Chiang Mai

Sustainable Urban Transport Project

Chiang Mai Municipality Incorporation with the Office of Transport and Policy Planning, Global Environment Facility and The World Bank

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Content

List of abbreviations

ADB	Asian Development Bank
BRT	Bus Rapid Transit
CM	Chiang Mai
CMM	Chiang Mai Municipality
GEF	Global Environment Facility
GHG	Greenhouse Gas
GMS	Greater Mekong Sub-Region
GPP	Gross Provincial Product
Km	Kilometer
NMT	Non-motorized Transport
OTP	Office of Transport and Traffic Policy and Planning, Ministry of Transport
PDMO	Public Debt Management Office, Ministry of Finance
SMEs	Small and Medium Enterprises
TOD	Transportation Oriented Development

Acknowledgement

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Main Message

In the last ten years, Chiang Mai's economy has grown continuously, largely driven by the commercial sector and tourism industry. Besides tourism, Chiang Mai is becoming a Mekong regional hub for transportation, aviation, education, and medical services.

As a result of rapid expansion, the city increasingly faces problems common to large cities, such as unplanned and sprawling development, destruction of the amenities of the historic city, air and water pollution, traffic congestion, waste management, and environmental degradation. This horizontal sprawling expansion of the city's land use consequently compromises the compact pattern of the city center. Due to unplanned urban development, the absence of traffic demand management policies and practices, and a complete lack of integrated transport and land use planning, Chiang Mai is facing several pressing urban transport challenges: growing road traffic congestion and air pollution, inadequate public transport system, and insufficient pedestrian ways, all of which further drive the use of private cars and motorbikes and urban sprawl. As a result, the livability, environmental sustainability, and personal mobility decline while the urban transport is becoming the major source of GHG emissions.

Sustainable urban transport development with a low-carbon focus will be crucial for Chiang Mai to enhance the city's livability, and maintain its attractiveness as a leading tourist destination. This project aims to help Chiang Mai to move onto the path of sustainable urban transport development by improving the city's technical capacity and building up the policy making process to integrate transport and land use planning which is essential for the city's historical significant areas, improve public urban transport infrastructure and system and implement appropriate traffic demand policies. The trend of economic expansion

is considered from the trend of gross provincial product (GPP). From the promotion of Chiang Mai development, it is expected that the important proportion of Chiang Mai, which focuses on tourism and being the regional center. According to the growing trend in the past, the service section has grown 6.1 percent per year, and industrial section has grown 4.1 percent per year.

The project had engaged with stakeholders in various levels from the design process. The plan for integrated transport and land-use planning was made through a bottom up process, rather than the usual bottom down approach. The process involves several public consultations, interview surveys as well as focus group meetings (additional details can be found in Chapter 3). The key to successful NMT project was stakeholder engagement. There were more stakeholders consultations organized than originally planned as it was requested from directly by the community. The citizens of Chiang Mai are interested in the city's developmental path.

The project is a pilot case study to demonstrate the potential of Chiang Mai to become an NMT city, it may take another year or 10 years to fully implement the plan. Most importantly Chiang Mai has chosen it's developmental path.

The project contributed to broader sustainable urban transport agenda beyond the city itself by piloting this comprehensive approach to capacity building and technical support at both planning and implementation stages to demonstrate tangible outcomes on the ground. Experiences accumulated and capacity built in Chiang Mai allow for replication activities in the immediate future

Through technical assistance and capacity building activities, the project filled in technical gap and launch a process that enabled the city to achieve the final outcome of a well-planned integrated sustainable urban transport system in the long run. It is recognized that the final outcome achieved with sustained efforts by the city over the next five to ten years and the project only provides strategic intervention to put Chiang Mai city on a sustainable development path.

Chapter 1

Introduction

Figure 1.1 Chiang Mai, Thailand
Source: Google Map

Chiang Mai is the center of the northern development area, located adjacent to 3 countries in the Greater Mekong Sub Region (GMS), Burma, Laos, and China (see Figure 1.1). Consequently, the investment has expanded continuously and Chiang Mai has grown rapidly as the area to support the development and development project as stated in the said cooperation. Land utilization, ownership, and people's way of living have changed drastically.

Chiang Mai is one of the most important and fastest growing secondary cities in Thailand. The city serves as a regional economic and cultural hub in the North and ranks as the fourth largest city in terms of population. It is also a well-known historical city with rich cultural heritages and environmental amenities.

In the last ten years, Chiang Mai's economy has grown continuously, largely driven by the commercial sector and the tourism industry (with 5 million visitors per year). Besides tourism, Chiang Mai is becoming a Mekong regional hub for transportation, aviation, education, and medical services. As a result of rapid expansion, the city increasingly faces problems common to large cities, such as unplanned and sprawling development, destruction of the amenities of the historic city, air and water pollution, traffic congestion, waste management, and environmental degradation. This horizontal sprawling expansion of the city's land use consequently compromises the compact pattern of the city center. Due to unplanned urban development, the absence of traffic demand management policies and practices, and a complete lack of integrated transport and land use planning, Chiang Mai is facing several pressing urban transport challenges: growing road traffic congestion and air pollution, inadequate public transport system, and insufficient pedestrian ways, all of which further drive the use of private cars and motorbikes and urban sprawl. As a result, the livability, environmental sustainability, and personal mobility decline while the urban transport is becoming the major source of GHG emissions.

Sustainable urban transport development with a low-carbon focus will be crucial for Chiang Mai to enhance the city's livability, and maintain its attractiveness as a leading tourist destination. This project aims to help Chiang Mai to move onto the path of sustainable urban transport development by improving the city's technical capacity and building up the policy making process to integrate transport and land use planning which is essential for the city's historical significant areas, to improve public urban transport infrastructure and system and to implement appropriate traffic demand policies. The trend of economic expansion is considered from the trend of gross provincial product (GPP). From the promotion of Chiang Mai development, it is expected that the important proportion of Chiang Mai, which focuses on tourism and being the regional center. According to the growing trend in the past, the service section has grown 6.1 percent per year, and industrial section has grown 4.1 percent per year.

Therefore, Chiang Mai Municipality (CMM) has initiated a project "Chiang Mai Sustainable Urban Transport" with the support from Global Environment Facility (GEF) through the World Bank together with the Office of Transport and Traffic Policy and Planning (OTP) as Implementing Partner. The aim is to improve the technical capacity of Chiang Mai Municipality for sustainable urban transport development, through technical support on integrated land use and sustainable urban transport planning and pilot demonstration on NMT improvement. Since, urban transportation involved more than just Chiang Mai Municipality staff, training will be extended to reach out to the public and officials from other concerned agencies such as the Office of Transport Policy and Planning (OTP), and the general public.

The ultimate objective of the project is to improve the technical capacity of CMM for sustainable urban transport development, through technical support on integrated land use and sustainable urban transport planning and pilot demonstration of non-motorized transport (NMT) improvement.

Chapter 2

Current trends and issues in land use and transport in Chiang Mai.

Chiang Mai went through 4 periods of settlement development, and is expanding horizontally.

The first settlement was in the old town square, where is it now rich in historical and cultural sites (Zone A in Figure 2.1), where building heights are limited at present. The second phase of development expanded to the east of the city where the train station is located (Zone B in Figure 2.1) with a mixture of densely populated area, commercial buildings, hotels, department stores and academic institutions. The third phase of development was concentrated to the west where Chiang Mai University was built and the first ring road or the Super-Highway and the international airport was built (Zone C in Figure 2.1). The fourth phase of development was located between the second and third ring road (Zone D in Figure 2.1), the area is still lightly populated with some agriculture land.

Figure 2.1 Chiang Mai's development zones.

The number of people living in Chiang Mai is increasing over the years. The number of households in civil registration in Chiang Mai municipality area had been increasing every year between 2001-2011, while the number of registered population had been decreasing as shown in Table 2.1. This means that there were unregistered population, long-stay foreigners and migrants move to live in Chiang Mai.

Year	Male	Female	Total	+ / - (%)	House-hold	+ / - (%)
2001	82,525	91,331	173,856	+1.25	67,178	+1.18
2002	74,819	84,584	159,403	-8.31	67,809	+0.94
2003	74,401	84,305	158,706	-0.43	69,073	+1.87
2004	78,835	87,937	166,772	+5.09	68,053	+1.47
2005	70,403	80,608	151,011	- 9.45	70,090	+1.26
2006	69,989	80,483	150,472	-0.35	70,090	+1.21
2007	69,122	79,188	148,310	-1.44	70,973	+1.26
2008	68,310	78,490	146,800	-1.02	71,514	+0.76
2009	66,564	76,406	142,970	-2.31	75,255	+0.88
2010	66,333	75,830	142,163	-0.56	75,721	+0.62
2011	66,036	75,325	141,361	-0.56	75,878	+0.21

Table 2.1 Illustrates the number of population in Chiang Mai municipality according to the civil registration 2001-2011

Source: Civil Registration Department, Chiang Mai Municipality Office, access in January 2011

Change in Labor force, there were 8,812 migrant labor forces registered (Chiang Mai Employment Office 2005), but the unofficial number of migrant workforces may be as high as 40,000. Eighty percent of them spread all over Chiang Mai city plan and in the future the demand for work forces will increase to work in new projects. The Greater Mekong Sub-Region Development (GMS) allows easy access for migrant workers to the area. It is expected that the number of migrant labor will double to 80,000 persons.

In 2004, there were 3,999,842 visitors visited Chiang Mai (Tourist Office Region 1), which increased by 376,477 visitors from the year 2004 of which 3,780,821 were tourists (visitors who stayed overnight in the area). The office expected that, in the future, number of the visitors would expand as Chiang Mai is being developed to be tourist center in countries in Greater Mekong Sub-Region. It is aimed that the visitors will be increase by 2.5 percent per year so, in the next 20 years, Chiang Mai will have 5 million visitors per year, and 10 percent of them are tourists who stay overnight in Chiang Mai.

The focus of development resources to Chiang Mai has caused the province, especially in city planning area, to attract more population than other areas. As a center of development, there will be more working populations, pupils and students come to the area, which leads to requirement of more facilities. This happens specifically in city plan area where the population expands continuously. It is expected that a number of population in Chiang Mai city plan will be 748,747 by 2027. The population in Chiang Mai municipality will decrease while the population in other areas, especially rural areas, will increase as shown in Figure 2.2. Figure 2.2 illustrates population density in city plan area. The dark orange color represents high density area while light orange represent low density.

