Document of
The World Bank

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PROJECT APPRAISAL DOCUMENT

ON A

PROPOSED GLOBAL ENVIRONMENTAL FACILTIY (GEF) GRANT

IN THE AMOUNT OF US$ 729,630

TO
THE KINGDOM OF THAILAND

FOR

THE CHIANG MAI SUSTAINABLE URBAN TRANSPORT PROJECT

April 25, 2011

CURRENCY EQUIVALENTS

(Exchange Rate Effective June, 2010)

Currency Unit = Thai Baht (THB)

THB 33 = US$1

FISCAL YEAR

October 1 – September 30

ABBREVIATIONS AND ACRONYMS

ASEAN	The Association of Southeast Asian Nations
BAU	Business as Usual
BMZ	German Federal Ministry for Economic Cooperation and Development
BRT	Bus Rapid Transit
CH_4	Methane
CM	Chiang Mai
CMM	Chiang Mai Municipality
CMU	Chiang Mai University
CO	Carbon monoxide
CO_2	Carbon dioxide
CO_{2e}	Carbon dioxide equivalent
DA	Designated Account
EA	Executing Agency
FM	Financial Management
GEF	Global Environment Facility
GHG	Greenhouse Gas
GTZ	German Technical Cooperation
IFR	Interim Financial Report
MRT	Mass Rail Transit
MOF	Ministry of Finance
NESDB	National Economic and Social Development Board
NMT	Non-motorized Transport
NO_2	Nitrogen dioxide
OTP	Office of Transport and Traffic Policy and Planning
PM	Particulate Matter
PT	Public Transport
RTPB	Regional Transport and Traffic Promotion Bureau
SUTP	Sustainable Urban Transport Project
TA	Technical Assistance
THB	Thai Baht
TOR	Terms of Reference
US	United States
USD	United States Dollars
WB	World Bank

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THE KINGDOM OF THAILAND

THE CHIANG MAI SUSTAINABLE URBAN TRANSPORT PROJECT

PROJECT APPRAISAL DOCUMENT

EAST ASIA AND PACIFIC
EASIN

Date: 25 April 2011 Country Director: **ANNETTE DIXON** Sector Director: John Roome Sector Manager: **JEEVA PERUMALPILLAI-ESSEX** Team Leader(s): Zhi Liu Project ID: P121162 Lending Instrument: GEF Grant	Sector(s): General transportation sector (80%); General energy sector (20%) Theme(s): Climate Change (50%); Urban development (50%) EA Category: C

Project Financing Data:

Proposed terms: GEF GRANT
[ ] Loan [ ] Credit [X] Grant [ ] Guarantee [ ] Other:

Source	Total Amount (US$M)
Total Project Cost:	**2. 50**
Cofinancing:	**1.77**
Borrower:	-
Total GEF Financing:	0.73

Recipient: The Kingdom of Thailand/Chiang Mai Municipality
Responsible Agency: Chiang Mai Municipality (CMM)
Contact Person: Mr.Tassanai Buranupakorn, Mayor
Telephone No.:+66 53 259 121
Fax No.: +66 53 876 237
Email: n/a

Estimated Disbursements (Bank FY/US$ m)

FY	11	12	13
Annual	$0.01	$0.21	$0.51
Cumulative	$0.01	$0.22	$0.73

Project Implementation Period: May 2011 – May 2013
Expected effectiveness date: May 2011
Expected closing date: May 31, 2013

Does the project depart from the CAS in content or other significant respects?	( ) Yes (X) No
If yes, please explain:	

Does the project require any exceptions from Bank policies? Have these been approved/endorsed (as appropriate by Bank management? Is approval for any policy exception sought from the Board?	( ) Yes (X) No ( ) Yes (X) No ( ) Yes (X) No
If yes, please explain:	

Does the project meet the Regional criteria for readiness for implementation?	(X) Yes () No
If no, please explain:	

Project Development objective: 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 NMT improvement.

Project description

Component 1: Integrated land use and sustainable urban transport planning. Technical assistance for CMM in developing a strategic plan to integrate land use and sustainable urban transport planning for Chiang Mai city.

Component 2: Area improvement for NMT. Technical assistance and investment support to CMM in implementing area improvement for non-motorized transport in selected sites in Muang Kao (i.e. historical city center of Chiang Mai).

Component 3: Project Management.

