Planning our way ahead: A review of Thailand’s transport master plan for urban areas

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Abstract

The tradition of transport planning in Thailand began as recently as 1960 with the Greater Bangkok Plan, and the 1971 Bangkok Transportation Study. Since then the country has incrementally developed its transport planning practice. This paper provides a detailed description of Thailand’s transport master plan for urban areas and its study process. It introduces the Office of Traffic and Transport Policy and Planning, which is responsible for formulating the plan. It describes the master plan study process of the regional cities, and provides three case studies in Si Sa Ket, Chiang Mai, and Lampang to illustrate the process in practice. The transport plan of Bangkok, the capital city, is described separately, as it focuses more on the planning of a mass-transit system. The study reveals a number of lessons learned.

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Keywords: Type your keywords here, separated by semicolons;

1. Introduction

There are a number of research focusing on policy options, or tools and assessment methods for decision making process, rather than on the whole application of planning or decision making process in practice. For examples: research on reviewing impacts of policy instruments in different cities includes Nakamura et al. (2004) and KonSULT (2005); research on designing transport strategies includes Shepherd et al. (2006a, 2006b) and Zhang et al. (2006); research on principles of integration includes May (1991), May and Roberts (1995), May et al. (2006), Geerlings and Stead (2003), Potter and Skinner (2000), Jones and Lucas (2000); and research on decision support system includes Miyamoto et al. (1996) and Ulengin et al. (2007). These are perfectly suitable for developed
countries. For developing countries, there is still a big issue how to transfer these experiences into practice.

The tradition of transport planning in Thailand began fairly recently. The first official urban transport plan is thought to be the 1960 Bangkok land use plan, called the Litchfield Plan (Litchfield, Whiting, Bowne and Associates, 1960), and the 1971 Bangkok Transportation Study (Kocks, 1975). Since then the country has progressively developed its transport planning practice to cope with rising urban transport problems. The government has tasked the Office of Traffic and Transport Policy and Planning (OTP) to oversee and actively assist the development of urban transport plans for Bangkok and regional cities. Over the last 10 years the OTP has been successful in its tasks; Bangkok revised its mass transit master plan in 2009, and transport master plans have been produced for all regional cities.

The objective of this study is to provide documentation that consolidates Thailand’s urban master plan process and to review the procedure. The aim here is to review what has been done, in order to recommend possible improvements to Thailand’s transport planning practice. In addition, the translated descriptions of the master plans provided here can be used to compare Thailand’s method with other international examples, thus contributing towards accumulated knowledge in this field.

The background to this paper and the motivation of the study is introduced in the first part. In the second part, the methodology of the study is outlined. In the third part, Office of Traffic and Transport Policy and Planning, the organisation responsible for the master plan is described. In the fourth section, the urban transport master plan for regional cities is detailed. This section presents the master plan study process. It also provides three case studies in Si Sa Ket, Chiang Mai, and Lampang, to illustrate how the process is put into practice. The transport master plan for Bangkok is provided in Section 5, together with some historical background to provide its context. The findings of the review are discussed and the paper is concluded in Section 6. A number of lessons learnt and recommendations are also provided in this section as possible improvements to the study process. Section 7 concludes the paper.

2. Methodology

This study built upon the previous studies on the subject, such as Charoenmuang, (1998), Jaensirisak & Klungboonkrong (2007a) and Jaensirisak (2006). Its primary source of data is OTP’s documentations, websites and its urban masterplan for regional cities reports, in particularly for Si Sa Ket, Chiang Mai, and Lampang. The information about the Urban transport master plan for Bangkok was collected and translated from various literature as well as OTP’s website and its public consultation brochures.

3. Office of Traffic and Transport Policy and Planning (OTP)

The Office of Traffic and Transport Policy and Planning (OTP), Ministry of Transport, is the governmental organisation responsible for all transport related policy. Founded in 2002, the OTP took over the responsibility for Thailand’s road transport management and policy from the Office of the Commission for the Management of Land Traffic (OCMLT). The OTP also assumed certain policy-related duties of the permanent secretary of the transport ministry and other offices. Today, the OTP’s mission is to formulate policy and plans, and provide high-level recommendation for all means of physical transportation in Thailand. It has a duty to ensure all transportation plans and policies of the Thai government are integrated.

The OTP has direct communication with high-level government bodies. For example, OTP’s director has a permanent seat on the Commission for the Management of Land Traffic, of which the prime minister is the chairperson. The commission’s main responsibilities are to propose principal land transport policies, national transport plans, and transport legislation to the cabinet. It is also tasked with a duty to make decisions on the national transport budget, foreign borrowings, and collaborations with other sectors on transport management issues. To facilitate its tasks and objectives, the commission has set the OTP with the following responsibilities and authorities:

- to study, analyse, and formulate principal transport and traffic plans, master plans, a national transport investment plan, and to monitor their progress
- to examine and propose policies, measures, and standards for land traffic management that shall be in accordance with the principal transport and traffic plans
- To analyse and scrutinise transport plans and projects for the commission, and to conduct itself in accordance with current transport legislation and other related laws set by the commission
to appraise, analyse, and compile reports on transport and traffic management, including safety and environmental aspects
• to examine, analyse, and research trends of transport and traffic, in economical, safety, and environmental aspects
• to organise information technology and a data system to develop Intelligent Transport (ITS) technology
• to operate and coordinate other tasks within the remit of OTP or as assigned by the commission

The OTP is among 8 government administration bodies under the Ministry of Transport (MOT), including the Marine Department, Department of Land Transport, Department of Civil Aviation, and Department of Highways. The ministry is also responsible for 14 state enterprises, such as State Railway of Thailand, Port Authority, Mass Rapid Transit Authority of Thailand, and Expressway Authority of Thailand.

