needs the improvement of services, bus conditions, route management and supervision. Not only in Bangkok Metropolitan Region, the public bus system in provinces and inter-provincial buses should also be developed

to provide good services and sufficient to meet the existing demand. Moreover, safety issues are also very important as most accidents and dead people are from the road transport. As the year 2010 is the year of Safety Transport, the goal is set to reduce half of the number of death from road transportation in the next 10 years. Regarding the effects to the environment, fuel import dependency must be reduced and turn to use more alternative and clean energy. Technology on energy saving vehicles should also be developed. The goals, strategies, outcomes and indicators for road transportation sector have been identified and showed in the Table 4.1-1.

Vision of road transportation

"Road transportation - Safe, Throughout the country, Respect to environment"

Table 4.1-1 Goals, Strategies, Outcomes and Indicators of Road Transportation

Goals	Strategies	Outcomes	Indicators
1. To promote economic activities along the economic corridors	1.1 Preparation of routes along the economic corridors	• Routes are ready to support the growth of trades and services along the economic corridors	• Volume of cargo delivery at border checkpoints • Volume of passes at border checkpoint
2. To link road transport between economic zones	2.1 Development of networks and facilities for transport between economic zones	• Routes are ready to support traffic and transport volume of passengers and goods between economic zones • Convenience on transportation	• Average speed of transport on major highway networks during rush hours • People are satisfied with using highways • Satisfaction of transport users on rural roads • Volume of road transport between economic zones, • Volume of cargo delivery by road between economic zones

Table 4.1-1 Goals, Strategies, Outcomes and Indicators of Road Transportation (Continued-1)

Goals	Strategies	Outcomes	Indicators
3. To ensure road transport safety	3.1 Prevention of road accidents 3.2 Solutions for road accidents	• Increased safety on road traffic and transport	• Number of dead people from road transport accidents • Number of dead people from road transport accidents on road networks under the Ministry of Transport • Death rate from road transport accidents • Death rate from road transport accidents on road networks under the Ministry of Transport
4. To make road transport environmentally friendly and reduce energy consumption	4.1 Energy management for road transport 4.2 Environmental management for road transport	• Energy savings and reduced emission of pollution from road transport	• Ratio of using energy in road transport sector • Pollution from road transport sector
5. To provide good quality of public road transport	5.1 Increase of quality and services in public road transport system 5.2 Improvement of public transport accessibility	• Increased use of public road transport system	• Number of public bus passengers in Bangkok Metropolitan Region • Ratio of using public bus in Bangkok Metropolitan Region • Number of inter-city public bus passengers • Ratio of using inter-city public bus • Satisfaction of public bus passengers

Table 4.1-1 Goals, Strategies, Outcomes and Indicators of Road Transportation (Continued-2)

Goals	Strategies	Outcomes	Indicators
			• Average speed of inter-city passenger bus • Average speed of inter-city passenger bus in the city area • Punctuality of inter-city passenger bus • Punctuality of passenger bus in the city area
6. To bring fast and convenient road transport	6.1 Reduction of traffic problems 6.2 Reduction of traffic bottlenecks 6.3 Traffic and Incident Management	• Convenient and fast travel and transport	• Average speed of travel in Bangkok Metropolitan Region during rush hours • Average speed of travel in regional cities during rush hours

Important flagship projects for road transportation sector 2011-2020 are summarized as follows:

(1) International Highway Network Development Project (DOH)

(2) Multi-modal Highway Construction to Support Multimodal Transport Project (DOH)

(3) Bridge Me Klong over River at Nakhon Phanom Construction Project, (DOH)

(4) Bridge Me Klong over River at Amphor Chiang Khong, Chiang Rai Province Construction Project, (DOH)

(5) Inter-City Motorway Project : Bang Pa-In-Saraburi-Nakhon Ratchasima 199 kilometers (DOH)

(6) Inter-City Motorway Project : Chonburi-Pattaya-Map Ta Put 89 kilometers (DOH)

(7) Inter-City Motorway Project : Bang Yai-Ban Pong-Kanchanaburi 98 kilometers (DOH)

(8) Inter-City Motorway Project : Nakhon Pathom-Samut Songkhram-Cha-am 118 kilometers (DOH)

(9) Inter-City Motorway Project : Bang Pa-In-Nakhon Sawan 199 kilometers (DOH)

(10) Accelerating Project to Widening Main Roads into 4-Lane Highway (Phase 2) (DOH)

(11) Increasing Highway Efficiency Project (DOH)

(12) Highway Safety Project (DOH)

(13) Rest Area for Large Vehicles on Primary Highway Routes Project (DOH)

(14) Developed Highway Project (DOH)

(15) Traffic congestion mitigation in Bangkok and Vicinities and Major Cities Project (DOH)

(16) Rural Roads Network for Transport Connectivity (DRR)

(17) Road Improvement Project (DRR)

(18) Project on the construction of 31 bridges across railway lines (DRR)

(19) Project on the installation of barriers and automatic flashing light (DRR)

(20) Project to solve traffic problems in suburban area and provinces (DRR)

(21) Project on the construction of a bridge over Chao Phraya River on Nonthaburi Road (DRR)

(22) Connecting Road Construction Project : Ratchaphruek Road-Kanchanapisek Road, Section East-West Line (DRR)

(23) Connecting Road Construction Project : Ratchaphruek Road-Kanchanapisek Road, Section North-South Line (DRR)

(24) Si Rat - Bangkok Metropolis Outer Ring Road Expressway Project (EXAT)

(25) Truck Terminal Station Construction Project in 12 transport hub provinces and border provinces (DLT), i.e., 1) Chiang Mai 2) Songkhla 3) Nong Khai 4) Ubon Ratchathani 5) Chiang Rai 6) Tak 7) Srakaew 8) Mukdahan 9) Surat Thani 10) Nakhon Ratchasima 11) Khon Kaen and 12) Nakhon Sawan

(26) Project on the development and improvement of 5 vehicle inspection systems (DLT)

(27) Project on the construction of a driving school center, Bang Ping, Samut Prakan (DLT)

(28) Project on Noise Level Testing when Driving (DLT)

(29) Passenger Terminal Construction Project (DLT)

(30) Project on the procurement of 4,000 air-conditioned CNG buses (BMTA)

(31) Project on the construction of office and bus garage in the area of Bang Ping airways station (BMTA)

(32) Project on the improvement of old bus garages and construct new bus garages for new air-conditioned CNG buses (BMTA)

(33) Project on the procurement of air-conditioned CNG buses in place of air-conditioned diesel buses (BMTA)

Important measures for road transportation sector 2011-2020 are summarized as follows:

(1) Concrete measure for Speed Management (DOH)

(2) Concrete definition and implementation of transport standards, such as passenger and truck drivers needs to do a log book (DOH)

(3) Measure to enforce traffic regulations and traffic violation punishment (DOH)

(4) Strict measure on truck weight limit (DOH)

(5) Measure to enforce strict safety standards for vehicles and public transport drivers (DOH)

(6) Measure to develop technologies in accident prevention, accident notification and safety information (DOH)

(7) Measure to define regulations on the management and supervision of the use of international roads (DLT)

(8) Measure to promote the use of helmets and safety belts (DLT)

(9) Measure to promote eco-driving, which might be used in connection with travelers information system and technology for eco-driving (DLT)

(10) Measure to promote the use of non-motorized transport, by developing infrastructure to support non-motorized transport (DLT)

(11) Measure to promote a walk, a use of bicycles and electric bicycles (DLT)

(12) Measure to regulate vehicles operations, leading to qualified and systemized public transport (buses, passenger vans, private vans, taxis and other public vehicles) (DLT)

(13) Measure to plan and develop Transit Management Center and track public passenger vehicles (buses, taxis, vans and other public vehicles) (DLT)