Safeguard policies triggered?	
Environmental Assessment (OP/BP 4.01)	(X) Yes ( ) No
Natural Habitats (OP/BP 4.04)	( ) Yes (X) No
Forests (OP/BP 4.36)	( ) Yes (X) No
Pest Management (OP 4.09)	( ) Yes (X) No
Physical Cultural Resources (OP/BP 4.11)	( ) Yes (X) No
Indigenous Peoples (OP/BP 4.10)	( ) Yes (X) No
Involuntary Resettlement (OP/BP 4.12)	( ) Yes (X) No
Safety of Dams (OP/BP 4.37)	( ) Yes (X) No
Projects on International Waterways (OP/BP 7.50)	( ) Yes (X) No
Projects in Disputed Areas (OP/BP 7.60)	( ) Yes (X) No

Conditions and Legal Covenants:

GEF Letter Grant Agreement Reference	Description of Condition/Covenant	Date Due

Article II, 2.03 (a)	The Recipient shall ensure that all street modification and renovation works to be done under Component 2 of the Project shall be carried out by the contractor in accordance with domestic laws and regulations. The Recipient shall include the applicable environment mitigation measures in accordance with domestic laws and regulations as part of the contractor's contract.	Recurring
Article II, 2.03 (b)	The Recipient shall cause the Office of Transport and Traffic Policy and Planning, as its implementing partner, to provide overall policy and technical guidance, ensure the Project activities are aligned with the central government's policy, and take lead in disseminating and replicating experiences from Chiang Mai to relevant cities in Thailand and Mekong region	Recurring
Article II, 2.03 (c)	The Recipient shall carry out the Project with broad based participation from various local stakeholders including Chiang Mai University, provincial administration, police authority, and special interest groups (e.g. bicycle club, minibus cooperative).	Recurring

A. STRATEGIC CONTEXT AND RATIONALE

I. Country and sector issues

1. Similar to many other developing countries, Thailand's urban transport pattern is characterized by rapid motorization as car ownership continues to rise with income level. Infrastructure investment which has been heavily focusing on road expansion has led to the dominance of road mode in both passenger and freight transport. As a result of motorization, non-motorized transport (NMT) such as walking and cycling has been marginalized. Traffic congestion, inadequate public transport services, and deteriorating pedestrian conditions are common problems in urban transport management in big cities in Thailand. Lack of efficient, affordable and high quality public transport services severely impacts the city's livability and quality of life. Heavy reliance on motorized transport also has critical implications on the country's sustainable development in view of energy security, environmental sustainability and global warming. According to a World Bank study,[1] Thailand relies heavily on oil imports (accounting for 70 percent of total energy imports) to satisfy its transport demand. The transport sector is one of the biggest consumers of energy, using about one third of the country's final energy consumption and is the second largest contributor (26 percent) to energy-based CO_{2e} emissions after electricity sector (37 percent). While there is considerable scope to improve energy efficiency and reduce greenhouse gas emission (GHG) emissions in urban transport, efforts are constrained by inappropriate (or complete lack of) traffic demand policies, a lack of knowledge and limited institutional capacity at the local level to address integrated transport and land-use practices.

2. 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 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, 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.

[1] World Bank and NESDB (2009), Thailand: Making Transport More Energy-Efficient. A Working Paper prepared under the Thailand-World Bank Country Development Partnership for Infrastructure.

3. Urban transport challenges have triggered the national and local governments to shift their interest to more efficient and less polluting modes of travel, such as public transit and non-motorized transport, as well as exploring the possibility of adopting transport demand management policies, such as congestion control, in recent years. In Bangkok, the national and municipal governments' efforts have been focusing on large scale investments in mass rail transit (MRT) and bus rapid transit (BRT). However, for cities outside of Bangkok, there is no clear strategic direction to address rising urban transport challenges.

4. The Regional Transport and Traffic Promotion Bureau (RTPB) of the Office of Transport and Traffic Policy and Planning (OTP), the national transport planning agency under the central government, has increasingly recognized the need for better urban transport planning and management at the local level as well as weak technical capacity of local authorities in meeting the challenges. In the past years, OTP has been working with 67 cities to produce transport master plans, disseminate information, raise funds, and provide technical assistance for implementation. While these OTP-funded studies provide a good starting point for cities outside of Bangkok to examine their urban transport issues and explore possible solutions, due to their limited scope and depth and to the lack of implementation capacity on the ground, the impact of these efforts has been limited. There are several steps that need to be taken to improve the development and implementation of these master plans. Moreover, the ability of OTP to provide ongoing technical support to local authorities is constrained and depends largely on the availability of OTP's annual budget. There is thus a need to bridge the capacity gap at local and national level in a more effective and sustained manner.