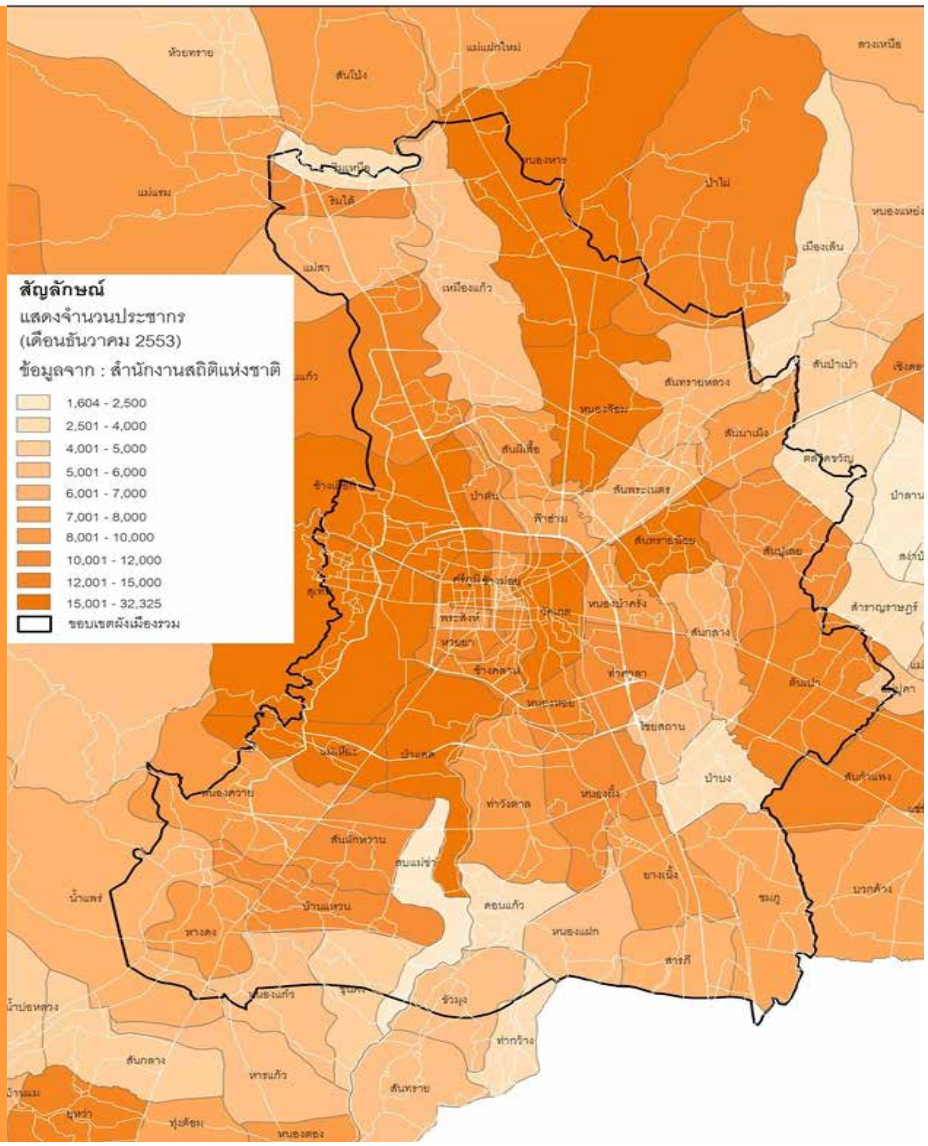


Figure2.2Map of population density in 2011

In the last ten years, Chiang Mai's economy has grown continuously, largely driven by the commercial sector and tourism industry (with 5 million visitors per year). Besides tourism, Chiang Mai is becoming a Mekong regional hub for transportation, aviation, education, and medical services. As a result of rapid expansion, the city increasingly faces problems common to large cities, such as unplanned and sprawling development, destruction of the amenities of the historic city, air and water pollution, traffic congestion, waste management, and environmental degradation.

This horizontal sprawling expansion of the city's land use consequently compromises the compact pattern of the city centre. Due to unplanned urban development, the absence of traffic demand management policies and practices, and a complete lack of integrated transport and land use planning. Figure 2.3 shows example of residential building expansion in Chiang Mai urban area during 2011-2013. The number of high-rise residential buildings (condominiums) is increasing. From the primary survey, there are 73 projects with 8,891 units, excluding projects that are under construction.

The Projects of condominiums during year 2011 - 2013 about 74 projects.

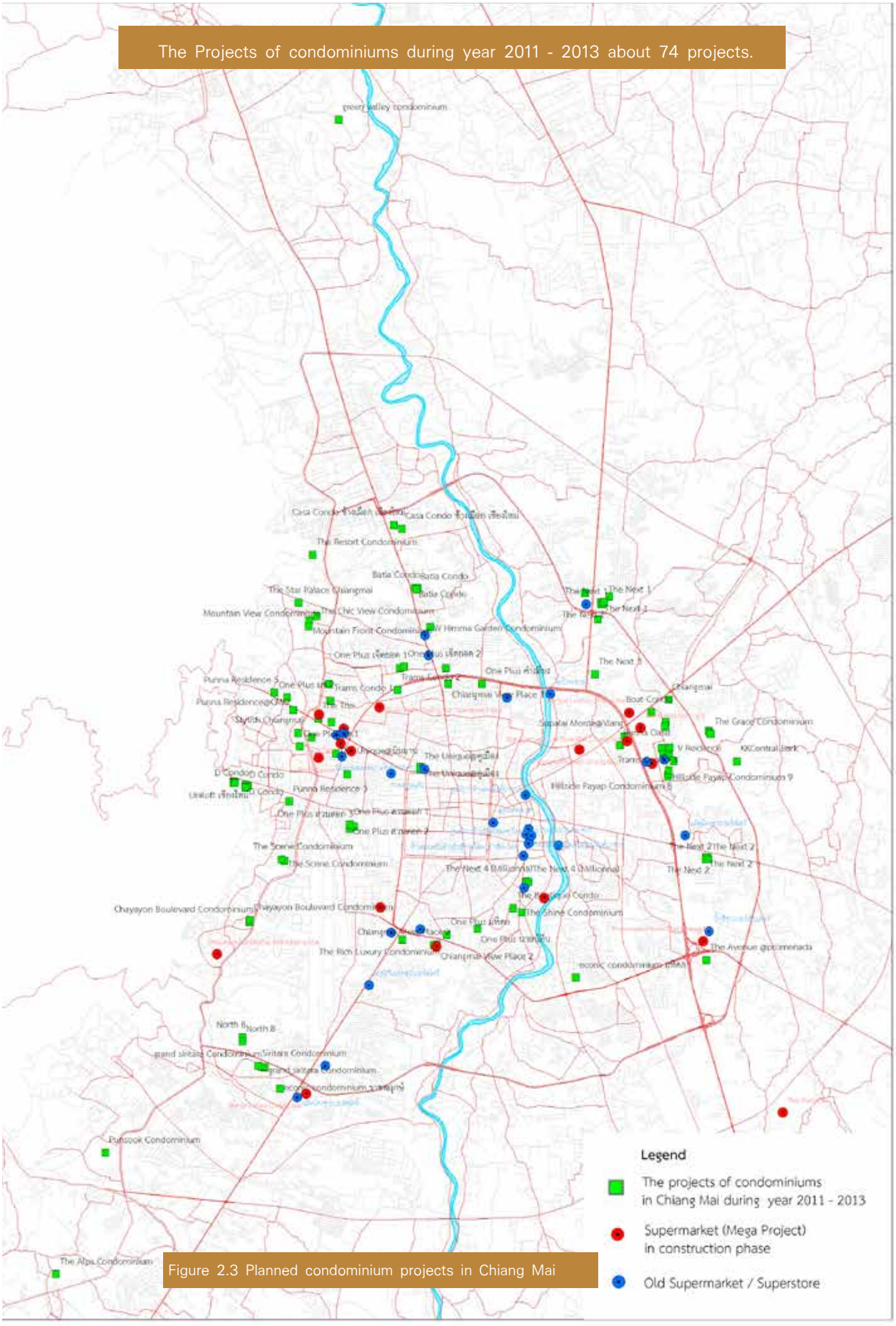
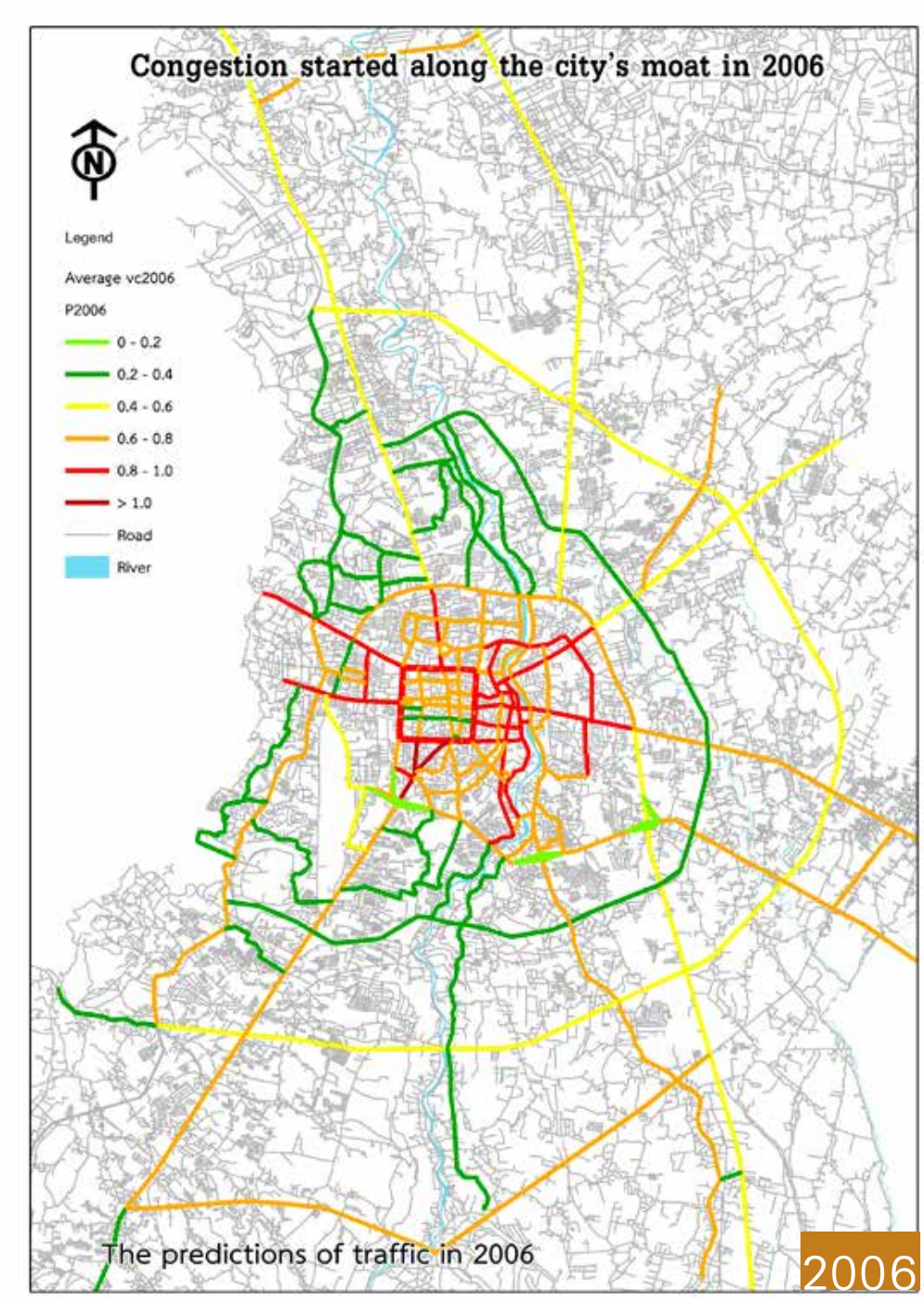