The OTP itself is comprised of nine departments/work clusters; namely (tentative translation) 1) Central Administration Department, 2) Land Traffic Management Department, 3) Transport and Traffic System Development Department, 4) Information Technology for Traffic and Transport Centre, 5) Integrated Ticket Management Office, 6) Rail System Development Office, 7) Safety Planning Bureau, 8) Planning Bureau, and 9) Regional Transport and Traffic System Promotion Bureau.

4. Urban transport master plan for regional cities

The urban traffic and transportation master plan in Thailand is carried out at the provincial level. The plan considers the condition of each province with a focus on its urban area. The objectives of the traffic and transportation master plan study of each regional city in Thailand are as follows:
• To establish the Traffic and Transport Master Plan that is coherent with the development plan of the province. The objective of the master plan is to enhance the capacity of transport infrastructure intra-city, inter-cities, and within regional areas.
• To develop transportation infrastructure that has the capacity to enhance economic development, competitive advantages for investors and encourage tourism.
• To have a comprehensive transport plan with an aim to promote public transportation or to reduce energy use in transport. The aim is that this will lead to optimisation of the transport system, increased accessibility, improved convenience, in an environmental friendly manner.
To have a transport management plan that is suitable for the current and future land use, including taking account of future urban expansion.

The Regional Transport and Traffic System Promotion Bureau within the OTP is responsible for the master plan of all regional cities. Its duties are to ensure the quality of the master plans and that their contents are in line with government policies and plans, such as the National Economic and Social Development Plan, and the National Principal Transport Plan. It is also tasked with monitoring and assessment of these master plans. Moreover, it provides technical and implementation support in the field of transportation management to the administrative bodies of regional cities.

The Bureau has selected 6 academic research centres across the country to support its undertakings. These regional centres are responsible for delivering technical supports on transport engineering matters and other related fields. Their duties are also to conduct the traffic and transport master plan studies for cities within their regional areas. Currently, all of the regional cities in Thailand have been issued with an urban transport master plan, except Bangkok, which has a Mass-transit master plan. A handful of these regional cities are going through the evaluation process to revise and update their master plans.

4.1. The master plan study process

Three different time frames are considered in the master plan, namely: short-term (1-2 years), medium-term (3-5 years), and long-term (6-10 years). Previously, the time frame was slightly longer (i.e. short-term plan considered 1-5 years). These time frames have recently been shortened to ensure the master plan is more implementable. The content of a master plan report commonly comprises of:

- General information about the province, such as its geographical and land use characteristics, socio-demographic conditions, and administrative boundary,
- Theoretical approach of the study, literature review, and relevant documents
- Study methodology
- Existing land use and transport system conditions and facing transport problems,
- Presentation and analysis of collected mobility data and other related information
- Key concepts and features of the master plan, including proposed strategies and projects to resolve the identified problems.
- Details of proposed project and plan

This content list is only a guideline; it can be adapted and changed according to the local need, as long as it addresses the following concerns effectively: i) Traffic and transport management plan for preventing and mitigating provincial traffic problems, ii) Transport network development plan for passenger and freight by all modes, in keeping with the city’s characteristic, as well as, economic, social, and environmental aspects, for a sustainable and liveable city, iii) Infrastructure and transport system development plan to enhance and support economic competitiveness, iv) Public transport development plan, v) Traffic safety plan, vi) Transport development plan for tourism, which supports city’s identity and its sustainability, and vii) Traffic and transport safety plan to prevent and mitigate accidents within the critical area of the province.

The overall transport master plan process of Thailand consists of seven main steps as shown in Figure 2:
Fig. 2 The overall traffic and transport master plan process in Thailand (base on Jaensirisak & Klungboonkrong (2007))

(i) Identify objectives/strategies of the traffic and transport master plan study. In this stage, the objectives of the study are ascertained. Effort is made to ensure coherency between the master plan and other related high-level documents, such as the National Economic and Social Development Plan and the National Principal Transport Plan. The objectives also take into account the visions of related regional, provincial, and local organisations.

(ii) Determine the existing transport & land use conditions: related transport and land use data is collected at this stage from primary and secondary sources. The primary data usually comes from mobility behaviour surveys and traffic counts. The sources of secondary data are the official administrative records, the national statistic data, and other reports or surveys. The combination of these two types of data provide an insight into the existing conditions and help to determine the future land use and transport trends of the study area.

(iii) Identify traffic and transport related problems: the existing conditions obtained from the previous stage provide necessary information to identify the current transport problems of the study area. Common transport problems are violation of regulation, safety, traffic congestion, improper traffic management and inefficient public transport services.

(iv) Develop and apply transport models: the mobility information obtained previously is used to produce an O-D matrix of the study area. The mobility information is input into a traditional 4-step urban transport planning model. The model is then calibrated and validated before it is used to predict future travel demands.

(v) Analyse and evaluate the traffic and transport projects and plans: the transport model is used to assess impacts of different transport projects and plans. Indicators, such as total Vehicle-Kilometre of Travel (VKT), the Vehicle-Hour of Travel (VHT), the average travelling speeds and the Volume per Capacity (V/C) ratios are usually the key evaluating indicators that determines the system’s level of service.

(vi) Propose traffic & transport plans and projects: the results of the analysis and evaluation are then used to formulate a master plan. Typically, a traffic and transport master plan commonly consist of the following elements, traffic development and management plan; traffic safety and environment
considerations; road network development plan; sustainable transport development plan; traffic system and equipment maintenance plan; a campaign to raise awareness and educate the general public about traffic and transport issues; infrastructure and transport system development plan to promote commerce and investment; growth and development of tourism plan, and logistical analysis and freight transport development plan.

(vii) Monitoring and evaluation: The master plan is revisited after a certain period, normally after 10 years, to assess the output and outcome of the master plan against its proposals. The Success Index (SI) and the CIPP model are employed in this process, which yields a report that contains recommendations for the next master plan.