(14) Measure to initiate to use of price measure to help handicapped, underprivileged people, e.g., prices set for this group (BMTA)

(15) Measure to implement subsidy system for public service obligation (BMTA)

(16) Measure to provide park and ride points (MRTA & BMTA)

(17) Measure to invest for improving the whole public transport system (public buses), which may be classified as PPP investment (BMTA and Bor Kor Sor)

(18) Measure to set up plans for improving road conditions in order to reduce traffic and road congestion (EXAT, DoH and DRR)

(19) Measure to plan and develop incident management and emergency response system (EXAT, DoH and DRR)

(20) Measure to initiate the use of price measure with transport in city area, e.g., paying fee for parking space (OTP)

(21) Measure to establish agencies taking care of developing Intelligent Transport System and coordinating between agencies (Ministry) and between public and private sectors (MOT)

4.2 Rail Transportation

Rail transportation will play an important role in the future, especially in international transport and transport between major regional cities of the country as rail transportation can accommodate lots of passengers and goods in the long distance, which reduces the costs of transport, saves energy and is environmentally friendly. Therefore, rail transportation should be promoted to become a backbone transport. Public rail transportation in the city area, such as that of BTS and MRT which can load lots of passengers, helps mitigating traffic problems. As the public sector also encourages more and more a modal shift from road transportation to rail transportation, the improvement of rail transportation efficiency should be therefore implemented, for example, the increase of networks to cover and link to other sectors of transport, the development of double track rail to reduce the problem of railway shunting, and the development of High Speed Train to reduce time and increase punctuality. Another important issue is the organizational reform of State Railways of Thailand (RST) to help increasing capacity in operations, management and supervision, developing the quality of services and reducing operating costs in rail business. The goals, strategies, outcomes and indicators for the rail transportation sector have been identified and showed in the Table 4.2-1.

Vision of rail transportation

"Key rail-based mode, Support all transport, Stabilize efficiency, Conserving environment"

Table 4.2-1 Goals, Strategies, Outcomes and Indicators of Rail Transportation

Goals	Strategies	Outcomes	Indicators
1. To link international cargo delivery network	1.1 Development and improvement of rail networks to link international cargo delivery	• More convenient, fast and reliable international cargo delivery, leading to increased volume of cargo delivery	• Volume of cargo delivery by rail via ICD Lat Krabang
2. To promote rail transport as a key remote transport, supporting country's logistics system	2.1 Development and improvement of rail infrastructure to link economic cities in the country	• More convenient, fast and reliable passengers and cargo delivery between economic zones	• More convenient, fast and reliable passengers and cargo delivery between economic zones

Table 4.2-1 Goals, Strategies, Outcomes and Indicators of Rail Transportation (Continued-1)

Goals	Strategies	Outcomes	Indicators
	2.2 Restructuring of rail operations to provide efficient and reliable services 2.3 Encouragement of using technology to improve rail transport efficiency	• Increased efficiency of operations and management	• Punctuality of goods trains • Average speed of ordinary trains • Average speed of special express trains • Average speed of goods trains • Volume of train passengers - North Line - South Line - Upper North East Line - Lower North East Line • Volume of cargo delivery by train - North Line - South Line - Upper North East Line - Lower North East Line • Financial status of SRT (Reduce deficit)
3. To ensure rail transport safety	3.1 Improvement and maintenance of infrastructure and facilities to be ready to operate safely 3.2 Prevention of accidents from rail operations	• Decreased number of accidents, injured and dead people as well as goods damage from rail transport	• Number of accidents from rail transport • Number of injured people from rail transport • Number of dead people from rail transport

Table 4.2-1 Goals, Strategies, Outcomes and Indicators of Rail Transportation (Continued-2)

Goals	Strategies	Outcomes	Indicators
4. To encourage a change to use more rail transport	4.1 Encouragement to travel and transport by rail	• Increased volume of rail travel and transport • Decreased emission of pollution from transport sector	• Ratio of volume of rail transport • Volume of emission of greenhouse gases from transport sector
5. To make rail public transport as accessible basic transport	5.1 Development and improvement of accessibility to convenient and fast public rail transport	• Accessibility and equality to use rail services (handicapped, underprivileged people, elderly people, children, women and low income people) • Increased satisfaction of passengers	Volume of passengers using - BTS - MRT • Volume of train passengers in social aspect of SRT • Level of satisfaction of passengers, especially handicapped, underprivileged people, elderly people, children, women and low income people

Important flagship projects for rail transportation sector 2011-2020 are summarized as follows:

(1) The 2nd ICD Construction Project (SRT)

(2) Double Track Construction Project, Eastern Coast Line, Section Chachoengsao-Khlong Sip Kao-Kaeng Khoi (SRT)

(3) Double Track Construction Project, Eastern Coast Line, Section Chachoengsao-Sriracha-Laem Chabang (SRT)

(4) Double Track Construction Project, Phase 2, Kaeng Khoi-Bua Yai Line (SRT)

(5) Double Track Construction Project, Mab Kabao-Jira Road Line (SRT)

(6) Double Track Construction Project, Nakhon Pathom-Nong Pla Duk-Hua Hin Line (SRT)

(7) Double Track Construction Project, Lopburi-Pak Nam Pho Line (SRT)

(8) Double Track Construction Project, Jira-Khon Kaen Line (SRT)

(9) Double Track Construction Project, Prachaupkhirikhan-Chumphon Line (SRT)

(10) Double Track Construction Project, Phase 2, Pak Nam Pho-Tapan Hin Line (SRT)

(11) Double Track Construction Project, Phase 2, Hua Hin- Prachaupkhirikhan Line (SRT)

(12) Double Track Construction Project, Phase 2, Chumphon-Surat Thani Line (SRT)

(13) Rail Track Improvement Project, Phase 5 (SRT)

(14) Rail Track Improvement Project, Phase 6 (SRT)

(15) Bridge Improvement Project (SRT)

(16) Project on the installation of Telecommunication Networks (SRT)

(17) Traffic Light Signaling System Project (SRT)

(18) Project on the development of landbridge linking ports in the Gulf of Thailand and those along the Andaman Coast (SRT)

(19) Project on the improvement of unsafe rail tracks, distance 2,406 kilometers (SRT)

(20) Project on the installation of level crossing barriers (new barriers) (SRT)

(21) Project on the procurement and improvement of barriers (SRT)

(22) Project on the installation of fences along rail areas (SRT)

(23) Project on the refurbishment of 56 locomotives (SRT)

(24) Kaeng Khoi Locomotive Depot Construction Project (SRT)

(25) Locomotive depots at Sriracha and Unit 10 Ladkrabang Construction Project (SRT)

(26) Project on the procurement of electric diesel locomotives in place of 50 GE (SRT)

(27) Project on the procurement of 13 electric diesel locomotives (20 tons per axle) (SRT)

(28) Project on the construction of Container Yards (CY) in regional areas (SRT)

(29) Project on the procurement of 15 new passenger rails for commercial services (SRT)

(30) Red Line Commuter Train Project, Section Bang Sue-Taling Chan (SRT)

(31) MRT Red Line Project, Section Bangsue-Rangsit-Thammasat Rangsit (SRT)

(32) MRT Red Line Project, Section Bangsue-Phayathai-Makkasan-Hua Mak (SRT)

(33) MRT Pink Line Project, Section Khae Rai-Minburi (SRT)

(34) MRT Orange Line Project, Section Bangkapi-Minburi (SRT)

(35) MRT Purple Line Project, Section Tao Poon-Rajburana (SRT)

(36) MRT Purple Line Project, Section Bang Yai-Bang Sue (SRT)

(37) MRT Blue Line Project, Section Bang Sue-Tha Phra (SRT)

(38) MRT Blue Line Project, Section Hua Lamphong-Bang Khae (SRT)

(39) MRT Green Line Project, Section Bearing-Samut Prakan (SRT)