5. For Chiang Mai city, OTP has funded *the Project of Master Plan and Preliminary Design of Mass Transit System for Chiang Mai City* which was completed in 2007. The project aims to i) formulate the Master Plan for the development of Chiang Mai public transportation system; ii) conduct feasibility study of the recommended transit system for Chiang Mai; and iii) develop a preliminary design and define the implementation guidelines and necessary contracts for the implementation of the Chiang Mai transit system. The developed master plan sets the vision to develop modern and safe mass transit system with consideration for energy savings. The proposed master plan focuses on how to meet traffic demand growth in the future when the traffic conditions are projected to reach critical limit in the next ten years. The plan aims to address the projected demand growth by increasing the role of public transport to not less than 25 percent of modal shares or approximately 300,000 person trips per day in the next 10 years and 500,000 person trips per day in the next 20 years. The study also proposes BRT as the suitable choice of technology for Chiang Mai city with the total recommended investment scale of 32 billion Baht (or approximately 1 billion USD) over the next 20 years and recommends three phases for implementation. The short-term strategy focuses on reorganizing the existing public transportation system while the medium- and long-term strategies involve the constructions of phase I and phase II of the proposed BRT network, respectively.

6. The OTP-funded study was a significant step in developing a better urban transport system for Chiang Mai by providing extensive technical background and information, kick starting the public policy making process, and raising public awareness about public transportation system. Nevertheless, there are several gaps that need to be filled in. The key weaknesses of the plan lie in the technology-oriented approach in developing the master plan and in not paying due consideration to implementation. As a result, the plan faces two key obstacles

for implementation which are lack of financial resources for scaled investment and lack of public support due to diverging interests of several stakeholders (existing bus operators, police authority, cyclists, street vendors, etc.) when introducing changes. Various technical aspects of the study (e.g. interactions between land use and urban transport planning, complementary measures such as parking and traffic management) could also be enhanced to more effectively and comprehensively address specific needs of the city (i.e. historical values and tourism promotion) and key barriers for implementation.

7. The Chiang Mai Municipality (CMM), the city administrator, has been showing strong commitment to sustainable urban transport. In addition to working with OTP in developing the Master Plan, CMM has also made various efforts to promote NMT and improve public urban transport services in the past, for example, NMT initiatives such as walking streets during the weekend and the development of bicycle lanes/promotional campaign to ride bicycles on Sunday's morning. Nevertheless, the impacts of these efforts have been limited due to lack of strong technical capacity of the local municipality to develop and implement NMT measures and public transport system in a more comprehensive manner. Transport and city planning functions within CMM undertakes planning-related activities but to a limited extent. Strategic planning is still led by central planning agencies such as OTP and the Department of Public Works and Town and Country Planning under the Ministry of Interior for urban planning. The main responsibilities of the Transport Section within CMM focus more on planning at operation level and service provision. The Transport Section has 57 staff (five engineers, six technicians and 46 operating and supporting staffs). All of the engineers are either civil engineers or power engineers. CMM currently has no transport engineers directly responsible for transport works. The Transport Section is divided into two main functions: traffic engineering (overseeing traffic management, traffic signals and facilities, traffic analysis) and transport (overseeing the operation of two bus terminals, operation of CMM's bus services including route design and coordinating with existing bus operators). Basic traffic and transport analyses are carried out by CMM staff based on data collected from CCTV and GPS system. Similarly, the main responsibilities of the City Planning Division are enforcing the regulations according to the Ministerial Regulation for Chiang Mai Urban Plan and issuing licenses for new buildings and building renovations. Urban planning (i.e. the development of the Chiang Mai Urban Plan) is undertaken by the Office of Public Works and Town and Country Planning which is a provincial office of the Department of Public Works and Town and Country Planning. Both the Transport Section and the City Planning Division are under the Technical Engineering Department within CMM.

8. 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. Building on the efforts of OTP and CMM, this small project aims to help Chiang Mai 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. It is expected that a well-planned and implemented transport system will eventually lead to a more sustainable urban transport system characterized by modal shifts to cleaner vehicles and modes, thereby improving mobility, enhancing the city's sustainability, and reducing its overall GHG emissions.