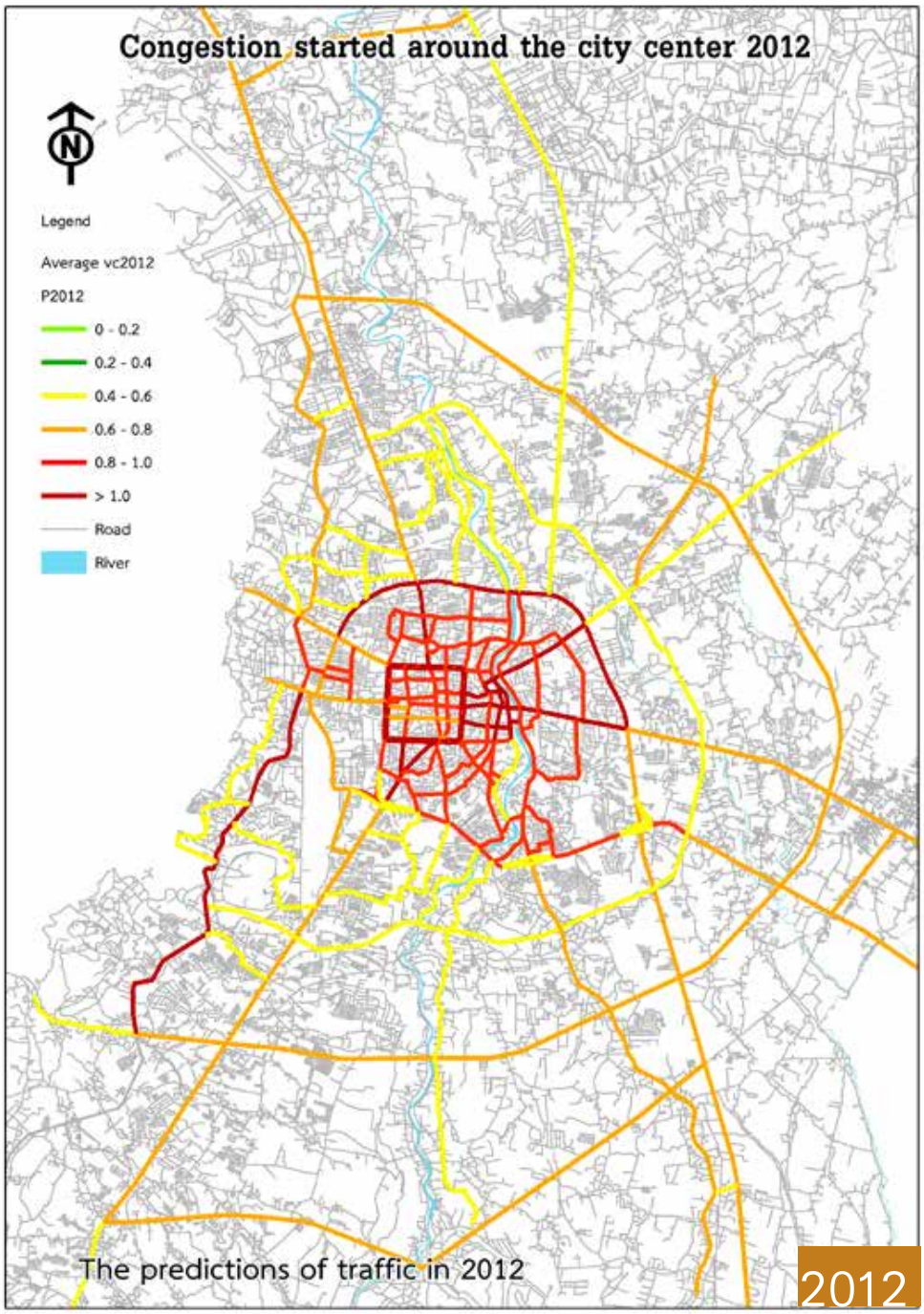
Figure 2.3 Planned condominium projects in Chiang Mai

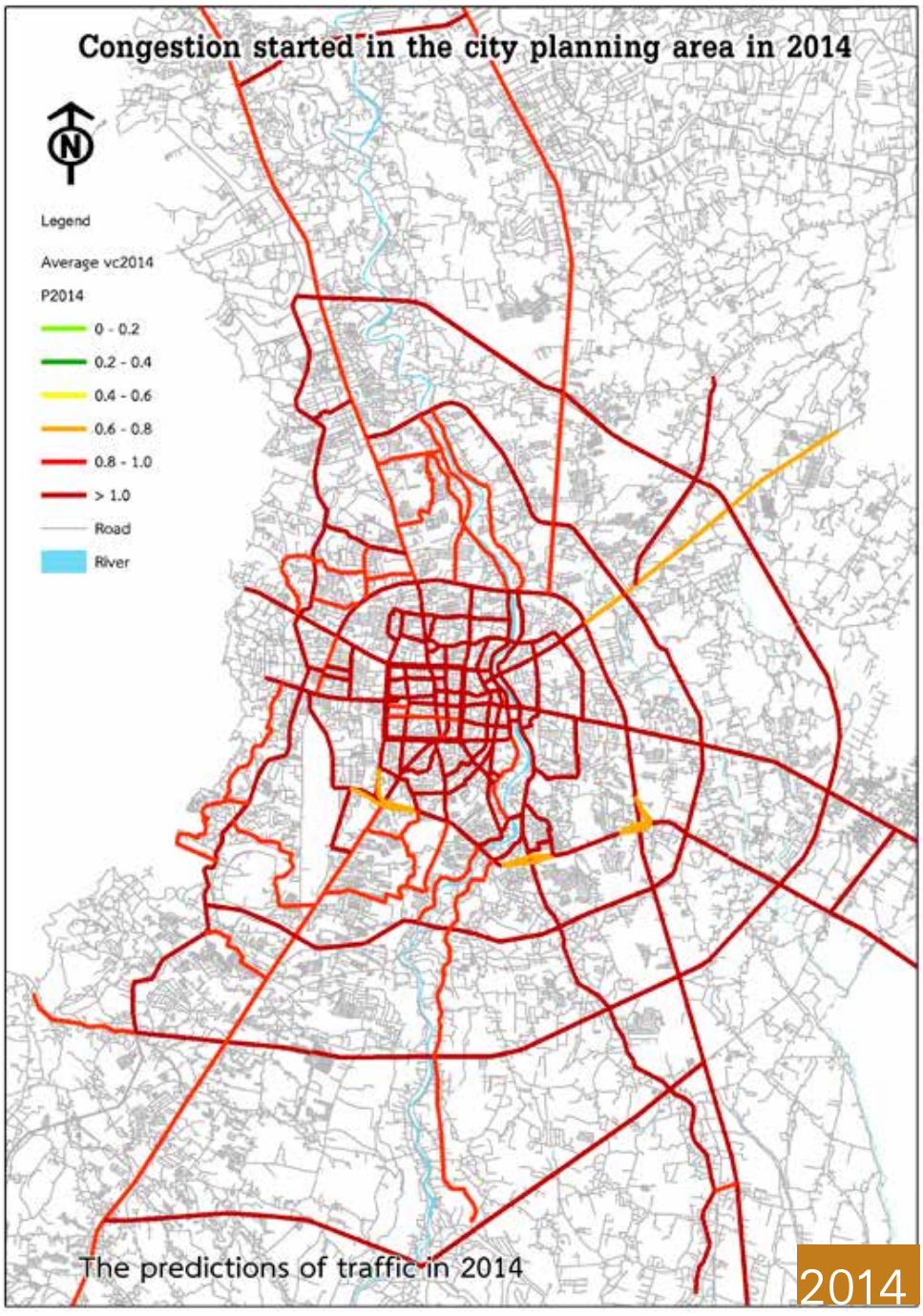
Chiang Mai is facing several pressing urban transport challenges: growing road traffic congestion and air pollution, an inadequate public transport system, and an insufficient pedestrian ways, all of which further drive the use of private cars and motorbikes and urban sprawl. As a result, the livability, environmental sustainability, and personal mobility decline while urban transport is becoming a major source of greenhouse gas (GHG) emissions. Thus, more transportation infrastructure is needed, but the supply could not keep up with the demand. This leads to the problem of parking space in the city center. Besides, the parking areas also have significant effect on traffic congestion problems.