Si Sa Ket province lies in a mountainous region with dense vegetation within the north-eastern region of Thailand. The province covers an area of 8,840 square kilometres. The economy of the province hinges on commerce, agriculture, education, and industry. The urban area of Si Sa Ket (hereafter, Si Sa Ket city) covers 57 square kilometres. Its population in 2006 was 44,300, which yields a density of 776 persons per square kilometre. The city’s transport mode share is: motorcycle 66.7%, private car 22.3%, public transport 5.6%, walking and cycling 5.2%, and others 0.2%. The main transport problems of the city at the time included: low quality of public transport services and non-motorised transport facilities, high incidence of traffic accidents (Figures 3 and 4), inappropriate traffic management (Figure 5), congestion and, poor travel information.

![Fig. 3 Low quality of public transport services](image1)

![Fig. 4 Low quality of non-motorised transport facilities](image2)
Si Sa Ket Transport Master Plan Project was initiated in 2006. It followed the European guild line as proposed by the Procedures for Recommending Optimal Sustainable Planning of European City Transport Systems (PROSPECTS), a European Union funded project. The transferability of the guideline was assessed and certain elements were addressed (Jaensirisak & Klungboonkrong, 2007b).

The study reported general information about the city, such as its geography, demographical data, and socio-economic information. It also described the existing conditions of land use and the transport system in detail. A number of transport issues were identified in the study; for example, lack of traffic discipline, pedestrian safety, congestion, improper traffic management, and inefficient public transport service. These concerns provided the context for the master plan.

The study collected a number of transport primary data, such as mid-block traffic count, average vehicle speed, and mobility interviews. This data combined with secondary data from official sources, such as traffic accident database illustrate the current status of the system. This data was analysed in detail and provided input for the development of a four-step transport model.

The transport model was used as a quantitative tool to predict future travel demand. It was also used to assess the impacts of different policies and measures. The indicators used in this study were traffic volume and capacity ratio (V/C) and average network speed. The time horizon of the study was 5 years (2011) and 10 years (2016).

The vision of the city was set to be a “Healthy city”, with a focus of becoming “a hub of the province in trade, service and education”. The master plan proposed seven key objectives for the city’s transport system, namely, 1) System efficiency, 2) Safety, 3) Protection of culture and environment, 4) Sustainability of the system, 5) Transport for tourism, 6) Improvement of road connectivity with neighbouring countries, and 7) Contribution toward economic growth.

These objectives go beyond meeting the city’s vision and take into consideration, public opinion and visions set by the government at national and regional levels from the following sources:

- The 8th and 9th national economic and social development plan (1997-2001 and 2002-2006),
- Vision, strategy and master plan of Ministry of Transport,
- Vision and strategy of the regional development plan for the lower North-East region in Thailand,
- Vision and strategy of Si Sa Ket province, and
- Vision, strategy and development plan of Si Sa Ket municipality.

The master plan proposed 41 projects in total. These projects can be classified into 9 different types and into short, medium, and long time frames. The plans and projects proposed by the study are shown in Table 1 below.
Table 1. Proposed projects for Si Sa Ket by type, their planned timeframe, and cost

<table>
<thead>
<tr>
<th>Type of project</th>
<th>Number of project</th>
<th>Total project cost (million baht)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Traffic management and development plan</td>
<td>6/2/0/8</td>
<td>58.0</td>
</tr>
<tr>
<td>(2) Traffic safety and environment plan</td>
<td>0/5/7/11</td>
<td>129.5</td>
</tr>
<tr>
<td>(3) Road network development plan</td>
<td>0/3/1/4</td>
<td>1,152.7</td>
</tr>
<tr>
<td>(4) Sustainable transport development plan</td>
<td>4/1/0/5</td>
<td>45.7</td>
</tr>
<tr>
<td>(5) Traffic system and equipment maintenance plan</td>
<td>0/0/3/3</td>
<td>65.0</td>
</tr>
<tr>
<td>(6) Traffic knowledge, information, and campaign development plan</td>
<td>0/1/8/9</td>
<td>56.3</td>
</tr>
<tr>
<td>(7) Infrastructure &amp; transport system development plan for commerce &amp; investment</td>
<td>3/1/1/5</td>
<td>178.0</td>
</tr>
<tr>
<td>(8) Tourist attraction and safety development plan*</td>
<td>0/0/2/3</td>
<td>130.0</td>
</tr>
<tr>
<td>(9) Cross-border transport network development plan*</td>
<td>0/1/0/3</td>
<td>520.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>23/12/6/41</strong></td>
<td><strong>355.4/834.8/1146.0/2335.2</strong></td>
</tr>
</tbody>
</table>

Note: * - no specific time frame was assigned to certain projects within this category

It is clear the master plan places an emphasis on short term projects; more than 50% of the projects are planned within the first 2 years. It is also apparent that the master plan favours traffic safety and environment plans, knowledge transfer, and traffic management types of project. Projects under these three categories combined to represent 71% of all projects proposed. It is also a concern that there are only five sustainable transport projects. This category also received the lowest funding. Moreover, the master plan assigned only 1% (28.7 million Baht) toward non-motorised transport projects. In contrast, it allocated nearly 50% of its proposed budget to projects related to private vehicular transport. The road network development projects are also the most capital intensive projects.

4.3. Case study B: Chiang Mai Transport Master Plan Revision 2 (2007)

Chiang Mai province is located within the mountainous area in the northern region of Thailand, some 700 kilometres from Bangkok. The urbanised area of the province is officially called Chiang Mai Principal Area, which spans 7 districts and covers approximately 429 square kilometres. The population of this urban area is approximately 670,000 (1999). The city has been designated a primary centre for various developments with the region as included in the National Economic Plan 6. The city has been positioned as a multi-service government hub for the northern region in the following areas: higher education, medical provision and training, commercial and industrial centre, and tourist destination.

The city is known to have chronic transport problems. Nernhard (2009) reports that in 1969, the city’s newspapers raised concerns about the city’s traffic congestion. An empirical study by Nimnual, Srisakda, & Satayopas (1980) reported an increased delay in traffic travel time. Since then, transport problems still remain a major concern for the city with intensifying congestion, over-dependency on private cars and motorcycles, and a high number of transport accidents (Charoenmuang, 2007).