II. Rationale for GEF support and Bank involvement

9. *Consistency with GEF Strategies*. The GEF focal point in Thailand is the Ministry of Natural Resources and Environment (MoNRE). This project was endorsed by MoNRE to be included in the National GEF Program (i.e. RAF 4) in 2006. The GEF-financed activities of the proposed project would contribute to the first Climate Change Strategic Objective in Mitigation, which is to facilitate market transformation for sustainable mobility in urban areas leading to reduced GHG emissions. The project will help lay a strategic and planning foundation to increase the use of sustainable transport modes such as public transport, walking, bicycles and bicycle taxis while limiting access and congestion from private motor vehicles. The project is planned to have a long-term impact, where GEF will provide the initial cost of the project, and further funding with other sources from the national/local government or from international sources (where GEF Implementing Agencies may play a significant role) will be sought. The project will be the crucial first step for the long term commitment to shift to sustainable urban transport development path.

10. *Value-added of GEF Involvement*. The major obstacle for sustainable urban transport in secondary cities is the lack of knowledge and expertise in planning and designing integrated land use-sustainable transport including appropriate policies, proper planning and design of public transit, BRT, bicycle lanes and walkways. Most plans and studies that had been developed often focused on one or two particular modes of transport, instead of addressing the situation as a whole. A fully integrated land use and transport system plan has never been developed. The GEF grant will provide a unique opportunity for CMM to acquaint themselves with international best practice in sustainable transport planning and policy and acquire relevant capacity to develop an integrated land use and urban transport strategic plan. In addition, through the demonstrations of selected policies and components (bicycle lanes and pedestrianization), the city staff will learn how to design, implement and manage particular projects properly, and how to incorporate feedback from citizens and visitors for further refinement.

11. Comparative Advantage of the Bank and Rationale for Bank Involvement. The proposed project will support investment in sustainable urban transport in Chiang Mai. The project will be piloting an improved non-motorized transport such as bicycle route and improved pedestrian facilities and areas, which is the type of intervention the Bank has extensive global operational experiences and thus comparative advantage. The Bank also has a comparative advantage in the area of urban transportation and sustainable urban development under the focal area of climate change. This project will also build on analytical work on Urban Transport in Medium Sized Cities in East Asia currently being carried out by the Bank, and where Chiang Mai is also included. At the country level, the Bank has developed a close relationship with several government counterparts and stakeholders as well as strong sectoral knowledge in the areas of urban transportation and climate change through the Thailand-World Bank Country Development Partnership for Infrastructure (a knowledge partnership between the Thai Government and World Bank) and ongoing policy dialogue in the transport sector in the last five years. The study by the Bank and the NESDB—Thailand: Making Transport More Energy-Efficient—assesses the performance of the transport sector in energy utilization, analyzes where inefficiencies lie and proposes options to improve transport energy efficiency. The study's findings suggest that Thailand has high potential to reduce transport energy intensity with the

right fuels pricing policy and successful implementation of various transport policy and technology options.

12. *Donor coordination.* The German Technical Cooperation (GTZ) has been serving as technical advisor to the CMM, through a German Government funded technical assistance project—Sustainable Urban Transport Project (SUTP)—since 2003. The chief mandate of the SUTP is to work with local governments to promote sustainable urban transport and thus assist cities to reduce automobile dependency and shift towards sustainable modes of travel such as public transport and non-motorized transport. The GTZ-SUTP helped produce technical reports on improving non-motorized transport facilities in Chiang Mai. GTZ-SUTP also assisted OTP in developing studies in Chiang Mai. The original proposal for GEF support to Chiang Mai's sustainable urban transport was a result of GTZ-SUTP. Currently GTZ is supporting CMM to prepare a Clean Air Plan for the city under the project entitled "Clean Air for Smaller Cities in the ASEAN Region." This project is funded by the German Federal Ministry for Economic Cooperation and Development (BMZ) and implemented by GTZ in cooperation with the ASEAN Secretariat. It aims to empower local governments of smaller cities (non-metropolitan/secondary cities) to develop and implement "Clean Air Action Plans" in order to improve living conditions. The Chiang Mai Clean Air Plan will include several technical components of direct relevance to the GEF proposal: (a) an emissions inventory; (b) air quality monitoring system improvements; (c) a survey of walkability in the city; and (d) development of short-term public transport and traffic improvement options. The first three components will benchmark current conditions in Chiang Mai, as a basis for the comprehensive strategic urban transport planning and area improvement through NMT activities proposed under this project. The public transport advisory services provided to local decision makers will be a valuable complement. The team will work closely with CMM and GTZ to ensure that activities supported by GTZ and GEF are implemented in a coordinated manner.