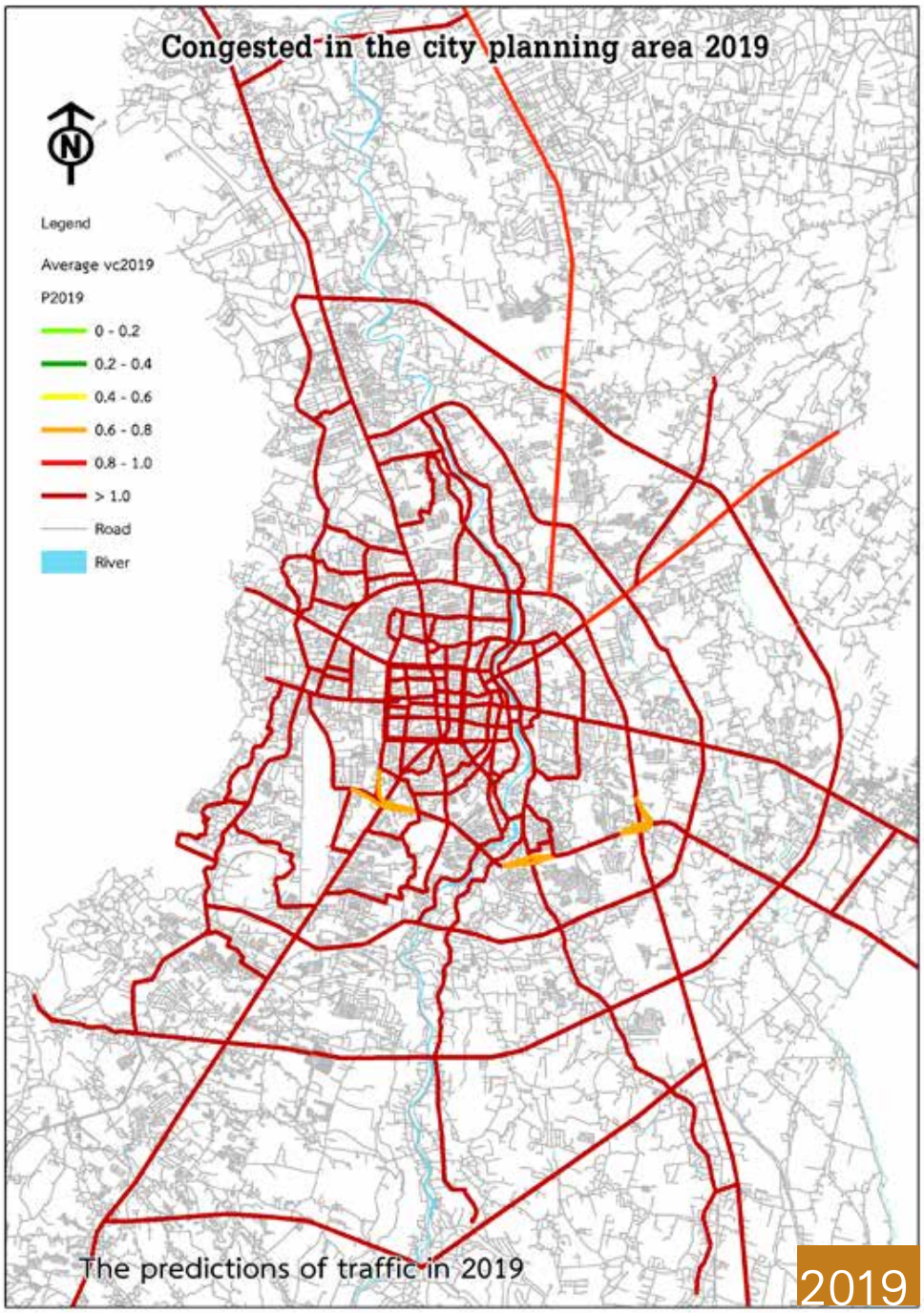
Traffic congestion problem has been more visible since 2006. The most congested area is around the city moat as shown in Figure 2.4. It is expected that the congestion problem will reach its critical point 2019, in the business as usual case. All road networks in Chiang Mai will be congested.

Figure2.4 models for traffic congestion in Chiang Mai in the year 2006, 2012, 2014, and 2019
Source: Faculty of Engineering, Chiang Mai University




Congestion started around the city center 2012
N
Legend
Average vc2012
P2012
0 - 0.2
0.2 - 0.4
0.4 - 0.6
0.6 - 0.8
0.8 - 1.0
> 1.0
Road
River
The predictions of traffic in 2012
2012


Congestion started in the city planning area in 2014
N
Legend
Average vc2014
P2014
0 - 0.2
0.2 - 0.4
0.4 - 0.6
0.6 - 0.8
0.8 - 1.0
> 1.0
Road
River
The predictions of traffic in 2014
2014


Congested in the city planning area 2019
N
Legend
Average vc2019
P2019
0 - 0.2
0.2 - 0.4
0.4 - 0.6
0.6 - 0.8
0.8 - 1.0
> 1.0
Road
River
The predictions of traffic in 2019
2019

The lack of a fixed route public transportation system to move people from their residential areas to important destinations in the city such as schools, offices and hospitals also contributes to the switch to personal cars. The congestion prevents smoothness of the service from coping with temporary surges of service receiver during rush hour. The main public transportation service in Chiang Mai is red cap taxi or omnibus. There is other public transportation available such as motor tricycle (TukTuk), tricycle, and taxi. Most of the service is on demand, especially red cap taxi. The fare is not fixed and depends on negotiation between the driver and the passenger.

The demand of public transportation for tourism and urban dwellers has significantly increased; hence, the number of vehicles on the road has increased as shown in Table 2.2. Vehicle registration had tripled during 1992 – 2005, from 405,868 to 1,241,085, whereas the number had not changed much during 2005 -2010. The lack of public transportation in Chiang Mai is a factor that influences the people to prefer personal vehicles to public transport.

Type of Vehicle	2006	2007	2008	2009	2010	2012	2013
Personal car no more than 7 seats (PV.1)	146,666	154,453	168,128	183,212	201,994	223,283	265,890
Personal vehicle more than 7 seats (PV.2)	13,617	14,160	14,834	15,472	16,187	16,944	17,812
Personal truck (PV.3)	197,252	208,125	219,571	231,416	244,005	256,805	276,296
Personal motor tricycle (PV.4)	47	48	58	64	66	73	72
Interprovincial taxi (PV.5)	1	1	1	1	1	1	1
Taxi no more than 7 seats (PV.6)	75	134	157	178	187	208	230
Small 4-wheeled carrier (PV.7)	84	84	84	84	84	84	84
Motor tricycle taxi (PV.8)	1,068	1,069	1,069	1,070	1,070	1,070	1,070
Business service car (PV.9)	80	84	90	90	91	96	95
Sight-seeing service car (PV.10)	0	0	0	0	0	0	0
Rent car (PV.11)	0	0	0	0	0	0	0
Motor cycle (PV.12)	967,334	1,021,462	1,078,821	1,137,748	1,199,956	1,273,585	1,373,711
Tractor (PV.13)	1,529	1,593	1,673	2,000	2,394	3,003	3,909
Road Roller (PV.14)	268	266	274	306	327	337	366
Agriculture vehicle (PV.15)	23	27	29	31	31	33	33
Trailer (PV.16)	47	47	48	49	49	49	50
Taxi motor cycle (PV.17)	630	716	694	675	667	642	608
Total vehicle according to vehicle regulation	1,328,721	1,402,269	1,485,531	1,572,396	1,667,109	1,776,213	1,940,227

Table 2.2 Data regarding vehicle registration in Chiang Mai between 2006 to 2012 Source: Department of vehicle licensing, Chiang Mai Provincial Transport Office, 31st December 2012

The traffic volume in Chiang Mai city plan tends to increase continuously with 5-6 percent growth rate per year. The analysis was based on population statistic, social-economic situation, land utilization, and analysis from related research studies and trend of projects involving with important activity in the city such as night safari, International Convention and Exhibition Center, SMEs promotion center, central market of agriculture product, and capacity expansion for main transport station in Chiang Mai. As shown in figure 2.5, it can be seen that the trend of transportation in Chiang Mai city plan will increase from 2 million trips per day in 2006 to 3.8 million trips per day in the next 10 years.

In addition, the share of private vehicles on the road used has been increasing. A survey conducted by OTP showed that trips made by people living in the city center has 30% share of private vehicle (sedan, truck and van), 43% motorcycle, and 9.3% red cap. However, the share of trips made by red cap is decreaing as shown in Figure 2.5.