The first Chiang Mai Transport Master Plan was created in 1994. It was among the earlier transport master plans for regional cities in Thailand. This revised study aimed to update the previous study and had the following objectives:

1) to reveal the past, present, and future trends of the city’s transport system,
2) to ensure integrated, convenient, fast, and safe mobility,
3) to provide a transport management plan that accorded with the city’s vision, and
4) to provide a plan and program with sufficient details to support a budget proposal.

The study refers to several international planning and transport studies, which highlight the progressiveness of the theoretical ideas behind the master plan study. It proposes a move away from supply-side measures (i.e. road construction), which will eventually lead to an escalation of transport problems. It also acknowledges the importance of considering social, economic, and environmental aspects and the connectivity between transport and other entities within the urban system, such as land use.

The study presents an overview of the city’s transport development at the time. It reviewed 8 transport studies
and projects previously completed for the city and drew from them a number of learning points. It also reported on the progress of the projects proposed by these studies. Additionally, the study compiles transport projects planned for the city by different authorities, such as the municipality of Chiang Mai, the traffic police, and the land transport department. Moreover, it summarizes relevant high-level information, such as the city’s vision, and national economic and social development plan that was used later to guide the master planning process.

The study collected primary data from a number of sources, such as vehicle count and mobility interview. The study team interviewed over 5,000 households (3% of population within the study area) and made over 9,000 roadside interviews. It also collected secondary data, such as vehicle ownership, public transport service, and land use pattern from official sources. It classified the city’s roads into different categories and identified accident hotspots. It reported the existing traffic circulation system and the on-street parking system of the city. The data collected combined to comprehensively illustrate the existing condition of the city’s land use and transport system. The data was also used to construct a 4-step transport model of the city (Transportation Improvement Planning System – TRIPS) to provide a quantitative analysis tool for the study.

The study team proposed a detailed transport master plan for the city. At the highest level, it proposes a vision for the city in 2021. Chiang Mai city is to become a liveable city, which develops in a sustainable manner, while maintaining its cultural identities. In 2021, the city will be the center of development for the northern region of Thailand and the greater Mekong sub-region. The study also proposes a set of desirable conditions for the city’s mobility system, such as reduced private vehicle use, reduced travel distance, and a comprehensive public transport network. The proposed vision and conditions were then broken down into objectives, indicators, strategies, and measures. A set of measures were then combined to form plans and projects. The study considered three different time frames: short (1-5 years), medium (5-10 years) and long (10-20 years). The proposed five objectives and their corresponding indicators are shown in Table 2. Table 3 shows the number of proposed projects within the master plan, classified by type, their time frame, and cost.

<table>
<thead>
<tr>
<th>Objective</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limit environmental damage</td>
<td>Noise from traffic</td>
</tr>
<tr>
<td></td>
<td>Carbon monoxide concentration</td>
</tr>
<tr>
<td></td>
<td>Low pollution transport system</td>
</tr>
<tr>
<td>Safety</td>
<td>Number and type of transport accidents</td>
</tr>
<tr>
<td>Convenient accessibility</td>
<td>Speed and convenient in commuting</td>
</tr>
<tr>
<td></td>
<td>Public transport availability and usage within the city area</td>
</tr>
<tr>
<td>Economic productivity</td>
<td>Transport system that can be managed using local knowledge</td>
</tr>
<tr>
<td></td>
<td>Appropriate for the situation</td>
</tr>
<tr>
<td></td>
<td>Economically viable</td>
</tr>
<tr>
<td>Equality for all users</td>
<td>A system that is suitable for residents from all social levels.</td>
</tr>
</tbody>
</table>

Table 3. Proposed projects for Chiang Mai city by type, their planned timeframe, and cost

<table>
<thead>
<tr>
<th>Type of project</th>
<th>Number of project</th>
<th>Total project cost (million baht)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Traffic Safety</td>
<td>8/3/2/15</td>
<td>128.3</td>
</tr>
<tr>
<td>(2) Urban area development</td>
<td>7/5/4/16</td>
<td>78.55</td>
</tr>
<tr>
<td>(3) Traffic management</td>
<td>3/0/0/3</td>
<td>8</td>
</tr>
<tr>
<td>(4) Convenient in commuting</td>
<td>5/0/0/5</td>
<td>30</td>
</tr>
<tr>
<td>(5) Restricted personal vehicle</td>
<td>4/3/0/7</td>
<td>115.5</td>
</tr>
<tr>
<td>(6) Develop public transport system</td>
<td>1/0/1/2</td>
<td>16</td>
</tr>
<tr>
<td>(7) Land use management</td>
<td>0/1/1/2</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>23/12/6/41</td>
<td>221.6/149.75/12/383.35</td>
</tr>
</tbody>
</table>

Note: The number of projects by timeframe does not add up because some projects have multiple types, e.g. the development of a bicycle network project which included restricting personal vehicles and improving the urban area to encourage cycling. These projects also excluded regular maintenance budget and funded projects.

Exchange rate 36 Baht = 1 USD

The Chiang Mai master plan proposed 41 projects for the city in total. A high proportion of these projects address traffic safety and urban area development (31 out of 41 projects). These projects differed greatly; they ranged from traditional measures (such as road construction) to sustainable transport measures (such as car sharing and bicycle network construction). More than half of the projects are planned for the short term or within the first 5 years after
the plan is implemented. The budget allocated to those projects with a short time-frame is approximately 58% of the total budget. Additionally, 11 of these projects are classified as urgent projects, which should be implemented to resolve immediate transport problems faced, as soon as possible. Examples of these urgent projects are public transport development, school bus system, and redesign of accident hotspots. This plan also allocates around 24% of its total budget to improve walking and cycling facilities - a significant proportion when compared to Si Sa Ket master plan. The master plan also includes detailed descriptions and designs for 16 of the above projects and outlines proposals for the remainder. This information can be readily adapted by the authority and included in their project and budget proposals.