(40) MRT Green Line Project, Section Mo Chit-Saphan Mai (SRT)

Important measures for rail transportation sector 2011-2020 are summarized as follows:

(1) Measure to improve regulations on rail transportation in order to support international cargo delivery and via borders, e.g., standardization of girder and break system (SRT)

(2) Measure to promote the capability of Logistics Service Providers (SRT)

(3) Measure to restructure rail operations and plans to improve internal management structure (SRT)

(4) Measure to promote the supervision of rail transport by urging the implementation of the draft of Transport Management Act …, including the establishment of Supervising Committee on Rail Transport (SRT)

(5) Measure to promote the development of insurance and indemnity system from rail accidents (SRT)

(6) Measure to increase the strictness of mental and physical inspection of rail drivers and the compliance to the procedures of controlling rail cars and to improve skills of controlling the rail cars in emergency situation. (SRT)

(7) Measure to control operating schedules and increase enough operators (SRT)

(8) Measure to create cooperation between community and public agencies to prevent accidents from rail intersection points, by strictly controlling and checking the smuggling of making shortcuts through rail intersection points of community (SRT)

(9) Measure to promote the registration and certification of rail development projects to become the projects that reduce the emission of greenhouse gases according to Clean Development Mechanism (CDM) (SRT)

(10) Measure to promote the use of public rail transport, such as the increase of parking spaces and provide Park & Ride points (SRT and MRTA)

(11) Financial measure to provide yearly Public Service Obligation (PSO) transport services by promoting equal accessibility to handicapped people, elderly people, children and low income people and providing basic services in low prices or no fares collected.

4.3 Water Transportation

Water transportation should be promoted to have more volume of transport as rail transportation (Modal Shift) since this sector of transport incurs lowest costs per unit and is the key of international cargo delivery. The water transportation should also be developed by considering on the linkage of other sectors of transport to ports as well as relying on the advantage of locations where water transportation can be undertaken from both the Gulf of Thailand coast and Andaman Sea coast. Landbridge can also be developed to link deep sea ports of the two coasts. In addition, the efficiency of Laem Chabang Port should be upgraded to become a world class green port. Regarding the issue of passenger transport, there are a large

number of passengers using public boat transport in the city due to the demand to travel to Central Business District (CBD). Therefore, we should improve the scenery along the canals to be beautiful and pleasant, construct a convenient walk path along the canals and upgrade the accessibility and use of public boat. This is expected to be a way to help mitigating the congested condition of traffic in Bangkok Metropolitan Region. The goals, strategies, outcomes and indicators for the water transportation sector have been identified and showed in the Table 4.3-1.

Vision of water transportation

"Water and Maritime Transport: Efficient, Convenient, Safe, towards World-class standard"

Table 4.3-1 Goals, Strategies, Outcomes and Indicators of Water Transportation

Goals	Strategies	Outcomes	Indicators
1. To upgrade services in international water transport	1.1 Development and increase of the capacity of infrastructure of international water transport 1.2 Improvement of efficiency of operations and services of water and maritime transport	• Infrastructure of international water transport has a capacity to support the expansion of economy in the future • Increased efficiency of gateways • Decreased costs of transport	• Volume of cargo delivery via Laem Chabang Port • Volume of cargo delivery via Chiang Saen Port 2
2. To improve the efficiency of domestic transport via waterways and along the shorelines	2.1 Improvement of infrastructure of transport via waterways and along the coastal lines 2.2 Improvement of operating procedures of transport via waterways and along the coastal lines 2.3 Development of qualified and adequate personnel for water and maritime transport	• More efficient infrastructure of domestic water transport, competitive to other modes of transport • Reduced delay of domestic water transport • Increased number of personnel for water and maritime transport	• Volume of cargo delivery via domestic waterways • Volume of cargo delivery along the domestic shorelines • Number of personnel in water and maritime transport

Table 4.3-1 Goals, Strategies, Outcomes and Indicators of Water Transportation (Continued)

Goals	Strategies	Outcomes	Indicators
3. To ensure water transport safety	3.1 Development and improvement of safe infrastructure for water transport 3.2 Encouragement of using technology to improve the safety of water travel and transport	• Increased safety for water travel and transport	• Number of accidents from public water passenger transport
4. To encourage a change to use more water transport	4.1 Encouragement of using water transport 4.2 Encouragement of using technology with boats for energy savings and friendly to the environment	• Increased water cargo delivery • Decreased pollution from water transport	• Ratio of domestic cargo delivery via waterways • Ratio of domestic cargo delivery along the coastal lines • Level of noise pollution from passenger boats
5. To promote the use of public boat transport	5.1 Development and improvement of accessibility to public boat transport	• Increased use of public boat transport	• Volume of passengers using public boat transport

Important flagship projects for water transportation sector 2011-2020 are summarized as follows:

(1) 2nd Chiang Saen Port Construction Project, Chiang Rai (MD)

(2) Khlong Yai Multi-Purpose Port Construction Project, Trat (MD)

(3) Pak Bara Deep Sea Port Construction Project, Satun (MD)

(4) Deep Sea Port on the Lower Gulf of Thailand Construction Project, Phase 1 (2nd Songkhla Port) (MD)

(5) Ban Na Klua Port Construction Project, Trang (MD)

(6) Port Construction Project, Chumphon (MD)

(7) Domestic Water Course Dredging Project (contract) (MD)

(8) Coastal Water Course Dredging Project (contract) (MD)

(9) Project on the procurement of boat tracking system and CCTV equipments for safety in Khlong San Saeb (MD)

(10) Project on the installation of safety alert system at public ports and electronic map system of Chao Phraya River (MD)

(11) Project on the procurement and installation of public boat real-time tracking system in Chao Phraya River (MD)

(12) Project on the procurement of goods and passenger ships tracking system in the area of Chiang Saen Port, Chiang Rai (MD)

(13) Project on the construction of terminal station for waterways transport for energy savings at Amphoe Ta Rue, Phra Nakhon Si Ayutthaya (MD)

(14) Project on the construction of terminal station for waterways transport for energy savings at Amphoe Mueang, Ang Thong (MD)

(15) Project on the development and improvement of ports in Chao Phraya River to link with land and rail transport (MD)

(16) Project on the development of 10 passenger ports in Chao Phraya River (MD)

(17) Project on the preparation towards introducing operational management of 2nd Chiang Saen Port (PAT)

(18) Laew Chabang Port Development Project, Phase 3 (PAT)

(19) Project on the development of Railway Container Transport Center at Laem Chabang Port (PAT)

(20) Project on the development of coastal ports (Port A_O) at Laem Chabang Port (PAT)

Important measures for water transportation sector 2011-2020 are summarized as follows:

(1) Measure to accelerate the time using in consideration of study results of Environmental Impact Assessment (EIA) and Health Impact Assessment (EIA) of water infrastructure Development (MD)

(2) Defining tax measures and controlling freight and containers surcharges

(3) Measure to develop ASEAN Connectivity in terms of infrastructure, rules and regulations and supervision to have the same standard under the international cooperation framework (MD)

(4) Measure to promote the strength of international freight operators, especially tax measures (MD)

(5) Measure to define the cooperation of creating market and goods production base, including services in the region (MD)

(6) Measure to coordinate with concerned agencies to solve the problem of the height of bridge foundation pillars, obstacles and barriers in waterways (MD)

(7) Measure to monitor and assess operational performances and define Key Performance Indicators (KPI) (MD)

(8) Measure to coordinate with the Customs Department to reduce procedures, documentation and customs protocols for water transport (MD)

(9) Measure to establish National Port Committee, acting to supervise and set directions of ports development in Thailand (MD)

(10) Measure to establish funds for promoting maritime business (MD)

(11) Measure to improve, amend, expand and draft rules and regulations as well as related Maritime Laws to facilitate the operations of water transport