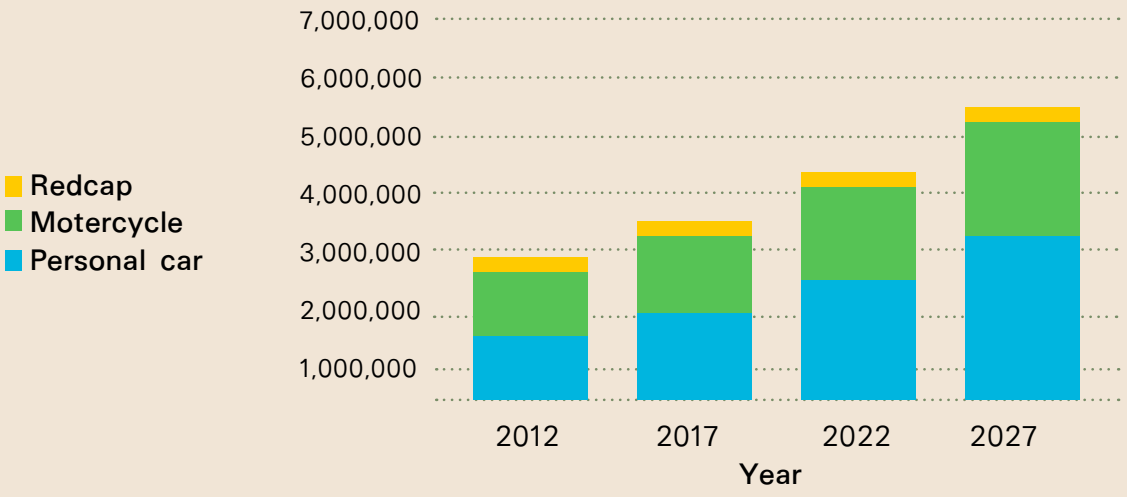
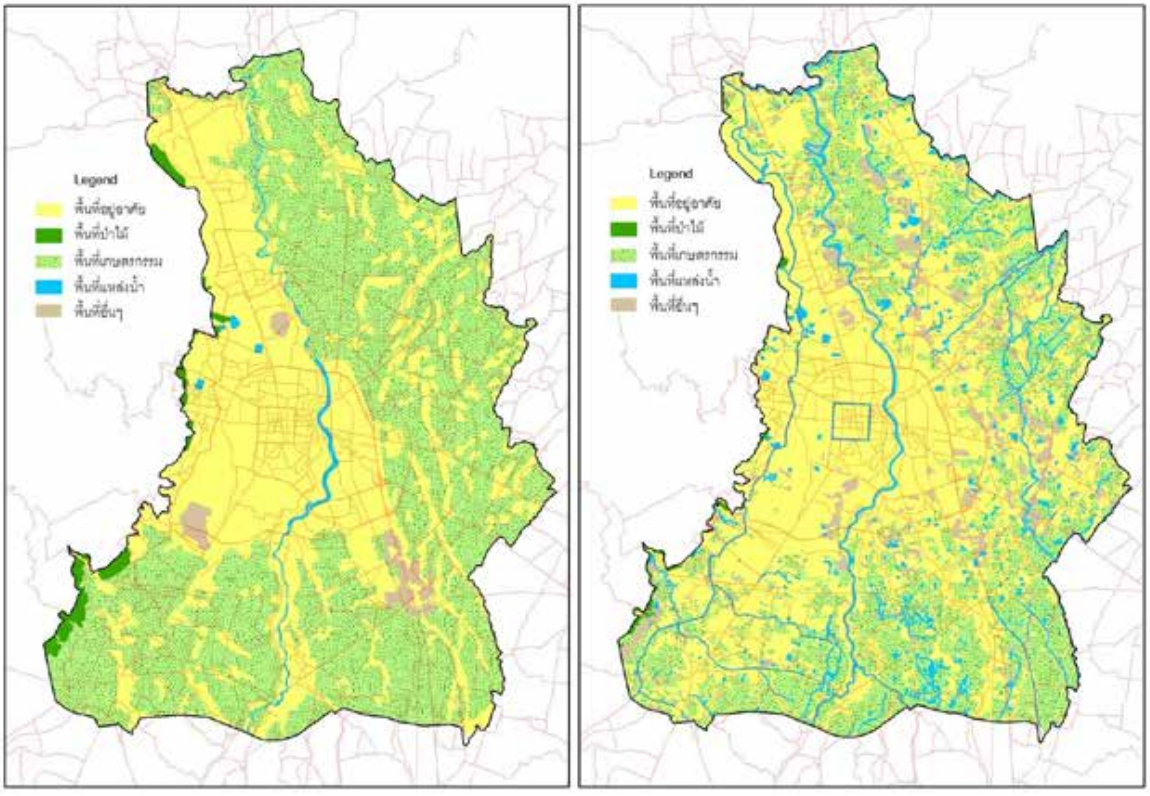


Figure 2.5 Comparative of vehicle share in 2012, 2017, 2022 and 2027

Land utilization for urbanization during 2000-2011 had expanded.

There are high-rise residences or apartments built to supply the demand from growing population. The urban area has expanded over open space and agriculture area (Urban sprawl) as ring roads was built and has an effect on the pattern of land utilization. The areas parallel to the main roads have high density of expansion. The expansion trend of Chiang Mai urban area in the future is shown in Figure 2.6 suggests that the urban expansion occurs along the main roads, especially the roads connecting districts or provinces; as well as also River Ping.

Figure 2.6 Maps of land utilization for comparison between the year 2000 (left) and 2011 (right)



There is no integration between transport planning and land use planning. Projects for residence, medium and large department stores have not considered road condition and capacity in Chiang Mai urban area. Therefore, it can be predicted that, when those construction projects are completed and open, parking space will not be adequately allocated. Since Chiang Mai has no complete public transportation management, customers and dwellers have to use public road as their parking space. As a result, the width of the road will be smaller, while the number of personal cars will be higher, especially during rush hours, when parents and pupils travel to the city, or where there is an attraction such as a big department stores. Time needed for making a trip will be longer and consequently worsens living quality of urban people. These cases are empirical examples of no integration between transport planning and land use. New residential building and land development project are being developed outside Chiang Mai Municipality area, while schools, academic institutions, and offices are densely located in Chiang Mai Municipality area as shown in Figure 2.7 and Figure 2.8.

Figure 2.7 Location of schools and academic institutes in Chiang Mai urban area

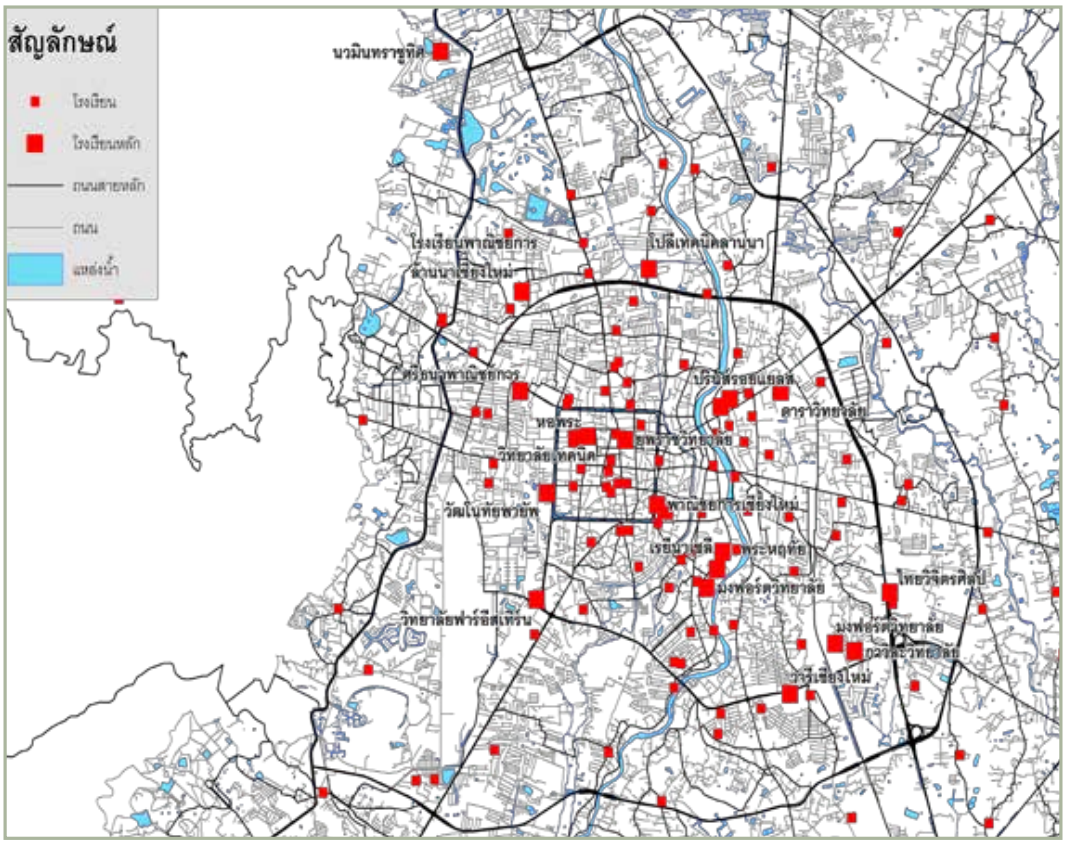
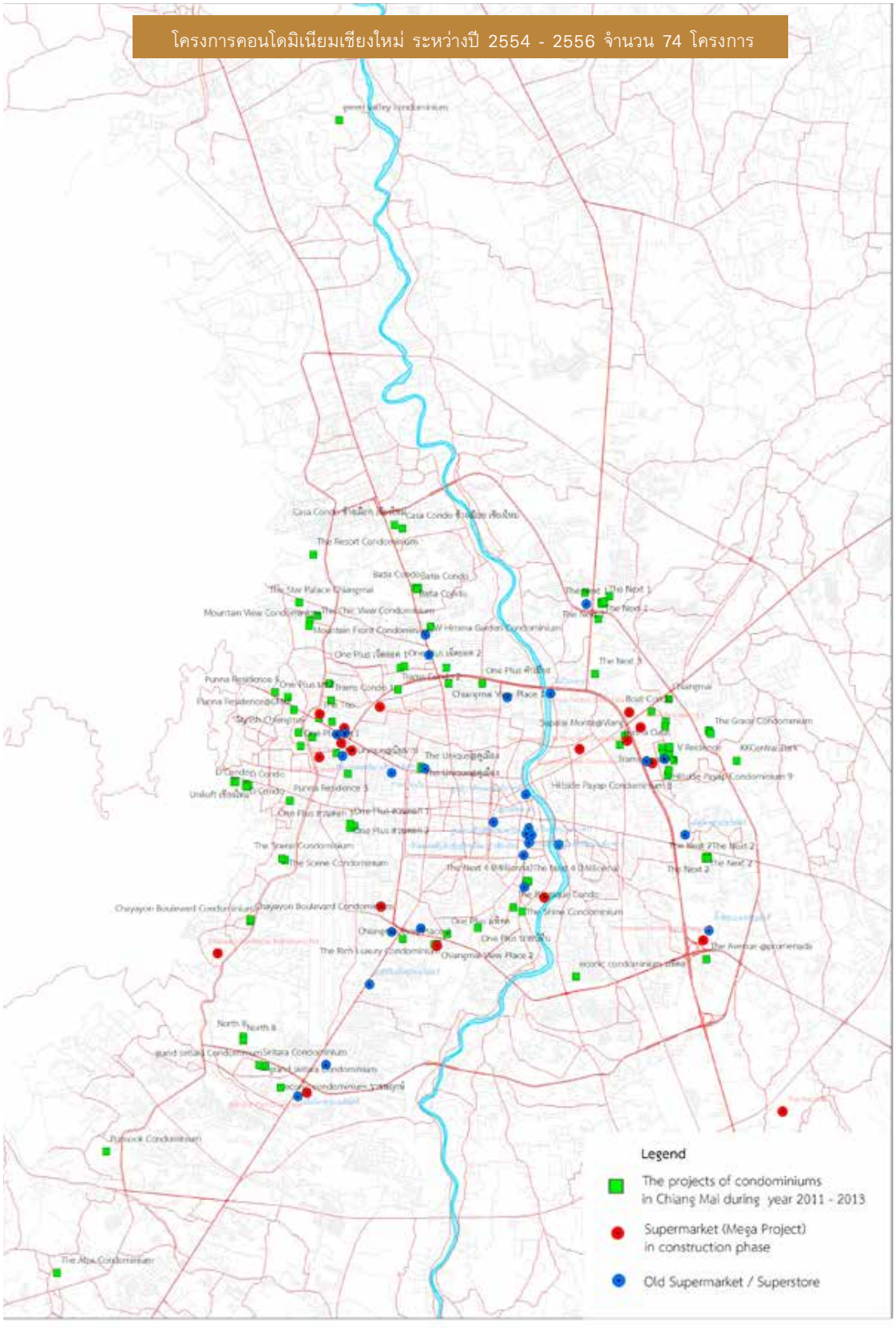