Lampang is a province in the northern region of Thailand. It shares a border with Chiang Mai province. The urban area of the province is called Lampang city. The distance between Lampang city and Chiang Mai is approximately 100 kilometres. This close proximity is one of the reasons that the government assigned Lampang city as a twin city to Chiang Mai. It aims to develop the two cities in parallel and to complement each other.

Lampang was chosen to be the first province to carry out a monitoring and evaluation study on its master plan. The OTP previously developed a transport master plan for Lampang in 1998. It was among the second tier provinces that were chosen for the master plan study. The evaluation study is an OTP’s pilot project, and aims to provide feedback and recommendations into the master plan study process.

The study employs Success Index (SI) in monitoring the master plan and uses Stufflebeam’s CIPP model in evaluating the master plan’s performance. The CIPP model evaluates four different aspects of the plan as shown on Figure 6.

The master plan of Lampang proposed 20 transport projects, which can be classified into 6 types in accordance to their objectives, such as enhanced network capacity, traffic management and control, and traffic safety. These projects can also be categorised by their timeframe. The evaluation study reveals the status of these projects by their timeframe in Table 4.
Table 4. Projects proposed by Lampang master plan and actual status in 2014

<table>
<thead>
<tr>
<th>Project timeframe</th>
<th>Total</th>
<th>Completed</th>
<th>Project status</th>
<th>Budget allocated (million Baht)</th>
<th>Budget utilized (million Baht)</th>
<th>% of total budget</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short timeframe</td>
<td>7</td>
<td>5</td>
<td>1</td>
<td>11.2</td>
<td>8.7</td>
<td>78%</td>
</tr>
<tr>
<td>Medium timeframe</td>
<td>6</td>
<td>3</td>
<td>2</td>
<td>239.4</td>
<td>24.4</td>
<td>10%</td>
</tr>
<tr>
<td>Long timeframe</td>
<td>7</td>
<td>2</td>
<td>2</td>
<td>310</td>
<td>120</td>
<td>27%</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>10</td>
<td>5</td>
<td>560.6</td>
<td>153.1</td>
<td>27%</td>
</tr>
</tbody>
</table>

Out of 20 projects proposed in the master plan, 10 projects or 50% of the proposed projects have been implemented, 5 projects have not yet been implemented and other 5 projects are asked to be cancelled. Most of the completed projects are short term projects; 71% of projects in this category have been completed. Next successful are the projects with a medium time-frame (50% completed), followed by the long term projects (29% completed). However, the projects with a long lead in are more successful in utilising their planned budget (27%) than the projects with a medium time-frame (10% of planned budget utilised). Short time-frame projects are the most successful in utilising planned budgets (78%).

The evaluation study reveals three main challenges in implementing the plan. Firstly, the budget available was insufficient to implement the proposed project. Some of the proposed plans have budgets that exceeded the financial capacity of the responsible organisations. Additionally, no financial support from the central government was received.

Secondly, the capacity of the local organisation could not cope with the level of complexity of some of the projects. Several projects were also found to fall short in the organisational spheres. Additionally, poor project coordination and lack of ownership hindered the implementation of the proposed projects. Certain projects were also found to be inappropriate in addressing the problems faced.

Lastly, some local organisations responsible for implementation of these projects did not have suitable and competent personnel. Despite the OTP’s effort in capacity building and training local staff, it was apparent the skills available were not sufficient. These shortfalls lead to a drop in the expected quality of the project.

Overall, the evaluation study found the actual project implementations to differ from the master plan’s proposal. Certain adjustments have to be made to the plans to accommodate unforeseeable changes. The CIIP model indicates that 50% of the implemented projects were carried out according to the master plan, the other 50% had challenges resulting from changes in budget and environment of the projects. The model also reveals that half of the implemented projects yielded satisfactory outcomes and 7 out of 10 projects yielded tangible improvements. The projects implemented have positive impacts on the transport system.

These results highlighted the needs for the OTP to strengthen its role in supporting regional cities to devise and implement their master plans. The study also made the following recommendations: a) for OTP to work more closely with local organisations, b) intensify efforts in monitoring and evaluation of master plans, c) develop capable personnel, d) involve local organisations in the monitoring and evaluation process, and e) organise monitoring and evaluation database.

5. Urban transport master plan for Bangkok

Bangkok was inaugurated as the capital of Thailand in 1782. Since then, it has rapidly grown to become the country’s most populated urban area. Over 8 million people, or more than 12 percent of the country’s population, reside within Bangkok. Its area has expanded from 4.14 square kilometer to 1,568.74 square kilometer of the city, or over 380 times.

Initially, the main mode of transportation in Bangkok was by paddle boat. Road transportation was rare and streets were narrow and only suitable for walking (Jaensirisak, 2008). However, an influx of western technology during the reign of Rama 4th (1851-1868) significantly changed the city landscape. Bangkok expanded rapidly, changing the way of life of its citizens with the city plan reflecting planning principles and theories similar to those of the west.

The city’s population reached 600,000 in 1900 with the city area of 13.32 square kilometer. Rama 4th ordered an expansion of the city and built several roads. The expansion continued during the period of Rama 5th (1868-1910).
Several more roads were built, as well as Thailand’s first tramway. These new roads promoted land transportation by the horse drawn cart, rickshaw, tricycle, tram, and car.

The first car arrived in Thailand around the turn of the 20th century. The exact year is unknown. The first record of car being imported into Thailand was in 1904 by Rama V. At first, cars were available within a small circle of the royal family, the elite of Thai society, and rich merchants. Over the years, construction of roads within and around Bangkok encouraged the growth of car ownership and car use. By 1931, there were 3,222 registered cars in Bangkok (Rounsuwan, 2013). Today, the car has become an essential mode of transport for Bangkokians. There are nearly 5 million cars and pickup trucks registered in Bangkok and around 40% of daily trips are made by private transport modes (World Bank & NESDB, 2009). The city is well-known for its transport problems and congested road networks. It is often cited as an example of a poorly organized and unplanned urban transport system.