(12) Measure to allocate scholarships on water and maritime transport education by government, including trainings and study trips (inside and outside the country) and equipment and learning materials can be imported without taxes (MD)

(13) Measure to develop curriculum system (academics, languages, skills, operations and IT knowledge) and increase academic institutes on water and maritime transport to provide qualified and adequate personnel (MD)

(14) The establishment of Information Center on Water and Maritime Transport to build database system (MD)

(15) The establishment of an agency equivalent to "Department" to support missions on the management of water and maritime transport (MD)

(16) Measure to establish Rescue Center for waterway and coastal transport (MD)

(17) Measure on setting up seminars, tests and giving knowledge on safety to boat driver and regular users (MD)

(18) Measure to strictly implement rules and regulations as well as penalties (MD)

(19) Measure to develop business operational standards for water transport and indicators to indicate the quality of operations (MD)

(20) Measure on taxes which facilitate the operations of entrepreneurs in order to create motivation in doing business (MD)

(21) Measure to provide funding sources with low interest and long-term installments for entrepreneurs to lend to invest in business development and improve the quality of services (MD)

(22) Measure to control and define standard price schedule of freight surcharges (MD)

(23) Measure to promote the integrated ship repair and building within the country, by establishing repair center and building docks complying with international standard (MD)

(24) Measure to establish a research center on the new technology of clean ship and alternative energy (MD)

(25) Measure to establish public boat control center in Chao Phraya River (MD)

(26) Measure to control and supervise suitable public boat fares (MD)

(27) Measure to provide a number of free public boats (MD)

(28) Measure to establish Clearing House to manage Common Ticket System (MD)

4.4 Air Transportation

To develop the country's economy towards sustainability and to prepare for Free Trade Agreement, air transportation needs to play a role as Aviation Hub of the region. Becoming an Aviation Hub attracts a large amount of money to the country from air business operations, both goods and passengers transport, which are expected to increasingly grow from the liberation of air services, including its business continuity such as maintenance. Moreover, it will have a good effect on the overall economy of the country, e.g., importation-exportation, trade, investment, tourism, etc.

From the study of IATA, if connectivity increases by 10%, GDP of the country will be increased by 0.07%. Factors that contribute to the increase of connectivity are number of destinations, frequency and number of seats per flight.

Improvement of air transportation efficiency must be derived from the development of many elements, which are the improvement of infrastructure, operation and management efficiency, quality services, the application of new technology, the preparation of infrastructure in order to support increasing demand for transport in the future, including multi-modal transport. The results from the above improvements will attract airlines to choose Thai airports as destination or transit point for goods and passengers and also increase incomes to airports and air business operations. Personnel in both managerial and operational level should also be developed in parallel with other elements.

Domestic travel from other parts of Thailand, especially from big cities such as Chiang Mai, Phuket, Songkhla, Ubon Ratchathani to Bangkok, the country's economic center, takes around 8-12 hours in average. If travelling by air, the traveling time will be reduced to 3-4 hours (including transit time), which is a big time-saving. Unfortunately, nowadays there are a limited number of people travelling by air. In the future, if promoting the competitiveness on quality and services among domestic low-cost airlines, the fare is likely to be lower and more people can access to this mode of travel. However, services of the low cost airlines must also provide the accepted safety standards. The goals, strategies, outcomes and indicators for the water transportation sector have been identified and showed in the Table 4.4-1.

Vision of air transportation

"Becoming Aviation Hub of the region, Paying attention to Environment, Ready to serve all with safety"

Table 4.4-1 Goals, Strategies, Outcomes and Indicators of Air Transportation

Goals	Strategies	Outcomes	Indicators
1. To make Suvarnabhumi Airport a hub for international air transport	1.1 Increase of competitiveness of Suvarnabhumi Airport, aiming to become the main airport in the region (passengers and cargo delivery) 1.2 Strengthening of air transport networks between Suvarnabhumi Airport and foreign airports	• Better economy of the country • Increased competitive capacity of the country • Increased travel and cargo delivery via Suvarnabhumi Airport	• Volume of passengers via Suvarnabhumi Airport • Volume of passengers at Suvarnabhumi Airport • Volume of cargo delivery via Suvarnabhumi Airport • Volume of cargo delivery at Suvarnabhumi Airport • World airport ranking • Capability to support airlines/passengers (flight per year) • Number of airlines at Suvarnabhumi Airport
2. To develop and increase the capacity of domestic airports	2.1 Improvement of airports capacity to support the expansion in the future 2.2 Strengthening of air transport networks of domestic airports	• Increased travel and cargo delivery via Thai international airports	• Capability to support airlines/passengers (flight per year) • Volume of passengers at domestic airports
3. To upgrade airports to become Green Airport	3.1 Energy savings and reduction of air and noise pollution from air transport	• More efficient energy consumption of airports • Pollution in the area of airports complying to international standards	• Energy consumption of airports • Noise level at airports • Volume of greenhouse gases emission at airports

Table 4.4-1 Goals, Strategies, Outcomes and Indicators of Air Transportation (Continued)

Goals	Strategies	Outcomes	Indicators
4. To promote efficient use of fuels, energy savings and the reduction of the emission of pollution and greenhouse gases from aviation activities	4.1 Encouragement of using aviation technology for energy savings and pollution reduction 4.2 Suitable and efficient management of airports	• More efficient energy consumption in aviation activities • Volume of greenhouse gases emission from aviation activities complying to international standards	• Energy consumption in aviation activities • Volume of greenhouse gases emission from aviation activities
5. To make air transport fair in costs and competitive to other modes of transport in long distance	5.1 Encouragement of fair competition in air transport services 5.2 Promotion of low cost airlines as a choice for travel in long distance	• Convenient and fast long-distance travel by air transport, passengers traveling in long distance have more choices of travel	• Volume of passengers using low cost airlines • Number of routes operated by low cost airlines

Important flagship projects for air transportation sector 2011-2020 are summarized as follows:

(1) Project on the development of Suvarnabhumi Airport, Phase 2 (AOT)

(2) Project on the development of Phuket Airport, Phase 2 (AOT)

(3) Project on the procurement of 14 aircrafts, according to Corporate Plan 2005/2006-2009/2010 (Thai Airways)

(4) Project on the procurement of 15 aircrafts in 2010-2014 (Thai Airways)

(5) Project on the procurement of 8 Airbus A330-300 in place of 6 Airbus A300-600 and 2 Airbus B747-300 (Thai Airways)

(6) Construction project to expand aircraft parking space and improve old passenger terminal and install passenger boarding bridges, Krabi Airport (DCA)

(7) Project on the expansion of the runway's length, aircraft parking space and airport's electrical system, Narathiwat Airport (DCA)

(8) Work to expand runway strip and runway end safety area, Surat Thani Airport (DCA)

(9) Construction work to improve passenger terminal, Nakhon Si Thammarat Airport (DCA)

(10) Project on the establishment of Air Traffic Management Center (AEROTHAI)

(11) Project to increase capacity of air traffic system/technology and develop Communications, Navigation and Surveillance Systems for Air Traffic Management (CNS/ATM) (AEROTHAI)

(12) Project on the procurement of high-efficiency test aircraft (AEROTHAI)

Important measures for air transportation sector 2011-2020 are summarized as follows:

(1) Measure to develop air route networks linking to other countries and to motivate airlines to use services at Suvarnabhumi Airport, such as assistance on providing market information to airlines (AOT)

(2) Measure to improve the efficiency of operations and services of airports and airlines, e.g., measure to reduce check-in time and minimize the time used for safety check and immigration (AOT)

(3) Measure to develop and improve quality of services, by focusing on highly customer oriented services (airlines staff, passengers, shippers, etc.) (AOT)

(4) Measure to improve the management and operations of cargo warehouse, by coordinating with public agencies, such as The Customs Department, to reduce procedures and documentation, resulting in more accurate and more convenient operations (AOT)