Figure 2.8 Location of condominiums and department stores under construction between the years 2011-2013



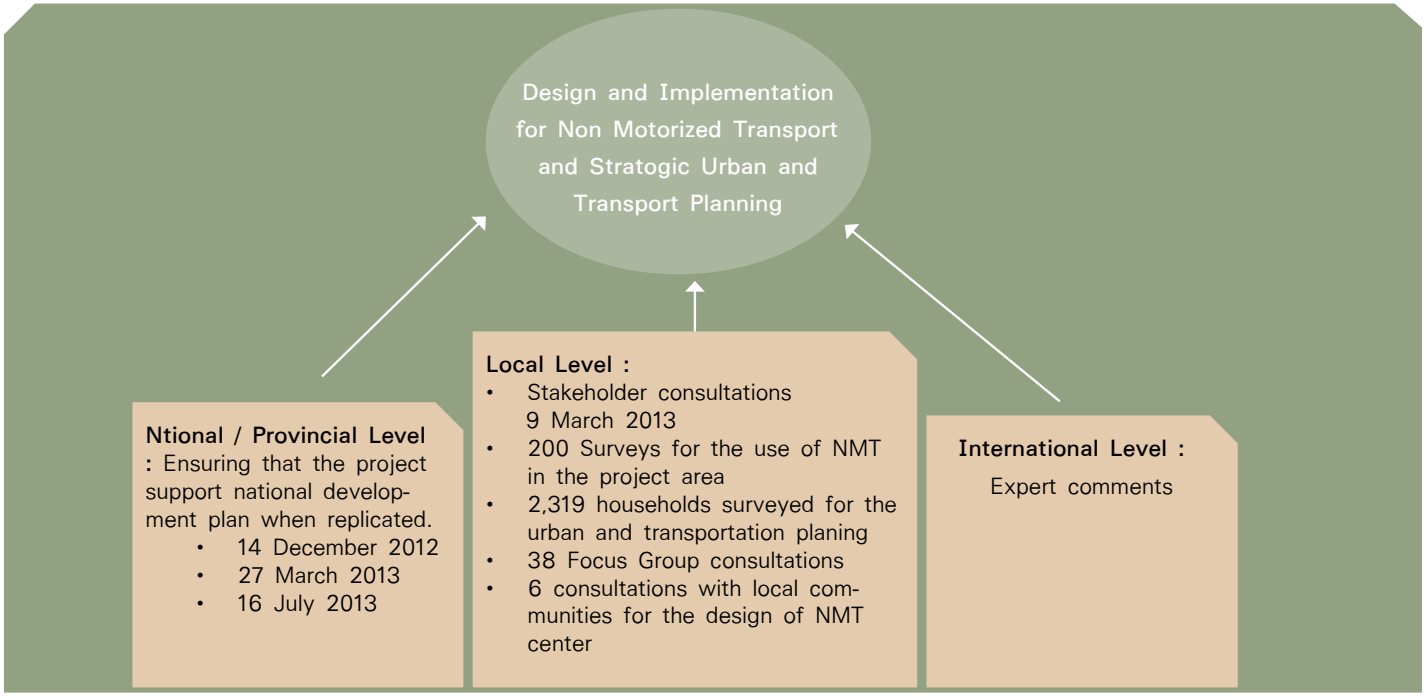
Chapter 3

Integrated Transport and Land-use Planning Process

The plan for integrated transport and land-use planning was made through a bottom up process, rather than the usual top down approach. The process involves several public consultations, interview surveys, as well as focus group meetings.

Public consultations were done at several levels, national, provincial as well as local, to ensure that opinions from different levels of stakeholders are integrated in plans. The different levels of public consultations are illustrated in Figure 3.1.

Figure 3.1 Stakeholders consultation for Chiang Mai Sustainable Urban Transport Project



The 2,319 households surveys were completed, where 6,189 people were interviewed with 19,385 trips from people around Chiang Mai. The survey results were used as a basis for the transportation planning, while the focus groups results served as the objective of the urban and transport plan.

6 Focus group consultations with the local communities at the Three Kings Monument were organized. The objective of these consultations were to discuss and agree upon how to integrate the communities concerned with the detail design of the non-motorized transportation center.

An internal expert also provided comments on the detail design of the NMT transportation center as well as the integrated land-use and transport plan.

Chapter 4

Strategic Plan for Sustainable and Integrated Urban Transport and Land Use for Chiang Mai city.

The concept for strategic plan for sustainable and integrated urban transport and land use for Chiang Mai city is focused on travel demand management and availability of transport options. The balance of traffic system can be adjusted during rush hour and high demand from tourists and visitor, by introducing mass public transportation, safe bicycle lanes, walkable pedestrian, instead of road expansion.

These transport options provide alternatives to private vehicle users, to switch to non-motorized transportation mode for short distance trips. This mode switch can solve traffic congestion within the city center.

To change the present will impact the future, by changing transportation mode now will solve and/or prevent the problems and challenges that Chiang Mai is facing today. Chiang Mai needs to have a clear vision for city's development path, controlled expansion, promote city's revitalization, efficient land use. The city's development scheme needs to balance between land-use efficiently and transportation impact to ensure low environmental impact with sustainable economic development.

Many cities have successfully solved the problems that Chiang Mai is facing today. The determination to develop systematically will control urban sprawl, reduce future unplanned transportation problem, and reliance on private vehicles.

The uncontrolled sprawling of Chiang Mai's city has resulted in requirement to improve the city's infrastructure to better support the city. The Strategic Plan for Sustainable and Integrated Urban Transport and Land Use for Chiang Mai city has 3 strategies and 9 tactics to allow the city to modernized, maintain it's historical and cultural identity, safe and sustainable as follows:

I. Social Engagement, Institutional Arrangement, Regulation, Finance and Process for Supporting Strategy:

1. Social Awareness and Understanding in Urban Issues
2. Network and Institutional Arrangement
3. Tax and Financial Instrument Development for Investment in Urban Infrastructure

II. Transportation Infrastructure for Steering Strategy:

4. Road and Parking Efficiency and Effectiveness
5. Alternative Transportation by Public Transit
6. Non-Motorize Transport

III. Land Use for Steering Strategy

7. Community Planning and Neighborhood Concept
8. Bottom-up and Smart Growth
9. Transportation Oriented Development (TOD)

Chiang Mai's Vision

There are many visions set by different organizations for Chiang Mai. But in designing and develop the Strategic Plan for Sustainable and Integrated Urban Transport and Land Use for Chiang Mai city the vision is "City's and transportation development for attractive city and sustainability". This require the city to become comfortable, equal for all, environmentally safe, healthy, safe, economical, attractive to tourist and sustainable.

In preparing the Strategic Plan for Sustainable and Integrated Urban Transport and Land Use for Chiang Mai city, the public consultation is one of the most important process that was on-going in pararelle with the strategic plan development. Different level of stakeholders were involved and the agreed on the city's vision and objective of the plan. (see detail in Chapter 2, Figure 3.1 and Figure 3.2)

Figure 3.1 Example of city's vision from school student

"Easy access to activities with various transporation alternatives safe, energy efficient, economical and cultural friendly"

- Seminar on Sustainable Urban Transport July 2013

Figure 3.2 Example of public Consultation, July 2013

Targets and Indicators

The 30 years target for the city's vision under the Strategic Plan for Sustainable and Integrated Urban Transport and Land Use for Chiang Mai city is described in Table 3.1:

Vision		Target
1	Mobility and Accessibility	Average trip time is 30 minutes per trip
2	Affordability and Travel Choice	Percentage share of trnasporation mode: 30% public transport and 30 walking
3	Low Environmental Impact	In 30 years air pollution reduced by 30% compared to the current year (2014)
4	Safety	The number of accidents reduce by 50% compared to the current year (2014)
5	Land Use	Green and Brown area increase by 20%, average travel distance reduce by 10%, the city does not expand more than 10%, population density within economic zone increase while population density in conservative area decreases.

Table 3.1 30 years target to develop sustainable transport in Chiang Mai

The success indicator of the strategic plan is: 1) % of transportation mode switch, 2) share of public transportation cycling, walking increases, 3) greenhouse gas and air pollution reduces and 4) % of accidents per population reduces.