III. Higher level objectives to which the project contributes

13. As discussed in the earlier section, due to the limited scope and depth as well as lack of implementation capacity on the ground, the impacts of past efforts by OTP and local governments in sustainable urban transport development have been limited. 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 will contribute 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 will 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.

B. PROJECT DESCRIPTION

I. Funding

14. The proposed project was approved by the GEF CEO for pipeline entry on January 28, 2010. It is a medium-sized project, with an indicative amount of GEF grant of US$729,630 and Agency fee of US$72,963 for the project cycle management services by the World Bank (acting as Implementing Agency for the GEF). The GEF grant will leverage the total co-financing/parallel financing amount of US$1,765,478 or at the ratio of 1 to 2.4. The project budget will support three components, including technical assistance activities, investment in a pilot demonstration, and project management.

15. The project will be co-financed by two main sources. The first co-financier of the project is CMM (the project executing agency), which will provide counterpart funds to co-finance the pilot demonstration and in-kind contributions of staff times and facilities. The second co-financing source is from OTP, which will provide in-kind contributions through staff times. In fact, it was originally envisaged that the GEF project would be implemented at the same time as the OTP-funded study *the Project of Master Plan and Preliminary Design of Mass Transit System* and that OTP funding for the study would form a major co-financing part of this GEF project. However, due to the long duration in securing the GEF funds, the OTP work was already completed in 2007. Nevertheless, the study remains an integral part of developing a sustainable urban transport system in Chiang Mai and is thus considered as parallel-financing of this project. In addition, given its experience and ongoing engagement with the city of Chiang Mai, GTZ may also continue to provide support to the project with potential co-financing and may play a role as consultant under this project.

II. Project development objective and key indicators

16. The main project development objective 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 NMT improvement.

17. The plan to be developed and implementation of pilot demonstration project are expected to help lay a strategic technical and institutional foundation for long-term development of sustainable urban transport. This will be achieved through a comprehensive approach that provides for an increased role of more effective and less energy-intensive forms of urban travel including an improved public transport system and NMT (walking, bicycles, bicycle taxis), which will in turn result in long-term reduction of vehicular greenhouse gas emissions.

18. Outcome indicators will be: (i) key technical gaps filled in the Chiang Mai land use and sustainable urban transport planning process; (ii) technical skills acquired by CMM for the planning, design and implementation of NMT improvement; and (iii) share of person trips by non-motorized transport within the historical city center of Chiang Mai increased to 10%.

III. Project components

19. **Component 1: Integrated land use and sustainable urban transport planning**. This component will provide CMM with technical assistance in developing a strategic plan to integrate land use and sustainable urban transport planning for Chiang Mai city, and through the process, build technical capacity and related skills in urban transport planning and management

for CMM's staff and relevant stakeholders. This component will include two major activities: (i) development of a strategic plan for sustainable and integrated urban transport and land use for Chiang Mai city; and (ii) planning capacity development and training.

20. The strategic plan will build on OTP-funded study and fill in existing gaps by focusing on:

(i) integrated land use planning/policies, with urban transport planning factoring in two unique features of the city, which are the preservation of historically significant areas and creating amenity value to promote tourism;

(ii) addressing the interactions between land use planning and transport planning which normally involves the following two types of actions: (a) adjust the existing land use plans based on traffic analysis generated from the transport plans; and (b) adjust the transport plans based on the land use functions assigned in the land use plans; in order to minimize the need for motorized trips and the use of personal vehicles;

(iii) comprehensive approach to urban transport planning which includes integration of several modes of transport in the city including both motorized and non-motorized transport modes, traffic management and parking management;

(iv) low carbon and energy-efficient urban transport management and investments;

(v) mechanisms to overcome implementation barriers including mobilization of financing resources for and financial sustainability of future investments, bridging capacity at the local and national level, and institutional arrangement for operation and maintenance;

(vi) mechanisms for broad-based participation in the policy making process to align various stakeholders' interests and build up public acceptance; and

(vii) action plan for CMM to implement the strategic plan in the next 3-5 years

21. The strategic plan will cover the Chiang Mai Urban Plan area (similar to OTP study), which includes the city centre and adjacent parts of outer districts and which are under the responsibility of CMM and seven district-level municipalities. The Urban Plan area (totaling 430 square kilometers with the population of around 520,000) is the area where major economic and social activities as well as places of historical values are concentrated in.