(5) Measure to develop market plans, public relations and customer relationship management in order to promote Thai airports branding (AOT)

(6) Measure to supervise safety aspects of both Airside and Landside and to improve terrorism risk assessment system to increase user's confidence (AOT)

(7) Measure to improve sufficiency and efficiency of personnel in operational and managerial level and to urge the personnel to always have service mind (AOT)

(8) Measure to promote activities that encourage air transportation in the region by coordinating with concerned agencies such as tourism, business and industrial activities in the region in order to attract airlines to open more flight destinations in the region (AOT)

(9) Measure to promote competitiveness among airlines, such as adjusting fees to be motivated and more suitable and to promote the airlines operations (AOT)

(10) Measure to supervise and define regulations to promote fair, transparent and suitable competition by establishing supervising agencies (AOT)

(11) Measure to improve sufficiency and efficiency of personnel in operational and managerial level and to urge the personnel to always have service mind (AOT and CATC)

(12) Measure to improve the efficiency of operations and services of local airports in order to reduce travel time and increase convenience for users (AOT and DCA)

(13) Measure to provide convenience to the passengers traveling to/from airports by promoting the transport linkage system to local airports (AOT and DCA)

(14) Measure to develop and improve quality of services of local airports, by focusing on highly customer oriented services (airlines staff, passengers, shippers, etc.) (AOT and DCA)

(15) Measure to develop market plans, public relations and customer relationship management in order to promote the use of international airports (AOT and DCA)

(16) Promotion of energy saving and energy conservation in passenger terminal (AOT and DCA)

(17) Measure to promote low cost operations of airlines, such as the promotion of using information technology in operations, the most utilization of resources, the procurement of low cost ground service, such as low cost terminal (AOT and DCA)

(18) Measure to promote the most utilization of local airports (AOT and DCA)

(19) Measure to promote the operations of low cost airlines to expend services to provinces, by coordinating between airports and airlines, such as the study of more demanding routes to open more services to people in provinces and airlines can operate without deficit (AOT and airlines)

(20) Measure to develop air route networks linking domestic and international travel by motivating airlines to use services at local airports in Thailand, such as assistance on providing market information to airlines, including promoting economic activities within the region, such as tourism and trade (AOT, CATC and airlines)

(21) Measure to promote airlines to increase flight destination to local airports in Thailand (AOT, DCA and airlines)

(22) Energy and environment management relating to aviation activities (AOT, DCA, AEROTHAI and airlines)

(23) Measure to manage and use suitable resources (AOT, DCA, AEROTHAI and airlines)

(24) Measure to promote the use of aviation technology which is energy saving and reduce pollution, by promoting technology development, including learning and utilization (airlines)

(25) Measure to promote energy saving and environment preservation, such as fuel management, promotion of using environmentally friendly aircrafts, promotion of using modern technology to reduce the use of energy on runways, etc. (airlines)

Chapter 5
Budget and Investment

Chapter 5 Budget and Investment

5.1 Budget for Investment

From the analysis of investment by government sectors, the proportion of investment expenditure of government sectors has declined since 1997 from 42.2% of the budget (380,050 million Baht) to 12.5% in 2010 (212,689 million Baht). In addition, Thailand has continually performed deficit budget policy from 2006 to 2010, averagely 2.48% of GDP a year. In 2010, the government has set up deficit budget of 350,000 million Baht or 3.60 deficit of GDP.

The public debt as of April 2010 was 4,108,980 million Baht, or 42.2% of GDP. Thereby, the government itself has to follow the fiscal discipline of medium-term Sustainability Framework (5-10 years ahead) by limiting public debt not over 50% of GDP and debt burden of government not over 15%. If the number is increased, it will affect the government budget used for the said debt payment and the proportion of investment from the government sector in the future.

From the allocated budget for Ministry of Transportation during 2001-2010, the budget of land transportation (road and rail transportation) was allocated most of all, i.e. 95% of all budget. Water and air transportation received lower budget, 3.5% and 1.6% respectively. The main strategies for transportation carried out until now include the enhancement of road transportation by means of construction and improvement of infrastructure, application of modern information technology to the operation, services and management in order to save time, and support of researches to increase the capacity of transport and traffic development.

Considering the proportion of expenditure by Ministry of Transportation, it is found that most of the budget, 80%, was spent on the investment of infrastructure. This is followed by personnel budget, operation budget, other expenditures and subsidies. Approximately, the capital budget based on the goals and the strategies of Transport and Traffic Development Master Plan 2011-2020 is shown in table 5.1-1.

Table 5.1-1 Investment based on the goals and the strategies of Transport and Traffic Development Master Plan 2011-2020

Unit: Million Baht

Plan/Project	2011	2012	2013	2014	2015	2016-2020	Total 10 years	%
Goal 1 : To make Thailand a Hub for Connectivity								19.22
Strategy 1.1 Develop and improve to increase network capacity and international transport hub	12,073.27	18,233.17	24,407.65	29,109.89	28,479.07	108,601.26	220,904.30	
Strategy 1.2 Strengthen the competitive capacity of Thai	12,179.09	31,198.21	30,562.85	9,004.43	9,004.43	45,022.17	136,971.20	
Goal 2 : To provide efficient transport system, good level of service and accessibility to economic zones and community								35.32
Strategy 2.1 Develop and improve the transport system efficiency to promote the expansion of development area to the region	22,032.52	51,954.33	79,250.06	90,498.90	77,878.40	336,230.00	657,844.21	
Goal 3 : To improve and increase safety in travel and transport								5.34
Strategy 3.1 Improve infrastructure, vehicle standards and environment to become qualified and safe for transport	16,845.44	17,545.26	11,997.45	8,114.00	4,710.00	40,101.00	99,313.15	
Strategy 3.2 Change behavior of concerned people to have knowledge, understanding, consciousness and skills on transport safety	0.00	0.00	19.20	92.18	0.00	0.00	111.38	

Table 5.1-1 Investment based on the goals and the strategies of Transport and Traffic Development Master Plan 2011-2020 (Continued)

Plan/Project	2011	2012	2013	2014	2015	2016-2020	Total 10 years	%
Goal 4 : To promote energy savings and environmentally friendly transport								4.21
Strategy 4.1 Promote and encourage to shift mode of transport to rail and water transport	2,245.09	2,039.46	8,932.65	2,570.08	50.00	50.00	15,887.27	
Strategy 4.2 Promote and develop technologies to have clean energy and clean vehicles and environmentally friendly	1,680.36	5,889.93	7,837.76	7,568.64	7,185.97	32,294.43	62,457.09	
Goal 5 : To upgrade the accessibility and increase the use of public transport								30.49
Strategy 5.1 Develop infrastructure and linkage system of public transport in thorough and equal manner	51,413.45	70,632.98	133,425.16	90,020.00	82,034.00	140,120.00	567,645.58	
Goal 6 : To increase mobility in travel and transport								5.42
Strategy 6.1 Improve and develop infrastructure to reduce bottleneck and traffic congestion problems	8,424.64	14,150.39	16,541.01	10,245.00	10,389.40	41,119.20	100,869.64	
Strategy 6.2 Improve efficiency of traffic management	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Total	126,893.85	211,643.72	312,973.80	247,223.12	219,731.27	743,538.06	1,862,003.82	100.00

(1) About 35.32% of budget for investment on transport and traffic plan in 10 years is focused mainly on **Goal 2: To provide efficient transport system, good level of service and accessibility to economic zones and community**. The high proportion of investment in this goal is for the motorways project and the project of widening main roads into 4 lane highways (Phase 2), all of which are to promote the expansion of economic development to other regions and reduce the crowd in Bangkok. There are also other projects in this goal including the project of rail transportation enhancement and the project of regional airports development.