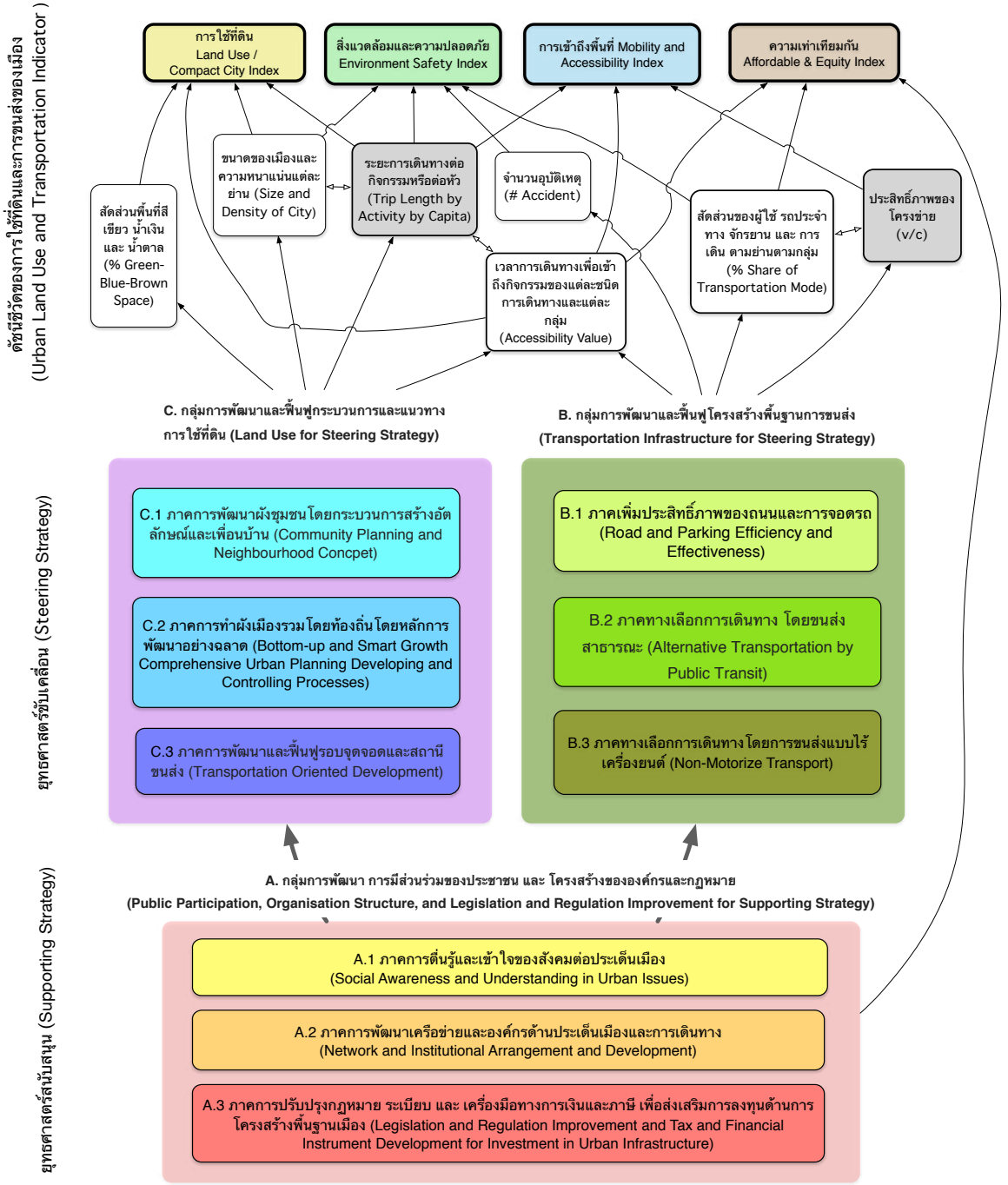
Strategic Plan for Integrated Land Use and Transportation for Chiang Mai City

The strategic plan can be divided into supporting strategies and driven strategies. “Social Engagement, Institutional Arrangement, Regulation, Finance and Process for Supporting Strategy” is the supporting strategy, without the implementation is this supporting strategy the driven strategies cannot be successfully implemented. The driven strategies are “Transportation Infrastructure for Steering Strategy” and “Land Use for Steering Strategy” will not be successful either. The driven strategy will be the key successful factor to reduce trip distance, improve network efficiency that will eventually leads to improvement of Accessibility Value, Land Use / Compact City Index, Environmental Index and Equity Index.

Strategic land use and transportation planning

ในปี 2587 เชียงใหม่จะเป็นเมืองคาร์บอนต่ำและสามารถลดการขยายตัวแบบไร้ระเบียบได้ ประชากรทุกคนสามารถเข้าถึงกิจกรรมต่างๆในเมืองได้ภายใน 30 นาที การใช้รถสาธารณะจะสัดส่วนที่ 30% และจะใช้การเดินในสัดส่วนที่ 20%

In 2044 Chiang Mai will become a low carbon city and reduce urban sprawl, the population will be able to travel to the city within 30 minutes, mass public transportation will have 30% share of the trips and walking will have 20% share of the trips



Chapter 5

Area Improvement of Non-Motorized Transport (NMT): Pilot demonstration at the Three Kings Monuments

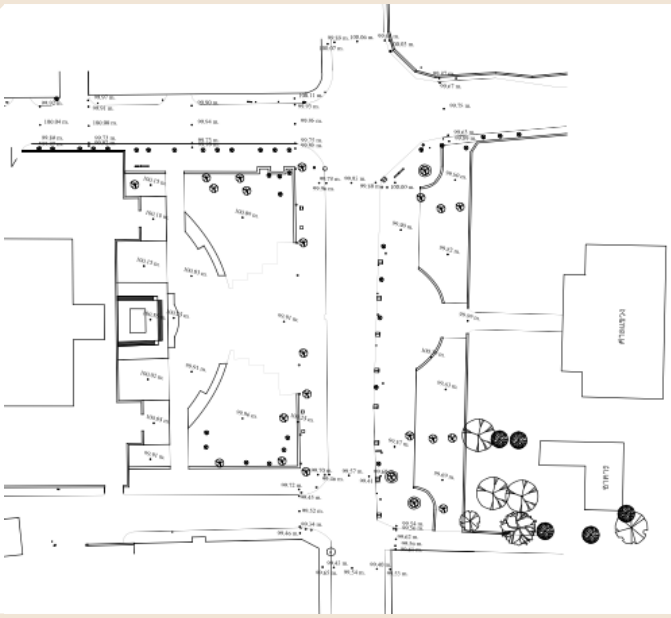
Chiang Mai Municipality has been showing strong commitment to sustainable urban transport. CMM has made various efforts to promote NMT and improve public urban transport services in the past, such as walking streets during the weekend and the development of bicycle lanes/promotional campaign to ride bicycles. In addition to the current campaign, the pilot project will focus on enhancing the role of NMT including pedestrianizaton and cycling to serve the demand for short distance trips, tourism and amenities.

The pilot demonstration mainly involves streets redesign to allocate more space to pedestrians and cyclists. The renovation of the street was done mainly by reallocation of existing street space for NMT with limited civil work on the streets. The pilot site also includes new signs and signals. The demonstration also involve operational scheme to revitalize bicycle taxis for tourism promotion.

Muang Kao, the historical city center of Chiang Mai was selected as a pilot demonstration area and the Three Kings Monument as the center for the NMT. The site was selected based on a strong potential for tourism promotion, and to preserve the cultural and historical environment of Muang Kao from deteriorating by motor vehicle traffic, and improving its attraction to tourists.

The design adopted the universal design concept to improve the Three Kings Monument area; that will allow all user groups to equally access or bene t from the facility.The design is derived based on activities throughout the year, opinions from different stakeholders, spaces needed for non-motorized transport (NMT) services. In addition, this master plan zoning design considers existing architecture design and incorporates the traditional belief of Lanna design (called Ta Lell) for the floor pattern.

Befor



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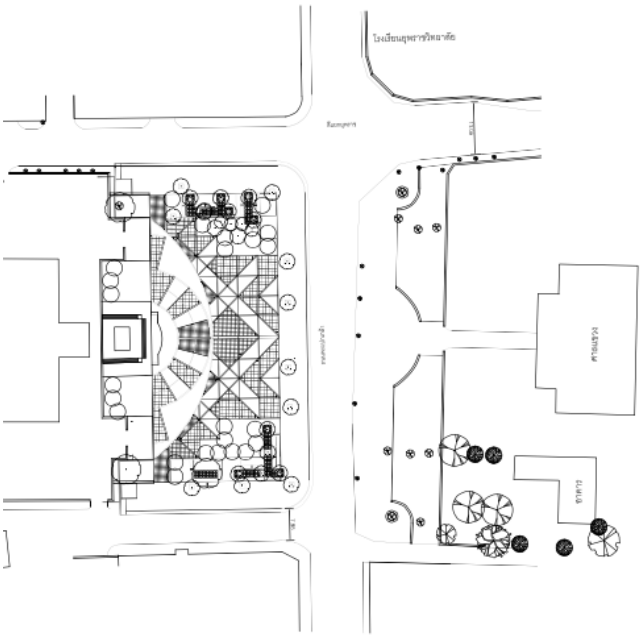


Bicycle Sharing scheme for Chiang Mai City

It was suggested that Chiang Mai Municipality apply the Call-a-Bike technology (operated in Germany and Austria) for the Bicycle Sharing system. The cost of this technology is lower than that of the Smart card technology and this technology does not require a fully-equipped station; only a small space for bike racks is necessary. This is more suitable with Chiang Mai old city area where the road spaces are limited and walkways are narrow.

- According to the design guide of 300-meter apart between public bicycle service stations and the total area of 2.25 sq.km. within Chiang Mai old city, 25 bicycle service stations across the city with 10 bicycles per station, as a result, the total of 250 bikes are required to operate. The stations should be located at intersections for ease of access by most users since city intersections are commonly known to people. Moreover, direct phone lines between stations and the service center must be provided. The bicycle design and appearance must be unique and different from those regularly used in the marketplace to deter theft. The bicycles will be equipped with an electronic locking system as used in other Call-a-Bike system.

Operation and Management Aspects

- The daily operation and management tasks are bicycle renting and returning services, redistribution of bicycles among stations, and maintenance work (for bicycles and communication lines). The consultant team suggests all works be outsourced by a private company and be governed by Chiang Mai Municipality personnel to facilitate the operations and to assure the service quality. The outsource work may be subsidized by Chiang Mai Municipality's budgets or revenues (e.g. revenues from parking fees) or supported by providing concession agreements to private companies such as advertising rights similar to the Vélibre System of Paris.
- The system installation should be paid by Chiang Mai Municipality to increase the perception of Chiang Mai public bicycle system.
- The proposed bicycle sharing system in Chiang Mai may apply the subscribing regulation and rental fee structure of Pun Pun system in Bangkok. Users pay a membership fee and a deposit to be eligible to use the system. The rental fee is free of charge for the first 15 minutes and 10 Bahts for the first 30 minutes. The rate is increased by 10 Bahts for every succeeding 30 minute. This rental fee structure will help encourage bicycle share among road users.