5.1. The beginning of Bangkok transport plan

Contrary to popular belief, the efforts to make plans for Bangkok’s transport system began as early as 1942. During Rama 7th reign, the city planning division was founded under the Public Works Department. It was tasked with the responsibility to oversee the infrastructure development of the city. Yet, the political instability during the time prohibited any long term planning from being made.

Under the reign of Rama 9th, several city and rural planning acts were passed to provide the city with development guidelines, yet they were ineffective due to lax enforcement and insufficient budget (Jaensirisak, 2008). The government of Thailand under Field Marshal Plaek Phibunsongkhram initiated the first National Economic and Social Development plan that focused on developing Thailand’s infrastructure. His government also called international experts for help in planning Bangkok. The consortium produced a land use and transport plan for Bangkok in 1960. The plan is commonly known as the Litchfield Plan (Rujopakarn, 2003). Two years later, the planning division was promoted to the planning department in 1962.

The implementation of the Litchfield plan was not successful because of the ambiguity of the laws related to town planning at the time. Additionally, Bangkok expanded at a much more rapid rate and in different ways than previously forecast. Several revisions of the plan were made to accommodate these changes (Thongchai 2548).

The government at the time reached out for external help again. Experts from Germany were invited to help with the transport and traffic planning for Bangkok. The study period was between 1972 and 1975. The plan proposed a city plan and the construction of several transport infrastructures, such as expressways, mass-transit system, and road changing system (Jaensirisak, 2008). Nevertheless, only the expressways were constructed by the government at the time.

A number of governmental authorities continued their attempts to improve the city’s transport system. In 1976, Expressway Authority of Thailand (EXAT) studied the feasibility of constructing three lines of mass transit, but the lack of funding and political problems caused the project to be cancelled in 1992. The government commissioned the construction of the Bangkok Elevated Road and Train System (BERTS) between central Bangkok and Don Mueang International Airport in 1990. Costing 80 Billion baht (US$3.2 billion), and commonly known as the Hopewell Project, this was eventually cancelled in 1997. Several reasons were attributed to the project’s failure, such as the Asian financial crisis, delays in construction, and flagrant corruption. In tandem with the BERTS project, the Lavalin Skytrain project also commenced in 1990. The project concession was cancelled in 1992 but another company, Thanayong Public Company Limited took over the concession. The project was completed in 1999; the system has two lines (the Dark Green and the Light Green) with a total length of 23 kilometres.

In 1992, the Mass Rapid Transit Authority (MRTA) was founded. The organization was formed with a vision for it to take over the running of Bangkok’s mass transit system once their concessions expire. It is also tasked with a responsibility to construct, coordinate and operate Bangkok’s mass transit system. It initiated construction of the Blue line in 1996 and this was completed in 2004. The total length of the line is 21 kilometers.

5.2. Bangkok mass rapid transit master plans

The first transport plan of Bangkok was the Mass Rapid Transit System Master Plan or MTMP. The plan was endorsed by the cabinet in 1994 for completion in the period 1995-2011. It proposed new constructions and extensions of the mass transit lines to yield a total length of 103 kilometers. This plan also included the BERTS system. After the termination of the BERTS system, the plan was revised and renamed the Urban Rail
Transportation Master Plan in Bangkok and Surrounding Area (URMAP). The plan proposed a total of 375 kilometers in the mass transit system, with three construction phases: the first phase of 141.9 kilometers between 2001 and 2011; the second phase of a further 158.2 kilometers would be completed in the period 2012-2022, and the third phase for an additional 75.3 kilometers was stated to begin after 2023.

The delayed implementation of the URMAP leads to a revision of the plan. The Bangkok Mass Transit Master Plan (BMT) was created by the OTP and endorsed by the cabinet in 2004 for completion in the five years from 2004 to 2009. The plan proposed a mass-transit system with seven lines, and a total network length of 291 kilometers. The implementation of the plan was delayed again; only 41 kilometers has been added to the network during the period. This resulted in another revision of the plan. In 2009, the OTP issued a revised master plan called the Mass Rapid Transit Master Plan in Bangkok Metropolitan Region (M-MAP).

5.3. Mass Rapid Transit Master Plan in Bangkok Metropolitan Region (M-MAP)

The M-MAP master plan consists of 12 mass transit lines; eight primary lines and five feeder lines. The plan was endorsed by the government in 2010 for the period between 2010 and 2029. The eight primary lines consists of two commuter rail routes (the dark red and the light red lines), the Airport rail link line, and five rapid transit lines. The five feeder lines will be monorail systems. As of June 2015, parts of this network are already in operation (86.52 kilometer), more construction work is in progress (107.2 kilometer), and tenders are to be issued in 2015 (144 kilometer), and 2016 (58.3 kilometer) (MOT, 2015). Figures 7 shows the proposed network of the M-MAP project.