(2) **Goal 5: To upgrade the accessibility and increase the use of public transport** has a little less proportion of investment of 30.49%, most of which is invested in the construction of sky trains.

(3) **Goal 1: To make Thailand a Hub for Connectivity** has 19.22% of budget proportion. The projects within this goal are Suvarnabhumi Airport Phase 2, Aircraft procurement project as to the corporate plan of Thai Airways International, and Highway construction project supporting the multi-modal transportation. All of these projects require a high amount of investment.

(4) There has been an attempt to create safety highway network because physical improvement is still necessary. Therefore, **Goal 3: To improve and increase safety in travel and transport**, which emphasizes on measures of supervision, has receives 5.34% of the budget. The number is almost the same as that of **Goal 6: To increase mobility in travel and transport**, 5.42%. This goal focuses on not only measures of travel demand management, but also the need of special express ways in order to increase mobility on road transportation. Besides, there is development of infrastructure to facilitate the air transportation.

(5) The goal with the least investment, 4.21%, is **Goal 4: To promote energy savings and environmentally friendly transport**. This is the investment on Modal Shift to encourage rail and water transportation, both of which cause very little pollution and save lots of energy. Therefore, it is necessary to prepare the infrastructure thereof so as to accommodate the demand of travel and cargo delivery.

Referring to the budget proportion of each transportation sector, the amount of investment in each year is shown in **table 5.1-2**.

Table 5.1-2 Demands of budget for the schemes/measures in each transportation mode

Unit: Million Baht

Transportation Mode	2011	2012	2013	2014	2015	2016-2020	Total
Road Transportation	33,398.56	56,779.50	73,110.94	85,997.82	87,361.77	395,496.23	732,144.83
Rail Transportation	74,951.73	111,479.19	187,376.34	128,287.11	97,963.00	252,570.00	852,627.37
Water Transportation	3,404.67	4,743.68	5,469.27	4,395.86	5,237.52	39,064.65	62,315.63
Air Transportation	15,138.90	38,641.34	47,017.25	28,542.33	29,168.98	56,407.18	214,915.99
Total	126,893.85	211,643.72	312,973.80	247,223.12	219,731.27	743,538.06	1,862,003.82

According to the average investment proportion, the budget proportion for rail transportation is increased from 18% during 2006-2010 to 46% during 2011-2020, which is the highest proportion. For the investment on road transportation within 10-year period, it is reduced from 77% during 2006-2010 to 39% during 2011-2020, as seen in **figure 5.1-1 and figure 5.1-2.**

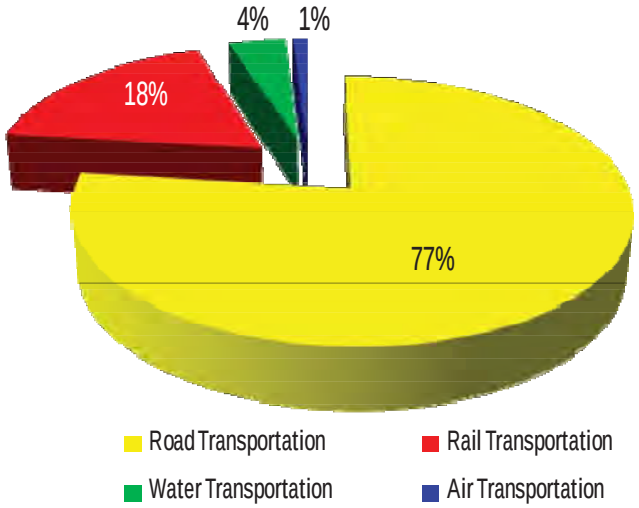


Figure 5.1-1 Average budget allocated to Ministry of Transportation during 2006-2010

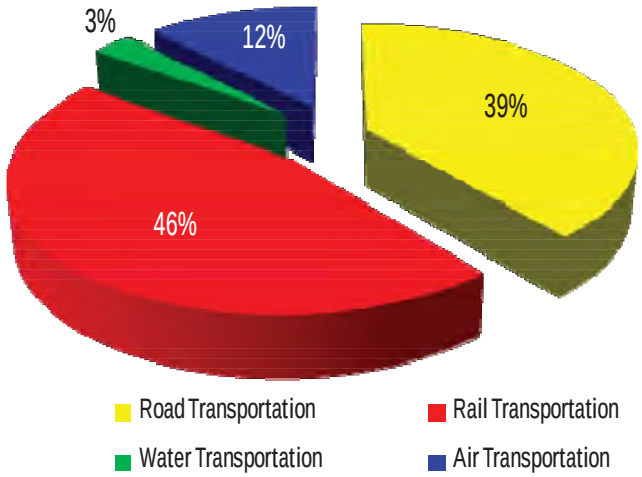


Figure 5.1-2 Average budget allocated to Ministry of Transportation during 2011-2020

5.2 Sources of Capital

There should be appropriate and cautious consideration of sources of capital for each project. This is because the government has continually performed deficit budget policy for many years, and the public debt is likely to increase. Hence, the government expenditures (especially investment expenditure) have more limitation. Since the government has to follow the fiscal discipline of Sustainability Framework by limiting public debt not over 50% of GDP and debt burden of government not over 15%, the ability to raise a loan and to allocate investment capital has been reduced. After the economic crisis in 1997, the amount of

investment expenditures from national budget is less than 25% of all expenditures, which is lower than provided in fiscal sustainability. Therefore the allocation of capital sources in order to lessen the fiscal burden in the future should be taken into account. The sources of capital, therefore, are divided into 4 categories: National Budget, Government Debts, State-Enterprise's Income and Public-Private Partnership (PPP). The consideration of capital sources depends on the features of project/measures and financial situation of the agencies in charge. For instance, the projects with high possibility of cost efficiency will receive capital from the private sectors that invest together with state-enterprises. On the other hand, the projects of Public Service Obligation (PSO) still rely on national budget. For the state-enterprises with good financial situation, most of the income thereof will be put into the capital so as to relieve the financial burden of government and avoid spending the amount of national budget and government debts. Due to the uncertainty in the future, there should be guidelines of risk management consisting of 6 stages, i.e. Planning, Risk Identification, Quality Analysis, Quantitative Analysis, Risk Response Planning, Monitoring and Control.

However, it is obvious that the development of transport and traffic in the future requires a great deal of capital investment as seen in **figure 5.2-1 and 5.2-2.** Also, it needs more Public-Private Partnership (PPP). The proportion of PPP increases from 15% during the year 2011-2015 to 23% in the investment plan of the year 2011-2020. There are still some projects of which the sources of capital are not yet identified i.e. SRT Red Line Project Bang Sue-Phaya Thai-Makkasan-Hua Mark, MRT Pink Line Project Khae Rai-Min Buri, MRT Purple Line Project Tao Poon-Rat Burana, and MRT Orange Line Project Bangkapi-Min Buri. If there is any consideration of capital sources, the proportion thereof may be different.