Box 1 Tricycle taxi service in Chiang Mai

People living in Chiang Mai have been familiar with bicycle taxis or Samlors for many decades. This bicycle taxi service used to be an important transport mode for short trips. Samlor is known as one of the distinguished symbols of Chiang Mai city. Many people earned money and raised their family from riding Samlors. However, this service has recently been fewer in number. The bicycle taxi serveices are mostly provided by the old riders. Although there are still some Samlors available in the city, its number is surprisingly reduced. The project team has conducted the survey and found that Samlor services in Chiang Mai are mainly served in four areas: Waroroj marketplace, Sompetch marketplace, Chiang Mai city gate, and Muang Mai marketplace. The routes of bicycle taxi service are flexible depending on customers' call.

The use of bicycle taxi (Samlor) as a major travel mode became less popular because of many reasons: (i) the increase in motorized vehicle use; (ii) the longer trip length; and (iii) the public's negative attitude to the Samlor as an inappropriate form in modern cities. Samlors are viewed as slow-moving vehicles obstructing traffic flow and causing traffic congestion problems; as a result, this vehicle type is prohibited in many capital cities, such as Bangkok and Jakarta. For provincial cities, bicycle taxis are still allowed to operate, yet their numbers have decreased. Bicycle taxis in Chiang Mai are used for short trips, mostly from and to the marketplaces. However, there are a small number of bicycle taxis used for city tours, organized by tourist agencies and by hotels.

Tricycle taxi revitalization scheme

The concerns about the negative impacts of motorized vehicles on environmental and economic problems, particularly the global warming problem from green-house emission (GHG) and the fuel price rise problem, have made road users more in favour of non-motorized transport modes. It is also believed that providing non-motorized transport like Samlor services would maintain the value of city culture and image. The good examples of revitalization of bicycle taxi services are in Singapore and Malaga City in Malaysia where the services are gaining popularity among tourists.

Thus, there is a need to develop strategies to revive and promote more bicycle taxi uses. The strategies should be consistent with one of the two following goals. The first goal is to maintain the current service while attracting new users for regular trip purposes. The second goal is to increase bicycle taxi usage for tourism.

The goals can be classified into five strategies as follows. (ADB,2008) :

Strategy 1:
Providing User-friendly Bicycle Taxi Facilities for Tourism

- Improving the conditions of bicycle taxi facilities to be more attractive for use in all seasons, and at the same time, keeping the original appeal.
- Providing parking lots for bicycle taxi both for customers safety and convenience.
- Providing bicycle taxi terminals for tourism trip purposes

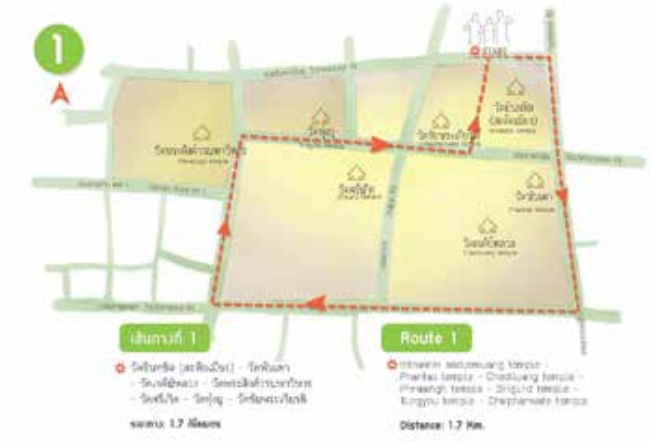
Strategy 2:

Launching Policies for Promoting Tourist Bicycle Taxi Services

A bicycle taxi route network is proposed for tourists. Each tourist route would connect to many attraction points including temples, marketplaces, stops, restaurants, and historical centers. Tourists would experience Lanna culture and lifestyle in Chiang Mai city. This network will be consistent with pedestrian and bicycle route network.

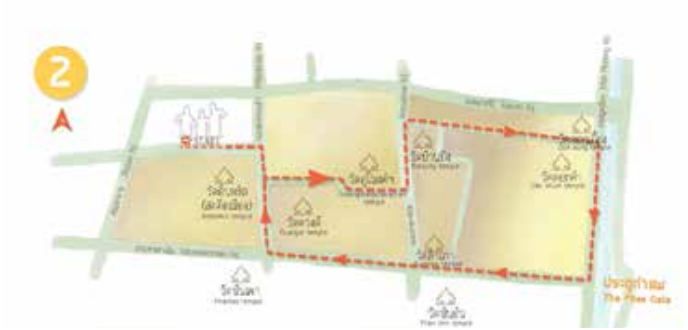
Three bicycle taxi routes are proposed as shown on maps in Figures 6-8. The attraction locations along each tourist route together with the total distance are also presented.

Figure 6 Tourist route 1



Attraction location
Inthakhin saduemuang temple - Duangdi temple - Umongma-hatherachan temple - Banping temple - Dok eung temple - Dok Khum temple - Phan ohn temple - Sumpow temple - Phantao temple
Distance : 2.1 K.m.

Figure 7 Tourist Route 2



Attraction location

Inthakhin saduemuang temple - Phantao temple - Chediluang temple - Phrasingh temple - Srigurd temple - Tungyou temple - Chaipharkiate temple

Distance : 1.7 K.m.

Figure 8 Tourist Route 3

Attraction location

Lamchang temple - Chiangman temple - Morkamtuang temple - Kuankarmarh temple - Montean temple- Dubphai temple - Srigurd temple - Chaipharkiate temple

Distance : 2.3 K.m.

Strategy 3:
Improving Safety for Bicycle Taxi Uses

- Providing proper improvement and maintenance of road lighting, traffic signs, traffic signals, and pavement markings in order to increase bicycle taxi safety.
- Establishing bicycle taxi maintenance and storage facilities and providing bi- weekly maintenance for bicycle taxis, such as braking systems, rubber tire condition.
- Installing a bike lane or a mixed-use bike lane for bicycle taxis and providing clear lane lines to separate them from other motor vehicles.

Strategy 4:
Encouraging Bicycle Taxis as a City's Travel Mode

- Providing financial supports. Public agencies (both central and local governments) should subsidize in terms of free interest loan to bicycle taxi drivers for repairing and replacing old vehicles.
-

Strategy 5:
Giving More Attention to Tourist Bicycle Taxi Services

- Establishing bicycle taxi societies and promoting their uses for tourists
- Encouraging tourism related to Lanna arts and culture

Chapter 6

Outcome and Results

It is recognized that a more comprehensive capacity building effort that encompasses adoption of appropriate policies must be undertaken in conjunction with the pilot demonstrations identified in the plan to achieve real outcomes on the ground.

The project contributed to broader sustainable urban transport agenda beyond the city itself by piloting this comprehensive approach to capacity building and technical support at both planning and implementation stages to demonstrate tangible outcomes on the ground. Experiences accumulated and capacity built in Chiang Mai allow for replication activities in the immediate future through the OTP and its network of 67 cities. Lessons learned from the project will also inform policy making at the national level when appropriate. In addition, experiences from the project could be disseminated to other secondary cities in Thailand and the Mekong region, which are facing similar challenges. The successful experience of Chiang Mai to develop sustainable urban transport may also be replicated in other secondary cities in the future.

Project Development Objectives	Outcome Indicators	Output Indicators
• To improve the technical capacity of Chiang Mai Municipality (CMM) for sustainable urban transport development, through technical support on integrated land use and sustainable urban transport planning and pilot demonstration of NMT improvement	• Key technical gaps filled in Chiang Mai land use and sustainable urban transport planning process (that would help promote the use of more efficient and cleaner modes of transport in the city and reduce GHG emissions from motor vehicles) • Technical skills acquired by CMM for the planning, design and implementation of NMT improvement • Share of person trips by non-motorized transport within the historical city center of Chiang Mai increased to10% (from baseline of 4%)	• A strategic plan to integrate land use and sustainable urban transport planning for the city developed. • A pilot demonstration for NMT improvement at selected site designed and implemented. • 10 staff received on-the-job training in developing the plans. • 10 staff received on-the-job training in implementing the pilot demonstration project. • 2 training courses conducted by international experts. • 13 staff gained international experiences on planning/ implementing sustainable urban transport. • 2 workshops to disseminate experiences of Chiang Mai sustainable urban transport project.

The users could save travel time that could be utilized for other activities. Increasing use of public transport system and NMT and reduced use of motorized transport will lead to energy savings and, other things equal, a possible reduction in fuel imports. Area improvement is also expected to expand economic activities in the selected area for small businesses and create new tourist attraction in the city. The improved bicycle taxis scheme will also create job opportunities and increase income level of the bicycle taxis operators. As pedestrianisation and cycling are the major modes of transportation for the lower income households, the project may also contribute to poverty alleviation by providing affordable, safe and reliable transport options for this group of city residents.

Greenhouse Gas Emission Reductions. A well-managed transport system is one of the greatest contributors to sustainable environment in the urban setting, as the transport sector is one of the key emitter of GHG emissions in terms of CO_2, CH_4, and NO_2, as well as other pollutants such as SO_2 and CO. The transport sector generates a considerable portion of total GHG emissions in cities. The percentage of trips undertaken by different modes of transport in a city is a major factor determining GHG emissions from the transport sector. The switch to more sustainable transport modes has high potential to reduce actual emissions in a city, and consequently produce major co-benefits with improved air quality for the citizens.

Through technical assistance and capacity building activities, the project expects to fill in technical gap and launch a process that will enable the city to achieve the final outcome of a well-planned integrated sustainable urban transport system in the long run. It is recognized that the final outcome will be achieved with sustained efforts by the city over the next five to ten years and the project only provides strategic intervention to put Chiang Mai city on that development path.

Public consultation was done at several levels to ensure that all stakeholders comments are included in the design and implementation plan of the project as indicated in the table above.