Fig. 7 M-MAP network (OTP, 2009)

The master plan study team set out a list of objectives for the master plan, together with four categories of quantitative and qualitative goals the system should deliver and the plans success measured by. These objectives and goals are the guidelines in implementing the master plan at project level. The goals can be classified into three types, namely, 1) Engineering & Connectivity, 2) Economic & investment, and 3) Social & Environment. The objectives of the M-Map and the goals are shown in Table 5.
Table 5. Objective and expected qualities of M-MAP

<table>
<thead>
<tr>
<th>Objective of M-MAP</th>
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<tr>
<td>• Reduce losses in economic, time, and energy, spending on vehicle, environment, health, and economic opportunities</td>
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<tr>
<td>• Increase proportion of mass transit trips to 20% within the first 10 years</td>
</tr>
<tr>
<td>• Large proportion of population can access the system, reducing their commuting time and spending</td>
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<tr>
<td>• Reduce long term cost to the country</td>
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<tr>
<td>• Reduce duplicate investments in rail and road system</td>
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<table>
<thead>
<tr>
<th>Expected qualitative and quantitative qualities of the system</th>
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<tbody>
<tr>
<td>A. Engineering &amp; connectivity</td>
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<tr>
<td>• Covers the inner city area, commercial area, and areas with high density</td>
</tr>
<tr>
<td>• Residents can travel continuously from home to destination within 75 minutes and with no more than 4 transits</td>
</tr>
<tr>
<td>• Meets the required travel demand and has convenient connectivity</td>
</tr>
<tr>
<td>• Employs suitable system to retain low construction, operation, and maintenance costs</td>
</tr>
<tr>
<td>• Single fare system with integrated ticketing</td>
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<tr>
<td>• Adequate level of service and safety standard</td>
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<tr>
<td>B. Economic &amp; Investment</td>
</tr>
<tr>
<td>• Fair fare system, in proportion to trip distance and area</td>
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<tr>
<td>• Lowest fare with optimum economic benefits</td>
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<tr>
<td>• Fare revenue is not below operation cost, the system is not a financial burden in long term</td>
</tr>
<tr>
<td>• Generates non-fare incomes and enable beneficiaries along the routes to support the development</td>
</tr>
<tr>
<td>• Employs a joint-venture system that most benefits the citizens</td>
</tr>
<tr>
<td>• Suitable budget for economic condition and select funding source to keep development cost low</td>
</tr>
<tr>
<td>C. Social &amp; Environment</td>
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<tr>
<td>• In line with Bangkok’s principal city plan, distributes housing and infrastructure investment with direction</td>
</tr>
<tr>
<td>• Improves quality of life and promotes environmental quality in the long term</td>
</tr>
<tr>
<td>• Low impacts to citizens and provides appropriate mitigations</td>
</tr>
<tr>
<td>• Acceptable level of disturbances during construction</td>
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<tr>
<td>• Promotes tourism</td>
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The OTP began the process to formulate the M-MAP in 2008 and took 9 months to complete. The process of the master plan revision is summarized in Figure 8 below.
The master plan revision process began by compiling transport data, project proposals, route alignments, and financial details from previous master plans. The information of any related transport projects was also included. Once these existing data and conditions were established, the study team reviewed the data available and produced a list of required improvements that should be made to the last master plan.

Next, the team reviewed the mass transit network as a whole to ensure the proposed master plan was the best fit. First, it focused on checking the integration and redundancy of the network. It then considered alignments, station locations, and maintenance hubs. It also reviewed the ridership forecast and proposed suitable primary and secondary routes, as well as recommending an appropriate type of mass transit. At this stage a preliminary estimation of the projects’ costs were also made.

In the third step, the proposed routes were reviewed once again. This review focused on the effects of the mass transit system on enhancing land use, the connectivity between different parts of the inner Bangkok area, and the integration of the mass rapid transit system with other transport systems, such as the bus and the canal boat. Next, the study analyzed and prioritized different parts of the network. Six criteria were used to select the order. They are 1) coherency with policy, 2) readiness of project, 3) network service, 4) environmental impacts, 5) economical return, and 6) investment return. At this stage, facilities that will enhance the efficiency of the system, such as park and ride and additional feeder services were also proposed.

The outputs from the foregoing steps yielded the M-MAP plan, which provided a basis to carry out the environmental impacts study for the master plan as a whole and for each individual line. A recommendation study to assess appropriate legislation that will optimize land use along the master plan route was also carried out in parallel. Finally, the information of the master plan and the study was conveyed to the public through the public participation process and public relations.

6. Lessons learned

The case studies of Si Sa Ket, Chiang Mai, Lampang, and Bangkok included here presents only a small glimpse into the methodology and the range of issues addressed by the master plans. These consider some of the elements in the ideal plan-led process, with thoughts about their transferability to South East Asian cities. The elements considered (Emberger et al. 2008), are: visions and objectives, policy instruments, barriers, strategies, and participation.

A list of possible improvements to the master plan process has been put together based on the review of the four master plans in this paper. Some recommendations are also drawn from the study by Jaensirisak (2006), which reviewed 32 transport master plans in Thailand.

- **Vision and core values.** Sustainability and liveability have been made the core values of master plans, yet they need to be better understood by the stakeholders involved, particularly by politicians. In addition, the vision for each master plan should be unique and support each city to reach its full potential.

- **Consider interdependence.** Although the master plan considers land use and environment in the study, it is often focussed solely on transport aspects. A system approach that considers the transport system and its interconnectedness with other spheres should be preferred. Such an approach may increase the complication of the planning process but will improve the comprehensiveness of the plan. The master plan should also place more emphasis on social facets. The inclusion of this sphere can improve the richness and comprehensive of the master plan study. Additionally, the plan should consider developing an integrated strategy to achieve synergy. By combining different policy instruments, acceptability of certain unpopular measures, such as parking management, can be improved by offering other incentives, such as public transport provision.

- **Propose sustainable transport solutions and focus on public and non-motorised transport.** The solutions considered by master plans are often supply-side measures, such as road widening and construction, or technology fixes, such as Intelligent Transport System (ITS). Sustainable transport solutions, such as travel-demand management, traffic calming, and pedestrianisation, should be featured in the master plan. The study makes a strong emphasis on vehicular and road transport. Instead, it should prioritise public transport and non-motorised transport modes, such as walking and
bicycle. Mobility data collection exercises should make additional efforts in to gather data for these modes. Additionally, connectivity between different modes should also be considered.