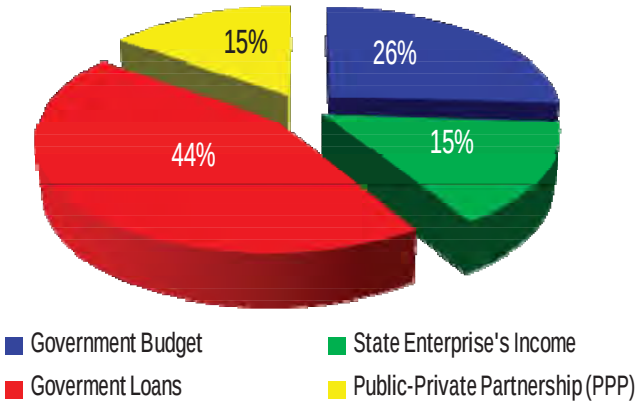


Figure 5.2-1 Average budget allocated to Ministry of Transportation based on the sources of capital during 2011-2015

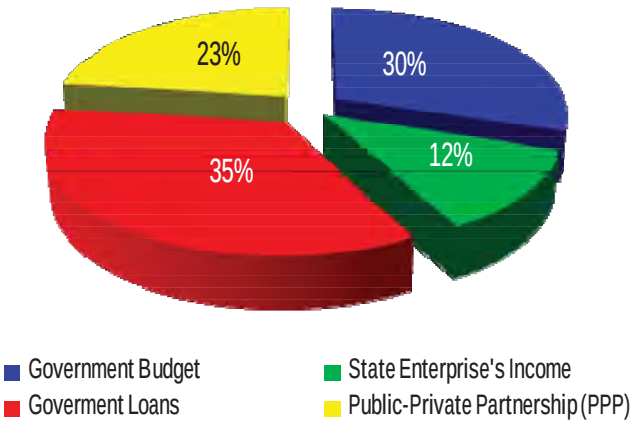


Figure 5.2-2 Average budget allocated to Ministry of Transportation based on the sources of capital during 2016-2020

When considering environmental factors such as the growth of GDP, budget allocated for Ministry of Transportation, capital investment of state-enterprises and ceiling of foreign currency loans, there are still some limitations in the sources of capital for the master plan. Anyway, there are some alternatives as follow:

(1) For the fiscal year 2011, the Goal 2, the improvement and enhancement of transport system in order to accommodate economic growth, requires a lot of money. Therefore, it is advisable to conduct securitization so as to establish a special organization, which will raise the budget for management and development of concrete rail transportation network.

(2) Several projects in Goal 4 should request subsidies from Clean Technology Fund (CTF) to support the transport and traffic systems that are in the category of Green Economy Project. This method can relieve the burden of budget in certain extent.

(3) On the whole, there may be some omission of certain plans/projects of each year in order to cut off the average budget of 100,000 million Baht per year. Perhaps, there may be the postponement of some operations in any agency depending on their discretion.

Chapter 6
Implementation

Chapter 6 Implementation

After conducting Transport and Traffic Development Master Plan and Strategic Plan for Transport Sector development, the next important step is to implement the said plans in order for the plans/projects/ measures to be in effect. The guidelines thereof are presented as follow:

6.1 Conduct guidelines for implementation of strategic aims

The next steps after conducting the strategic plans:

(1) For the allocation of budget and approval of any plan or project, the information, goals, outputs, outcomes and likely risks affecting operation units should be made in the form of agenda-based report. Thereby, the operation report must clearly define responsibility in the level of function-based. However, the most important part of this report is that the agency applying for the approval must be able to explain how it can carry out the said operation and how it can achieve the goals and aims and any level of index. This is to make sure that, upon receiving the approval of that plan/project, the outcomes will finally be connected with the strategic goals.

(2) The agencies to consider and approve the plan/project must be able to analyze possibility and success of the project and/or provide the agencies requesting the budget with clear suggestions to improve the plans. They should point out any defect in the process of operation so that the said operation would be carried out with the most efficiency and effectiveness. Besides the emphasis on operation process which may have some defects, there are some other elements that are worth taking into account.

   1) How much do the attitude and corporate cultures of that organization understand and place an emphasis on the strategic goals?

   2) What skills are considered defective in the operation?

   3) How much expertise and skill, in terms of particular techniques of operation and management, do the personnel in charge have in order to support the operation of technical staff?

   Once considering all factors relevant to the operation process of the plan/project, the next stage is to further enhance the performance of operation. In order to do so, the emphasis must be placed on the positions and responsibility of any personnel to see whether there are any limitation and then to find the ways of solutions on the operation.

(3) There should be fundamental knowledge for the agencies because it is a significant foundation to improve the management process. There are two cases in this issue. In the first case where there is knowledge already, it is advisable to find out what prevents the knowledge from being applied or utilized in the operation. In the other case where there is not any knowledge, it is necessary to search for the knowledge and find out the best way to pass it on to all relevant agencies so that they could realize and prepare themselves for the upcoming problems.

(4) Information technology should be applied so as to enhance the scale of services. When the corporate cultures and attitudes are adjusted to stimulate the personnel to realize the importance of operation, the next step is to operate the plan or project. In this step, different innovations should be employed in all agencies so that they would receive updated, precise and comprehensive information. This will in turn lead to the more effective design of monitoring system and the more appropriate allocation of resources, e.g. money and personnel, which are essential to drive the operation and to achieve the strategic goals.

6.2 Establishment of Office of Strategy Management to implement strategic plans

Kaplan and Norton suggested the idea of setting up Office of Strategy Management within the agencies to drive the strategic plans from the level of impact to the production unit. Looking into the management of government sectors today, it is found that even if there is establishment of units responsible for drafting and supervising strategic plans, these units are believed to focus only on the drafting and setting up indices indicating the outputs and the outcomes just in order to obtain the budget as much as possible. The success of operation under the strategic plans without overlapping any other agencies in the ministries is usually left behind.

In the future, there is a proposal to set up an agency acting as Office of Strategy Management. At present, there are already these kinds of agencies such as Bureau of Strategies Management under Department of Industrial Works or Office of Strategy for provincial Budget Management, under Ministry of Interior, etc. The desired function structure of Office of Strategy Management may be ministerial agencies so that they could manage the overall strategic plans. The structure of Office of Strategy Management can be classified into 2 models.

(1) Model 1: Office of Strategy Management is an agency in the level of department; that is, it is under direct supervision of ministers, who connect the strategic goals with operations in level of output and outcome of other agencies in the ministry.

(2) Model 2: Office of Strategy Management is an agency under budget planning units of the ministry, in order that the strategies would be driven along with the process of budget allocation. The advantage of this model is that the strategic plans and the budget plans are conducted at the same time, leading to the more appropriate of budget allocation.

Basically, the main function of Office of Strategy Management is to act as a middle party linking and integrating strategies and tactics of different agencies that are mutually responsible for the management of plan/project. Another function thereof is to pass on knowledge between executives and operation units. Besides, Office of Strategy Management usually acts as a monitoring and consulting unit for the conduct of plans in output and outcome level, giving suggestions to operation units in terms of new methods or techniques that can drive the operation plans to achieve strategic goals of the ministry. The main guidelines of operation include:

(1) Set up Monitoring and Evaluation system consisting of different kinds of tools that are suitable to the plan/project. Therefore, Office of Strategy Management has the following additional functions in addition to monitoring and evaluation.

   1) Pass on the knowledge and issues about strategic goals to the agencies under the ministry

   2) Pass on integrated knowledge about how to conduct strategic plan in order to make strategic connection with operation.

   3) Set up standards of performance based on provided indicators, provide advice about the likely problems of plan/project management, and act as a technical support unit for other agencies.

(2) The function as a coordinator within agencies focuses on the attempt to hold meetings in which the executives of strategic policy level and department level as well as operating officials can share their opinions among each other. It is seen that the objective of the meetings for strategic goal management is to have both agenda-based and function-based staff understand the conditions of their functions in the organization. Therefore, Office of Strategy Management has to revise the strategic plans and collect the performance thereof from various indicators.

(3) During the long-term strategic plans, there should be steady improvement, revision and monitoring of the said strategic plans.

Office of Strategy Management also has a function of providing suggestions and new ideas during the process of the plan/project. Once the function-based agencies have received both positive and negative feedbacks, there should be some improvement other than provided in the plans. So, the said improvement should be separated from the existing plans and supervised by specific output-level staff. Meanwhile, Office of Strategy Management has to closely monitor the said improvement and report it to the agenda-based executives.