22. For planning capacity development and training, the training will involve on-the-job training throughout the planning process where CMM staff will be working closely with urban transport experts to be hired under the project. In addition, the consultants will also design specific training activities for CMM and OTP staff in the forms of workshops or classroom training.

23. **Component 2: Area improvement for NMT**. This component will provide technical assistance and investment support to CMM in implementing area improvement in selected sites in Muang Kao (i.e. historical city center of Chiang Mai) in order to demonstrate the concept and benefits of integrated sustainable urban transport. The pilot project will focus on enhancing the role of NMT including pedestrianization and cycling to serve the demand for short distance trips, tourism, and amenities. The component will support:

(i) development of an engineering design for selected site;

(ii) operational scheme to revitalize bicycle taxis mainly for tourism promotion;

(iii) street modification and facilities for NMT as pilot demonstration at selected site;

(iv) public campaign to raise awareness about sustainable urban transport and promote the use of NMT in the city; and

(v) training activities on urban transport project management and international experiences in implementing NMT projects;

(vi) dissemination activities including workshops and site visits to share Chiang Mai's experiences in planning, design and development of sustainable urban transport project with selected national and local staff from other medium-sized cities in Thailand and the Mekong region.

24. The pilot demonstration is expected to mainly involve street redesign to allocate more space to pedestrians and cyclists. The approach to the proposed activities is spatial and comprehensive, taking into account the economic, social, financial, architectural, and environmental aspects. The renovation of the street will be done mainly by reallocation of existing street space for NMT with limited civil works. The pilot will also take into consideration traffic management and parking management (parking policy and parking facilities) for the project site and/or the adjacent roads, as pedestrianization normally would require certain level of restriction, detour or re-routing of the existing motorized traffic. The pilot improvement may also include new signs and signals (for both NMT and general traffic), surveillance equipment and other associated facilities (e.g. vehicles for physically challenged persons).

25. As seen from various examples worldwide, pedestrianisation projects are less civil work intensive but more focused on building awareness of and demonstrating the benefits to relevant stakeholders, particularly businesses, in the area. The pilot demonstration project is expected to create a vibrant public space in the core city that will directly benefit Chiang Mai's tourism and residents.

26. With its strong potential for tourism promotion, the project also seeks to revitalize bicycle taxis which have seen declining role in the past years. GEF funding will be used to develop an operational scheme for bicycle taxis operation as an integral part of the area improvement effort. CMM in the past has made efforts to improve the bicycle taxis through redesigning them, and this component will build upon the previous effort initiated by CMM.

27. Component 3: Project management. The component will support: (i) individual consultants for project management, procurement support and monitoring and evaluation; and (ii) incremental operating costs for CMM and OTP in carrying out the project activities including coordination with various stakeholders.

IV. Project costs

28. Project costs are shown in the table below and further details are provided in Annex 3.

Table 1: Project Costs by Component and Sources of Financing (USD)*

Component	GEF	Co-financing		Parallel Financing	Sub-total Co-financing+ Parallel Financing	Total
		OTP	CMM	OTP		
Component 1 : Integrated Sustainable Urban Transport Plan	100,000	9,427	90,137	1,439,394**	**1,538,958**	**1,638,957**
Component 2: Pilot Demonstration of NMT Improvement	571,670	5,907	133,823	-	**139,730**	**711,400**
Component 3: Project Management	57,960	13,300	73,491	-	**86,791**	**144,751**
Total	**729,630**	**28,633**	**297,450**	**1,439,394**	**1,765,478**	**2,495,108**

Note. * The exchange rate used is THB 33/ USD.
** OTP funded a study "Master Plan and Preliminary Design of Mass Transit System for the City of Chiang Mai" with the total amount of 47,500,000 THB.

C. IMPLEMENTATION

I. Institutional and implementation arrangements

29. *Implementation Period*. The project will be implemented over a two-year period, expected to start in May 2011 and complete in May 2013.