- **Set appropriate indicators.** The master plans often set indicators that focus on vehicular traffic; for example, volume and capacity (V/C) or average network speed. Such indicators will promote measures that favour vehicular traffic, such as road construction and worsen the system in the long run. Alternative indicators, such as lower vehicle ownership, should be considered (See (EC, 2010; Litman, 2008; Nielsen, 2009) for more information). Moreover, certain indicators may be in conflict with one another. For example, Chiang Mai city set commuting speed as its indicator, yet increased network speed may also increase the number of transport casualties and deaths. It is necessary to take a holistic perspective in selecting appropriate indicators.

- **Wider participation in planning process.** The master plan process should incorporate participants from a wider range of organisations, as well as from different levels of governmental bodies. In the case of Bangkok, only three formal public hearings were organised and less for other master plan study. The study noted the public’s concerns but more could be done to actively involve people in the planning process, especially in setting the vision and in evaluating existing problems. This will utilise local knowledge, add other points of view of the issues faced, thus improving the quality of the master plan. Public participation meeting should be organised more frequent, in both small and larger group.

- **Improve monitoring and evaluation processes.** Currently, the emphasis on these two processes is weak. Continuous monitoring and evaluation of the master plan will ensure successful implementation of the plan. The master plan evaluation study of Lampang shows only 50% of the proposed projects are implemented. With continued monitoring and evaluation, difficulties or challenges in carry out the plan can be picked up earlier and appropriate actions can be taken to provide support to the local authority.

- **Better project assessment framework.** It is apparent from the case studies presented here that the impact assessment of projects proposed in the master plans can be enhanced. Effects of the proposed measures should be analysed in qualitative and quantitative manners. For example, in the case of Chiang Mai city, the study mentioned the qualitative and quantitative assessment methods but failed to apply them to the proposed measures. This enhancement will add value to the decision making process and the monitoring & evaluation of the master plans. Alternative types of transport model should be considered in place of the traditional 4-step model. The 4-step model is known to have bias toward traditional transport measures, such as road widening, while discounting or even dismissing sustainable transport solutions. Land Use and Transport Interaction (LUTI), on the other hand, simulates the interaction between transport and land use and allows modelling of non-motorised transport modes.

### 7. Conclusion

Over the years, Thailand’s transport master plans have proved to be a valuable exercise in providing a mine of information concerning transport modes, land use, socio-demographics, and environmental data for each city. The planning process has pooled data from different sources and housed them in one place. Adherence to the planning process also provided opportunities to collect primary data, such as mobility behaviour and traffic count for major towns and cities, which might otherwise not have been collected by local authorities. This data is extremely useful and has a wide range of potential applications in transport planning, formulating local government policy in urban planning, for example, and beyond. These studies have also provided expert technical support for local government departments to review local transport systems.

The master plans themselves have also proved to be useful documents. They provide a clear direction of the cities’ development in the field of transport within a specific time frame. The master plans are available to the public, thus enhancing the transparency of the process. Moreover, they have been used to support budget proposals by local governments. They have also been used by the central government in aiding with its transport budget allocations.

Although significant progress has been made in this field, there is still much to do to improve Thailand’s urban transport planning practice. A number of possible improvements have been suggested in this paper. Three points
stand out in particular: the needs for a holistic systems approach, a bigger emphasis on, and higher regard for sustainability, and active involvement of the public in shaping local transport plans

A holistic systems approach is necessary in creating transport policy because of the complex interaction of the many factors which should be taken into consideration. This complexity arises from the number of factors within the transport system and the interconnectedness between them. Tackling transport policies in a piece meal way can lead to unforeseen problems. For example, an attempt to solve a congestion problem in one area by providing more road space may encourage additional vehicle trips and ultimately worsen the overall situation. Instead, a broader consideration concerning transport issues should be made. For example, could the congestion problem be solved changing the route of public buses or providing alternative public transport? Might higher parking charges or city centre zoning charges dissuade people from using private vehicles and encourage the use of public transport? Could local government initiatives to create safe, supervised cycling routes to schools reducing school run traffic? Integration is a key element in the transport strategy development (see e.g. May and Gardner, 1990; May, 1991; May and Roberts, 1995; May et al., 2006; Jones et al., 2006). However, there is still considerable confusion as to what is meant by integration, and how best it can be achieved in developing countries.

A sustainable transport system is often mentioned in Thailand’s master plan as its fundamental goal but as proposed plans move toward implementation the concept of sustainability is often watered down. This point becomes more apparent, if the budget assigned to sustainable transport measures, such as bicycle facility provision, is compared with the funds available for to road construction. There are simply too few sustainable transport projects and insufficient funds allocated to make them work. This discrepancy indicates there is much to be done to change the mind-set of the parties involved in the planning exercise. A strong emphasis to ensure transport issues are looked at through the economic, social, and environmental lens needs to be made.

The public and stakeholders are already involved in the current master plan process. However, their participation could be much more active. In the current approach, public participation is sought only to inform the public about a proposed plan. These meetings are usually at the latter stages of the planning process when most details have already been determined. More effort should be made to encourage dialogue between study teams and stakeholders throughout the process, especially during the earlier stages. Smaller group meetings and working groups that encourage participation from people of all walks should be considered. Active public participation can increase the comprehensiveness of the plan and the plan’s acceptance by the public.

In this study, the focus is on planning process, yet equally important are implementation of the plan. An Austrian writer, Peter F. Drucker wrote, “Unless commitment is made, there are only promises and hopes; but no plans.” In the case of Thailand, the reverse seems to be the case; there is huge commitment to the creation of plans but the promise and hope offered within them rarely materialises. Many plans are delayed or cancelled far more often than they are implemented, as demonstrated in the case of Bangkok’s Mass-transit master plan. Political instability is often cited as the main reason transport plans are not followed through; the average life-span of a Thai cabinet, for example, is 1 year and 3 months. To ensure transport plans, often spanning the lifetime of several governments, are implemented needs legislative mechanisms that prevent political interference in long term transport projects. Strong and continuous monitoring and evaluation can also help to ensure approved projects are carried out efficiently and effectively.

References