6.3 Monitoring and Evaluation Process

The first step usually taken in Monitoring and Evaluation Process is Pre-Evaluation, in which the framework is established to evaluate the projects waiting for budget allocation. The next step is the On Going Process, in which the staff will monitor and evaluate the indicators of the projects that receive some budget during that fiscal year. The final one of this process is the Post-Evaluation of all projects after the end of fiscal year. After these three steps, the data of all projects will be collected in order to further improve the monitoring and evaluation process as well as the strategic plans. The said steps can be summarized as below:

(1) Pre-Evaluation

The process of budget allocation is designed to have connection with strategy management, whereby the Key Performance Indicators (KPI) of the said plan/project are the links between strategic goals and budget allocation. Hence, it emphasizes that the main function of effective monitoring and evaluation system is to set up indicators. Accordingly, in order to establish a framework of management, the application for budget allocation of the plan/project should include contents, objectives and reasons why the said plan/project is put under some indicators. However, the supervision of the plan/project by means of indicators only does not guarantee that the said plan/project will be conducted responsibly as to the framework of indicators after receive allocated budget.

So, in order to prevent the defects of Pre-Evaluation, the monitoring mechanism should be done during the fiscal year.

(2) On-Going Process

It is an examination focusing on working process, for example, examination of budget reimbursement of government agencies, which is basically used to monitor the progress of projects. Another benefit obtained from the monitoring is that the officials in charge will receive enough information to assess and analyze the risks of the said plan/project. Then, they can cope with different situations efficiently.

(3) Post-Evaluation

This is the step of analyzing the results of budget spending to see whether the plan/project can provide any benefit as planned at the beginning of the fiscal year, whether it complies with the criteria of indicators, and how much it responds to the goals of ministry or of the country.

The development of database is very significant in improving the monitoring and evaluation system. Meanwhile, any information from both internal and external factors is seemed as helpful knowledge for the improvement of strategic plans in national, ministerial and function levels. The information needed to maintain based on the aforementioned periods can be identified as follow:

(1) Database of Pre-Evaluation

1) Information of the plan/project management within agencies is very useful. This information will encourage the authority, which is empowered to approve the project, to have more confidence in the management standards of the agencies in charge. In other words, the responsibility of the agencies in charge is indirectly set up as a criterion.

2) The information about economic and social situation, concerning the responsibility of ministry, is applied to predict the trends and situations that the plan/project may confront with. So, the said information will lead to the improvement of different indicators.

3) The revision of information about problems during the performance of any agencies within the ministry will reflect their strengths and weaknesses while providing public services. The said problems may include the lack of staff, too strict regulations, inefficient technology system, etc.

(2) Database of On-Going Process

1) The agency in charge of monitoring and evaluation should have the monitoring information of budget reimbursement, at least to make sure that the said allocated budget is utilized according to the objectives of the plan/project. Besides, the said database should be available steadily from the beginning to the end of the fiscal year.

(3) Database of Post-Evaluation

1) The information is collected to evaluate the performance of plan/project according to the different indicators, and to see whether the provided goals are achieved or the strategic goals are all reflected or not.

The Information needed to analyze the risks of project, though collected in the post-evaluation period, focuses on monitoring and evaluating the plan/project based on significant indicators. Also, the agency in charge should take into account the application of the said information to set up strategic plans and manage the budget of the next fiscal year. Therefore, the collection of information based on the indicators must be employed to analyze and revise targets, outputs and indicators of the strategic plans. Furthermore, the information from the past helps reflect the risks that may occur in different kinds of projects.

Today, Thailand, due to the Globalization, is susceptible to the currents of changes in terms of economy, society, politics and development of technology. The transportation, which is the significant factor driving the economy, has been inevitably affected. For example, the fluctuation of oil prices leads to the increase of delivery costs, and the development of economic cooperation with neighboring countries forces Thailand to prepare itself for the link of transportation network to that of the neighboring countries, etc. Therefore, Ministry of Transportation, by Office of Transport and Traffic Policy and Planning, as a central agency drafting transportation development plan, has realized the importance and the urgent necessity to revise the situations concerning transport sections and to study the long-term transport development master plan. Thereby, the ministry has to revise and improve all database about the guidelines of transport

development plan so that it would be in compliance with the changing situations. Also, the foundation of transport network development should be laid out cautiously in order to satisfy the actual demands in the levels of Agenda based, Area based and Function based. Then, all of the aforementioned is applied to conduct Transport and Traffic Development Master Plan and Strategic Plan for Transport Sector Development for the agencies within Ministry of Transportation. With common targets, there will be less redundancy in conducting plans and projects, leading to the decrease of unnecessary expenses under the limited budget. The said plans can be used as a framework for any agency within the ministry and the other members concerned to perform their tasks integrally and in the same direction.

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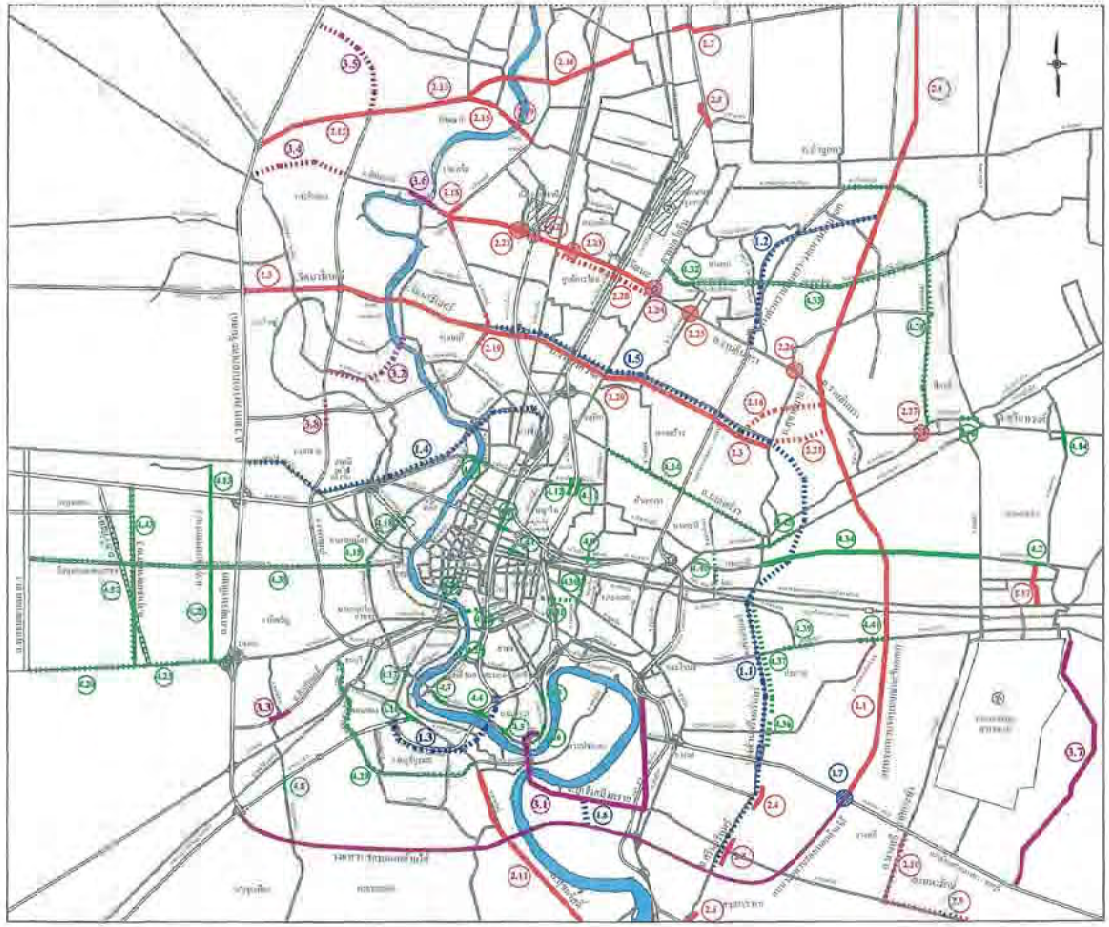


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