30. *Executing Agencies*. This GEF project will have one executing agency (EA) and one implementation partner. CMM will be the recipient of the GEF grant and the EA of the project. As an implementation partner, the OTP RTPB will provide overall policy guidance, technical assistance and supervision support to CMM in designing and implementing the pilot demonstration project. OTP RTPB will also take lead in disseminating and replicating experiences from Chiang Mai to relevant cities in Thailand and Mekong region. The implementation of the project will be carried out with broad based participation from various local stakeholders including CMU, provincial administration, police authority, and special interest groups (e.g. bicycle club, minibus cooperative, etc.). It is likely that GTZ may support the project with co-finance as another implementation partner.

31. *Procurement Arrangement*. Procurement will be handled by CMM with the assistance of a qualified individual consultant. The Bank's Procurement and Consultant Guidelines will be followed.

32. *Financial Management Arrangement*. The Finance Department of CMM will be responsible for overall financial management of the project, which includes budgeting, accounting, internal control, fund flows, financial reporting and auditing. The project will utilize the existing staff within the Municipality with a few modifications to the current system to maintain project records and documentation as follows:

- *Reporting arrangement*. The project is required to provide to the Bank a) interim financial reports semi-annually within 45 days after the end of the semiannual period; and b) annual audit report within 6 months after the end of each fiscal year.

- *External audit arrangement*. The financial statements will be audited by an independent auditor acceptable to the Bank on terms of reference acceptable to the Bank.
- *Disbursement arrangement.* Disbursement of the Grant proceeds will be made through direct payment from grant account for major consultant contracts and from a designated account for small payments with replenishment made on a monthly basis. To receive the project funds, a designated account (DA) shall be open in US dollar currency at a local commercial bank acceptable to the Bank with a ceiling of USD 70,000. The DA will be used exclusively for project eligible expenditures. The detailed arrangements are elaborated in Annex 5.

II. Monitoring and evaluation of outcomes/results

33. Expected outcome and key performance indicators are shown in the table below and in Annex 2.

Table 2: Results Monitoring Framework

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 5 staff gained international experiences on planning/implementing sustainable urban transport 2 workshops to disseminate experiences of Chiang Mai sustainable urban transport project

34. The Bank will carry out periodic supervision and closely monitor the listed indicators and evaluate the project performance on an ongoing basis.

III. Sustainability

35. Sustainability of outcomes will be ensured with institutionalization of good practice in sustainable urban transport planning and implementation in CMM's transport and relevant departments and enhanced capacities among CMM and OTP staff as well as wider stakeholders to be involved throughout the project implementation process, e.g. CMU, traffic authorities, etc. The pilot demonstration project will also contribute to sustainability of the project by raising public awareness and long-term public support in the sustainable urban transport agenda. The project sustainability will also depend on financial resources to support the investment program to be recommended by the plan to be developed. Although this is beyond the scope and intervention of the project, it is envisioned that the capacity built at the sub-national government level and the recommendation put forward by the developed integrated sustainable urban transport plan would allow CMM to explore various funding models to implement the plan in the future.

IV. Critical risks and possible controversial aspects

36. The major risks for achieving the project objectives are: (i) weak cooperation among stakeholders; (ii) opposition from certain interest groups such as motorists and auto-taxis; and (iii) inadequate public investment to implement the plan developed under the project. Risk mitigation measures are (i) ensuring that the project has sufficient level of consultation and broad based participation across different groups of stakeholders as well as decision makers, as part of the project implementation process; and (ii) including in the integrated sustainable urban transport plan a careful consideration, analysis and policy recommendations of financial options and direction of municipal financing reform to support the medium- and long-term implementation of sustainable urban transport plan in Chiang Mai.

D. APPRAISAL SUMMARY

I. Economic and financial analyses

37. *Economic benefits*. A reliable and affordable public transport system would enable the users to 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. However, as the project is a small TA project, economic benefits are not quantified.

38. *Emission Reductions.* Well-managed transport system is one of the greatest contributors to sustainable environment in the urban setting, as 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.

39. 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.

40. ***Direct Impacts***. The project is expected to generate limited amount of GHG emission reductions as direct impacts from pilot demonstration of area improvement through NMT in the old town area. Due to lack of sound baseline data on existing travel patterns in the old town, an *indicative potential* for GHG emission reductions as a *direct impact* are quantified. It is estimated that the investment in area improvement could potentially increase modal share of NMT by 8 percent in the project case compared to the BAU case. The majority of the shifts away from cars and motorcycles trips are expected to come from trips made by tourists. It is assumed that the GHG emission reductions will start in 2013 (given that the project will complete in year 2012) and direct impact will occur in the next ten years which is the assumed lifetime of investment. The estimated average emission reductions per year are 295 tons of CO_{2e} and accumulated CO_{2e} emissions reductions of 2,952 tons of CO_{2e} over ten years (savings are assumed to start in year 2013). The project cost effectiveness is 194 USD per ton of CO_{2e} for GEF support under component 2 and 135 USD per ton of CO_{2e} for total project cost of component 2.

41. It should be noted that the pilot demonstration is designed to mainly serve the purpose of institutional capacity building, i.e. how to plan, implement and manage NMT. Besides benefits from GHG emission reductions, there are significant co-benefits in preserving the cultural and historical environment of Muang Kao from deteriorating by motor vehicle traffic, and improving its attraction to tourists. The future benefits of transport CO_2 emission reductions would not materialize without the technical assistance supported by the project that addresses planning and institutional capacity constraints.

Table 3: Estimated CO_{2e} Emissions as Direct Impacts - BAU vs. NMT Improvement under the Project

	BAU Scenario	Project NMT Improvement	Annual Savings	Accumulated Savings
Year	tCO2e	tCO2e	tCO2e	tCO2e
2010	10,035.11	10,035.11	0.00	0.00
2015	10,457.16	10,296.10	161.06	322.12
2022	11,048.02	10,511.16	536.86	2,952.75

42. ***Indirect Impacts***. The *whole potential* of GHG emission reductions that could be achieved in the city of Chiang Mai if the final outcome of sustainable transport planning and implementation could be fully realized are also quantified as indirect impacts of the project using top-down approach. The scenario called **'***sustainable urban transport planning and*

implementation" is developed to project GHG emission reductions assuming that final expected outcome is achieved in the year 2030. Under this scenario, GHG emissions reductions will be achieved through two main sources: i) reducing motorized transport through traffic demand management policies; and ii) modal shift to public transit and non-motorized transport in the urban area.

43. The following table shows the estimated potential savings from GHG emission reductions by the project by comparing emission reductions in the BAU scenario (without GEF intervention and without sustainable urban transport planning and implementation) and the sustainable urban transport planning and implementation scenario (with GEF intervention and subsequent implementation of sustainable urban transport) during the years 2010 to 2030. The estimated average GHG emission reductions per year are 77,036 tons of CO_{2e} and accumulated CO_{2e} emissions reductions of 1,155,541 tons of CO_{2e} over 15 years (savings are assumed to start in year 2015). Further details on incremental cost analysis and GHG emission reductions calculation are provided in Annex 6.

Table 4: Estimated CO_{2e} Emissions as Indirect Impacts – BAU vs. Sustainable Urban Transport Planning and Implementation Scenario

	BAU Scenario	Sustainable Urban Transport Planning and Implementation Scenario	Annual Savings	Accumulated Savings
Year	tCO2e	tCO2e	tCO2e	tCO2e
2010	538,653.96	538,653.96	0.00	0.00
2020	661,821.96	613,674.42	48,147.54	144,442.63
2030	784,989.97	640,547.34	144,442.63	1,155,541.01

II. Technical

44. The proposed project aims to improve CMM's capacity in land use and urban transport planning and implementation which will enable the city to develop long-term urban transport systems which are environmentally, socially and financially sustainable. The technology proposed for the project will focus on proven technology. The project will aim to promote the modal shift to public transport and various NMT modes such as bicycles, bicycle taxis and walking for short-distance and medium-distance trips. Bicycles and bicycle taxis are expected to assume larger roles as the main mode of transport inside the core city (Muang Kao) and complementary form of transport (i.e. feeder system) to the public transport system that might be introduced in the future. While the project will focus on building relevant agencies' capacity in planning and implementation of sustainable urban transport in integration with land use dimension, strong emphasis will also be given to public policy making process in order to ensure broad based participation and general public support which are essential to the project's success in the short run and development of sustainable urban transport system by the city in the long-run.

III. Fiduciary

45. *Procurement*. Procurement capacity assessment has been conducted for CMM (see details in Section B of Annex 4). The assessment concluded that the capacity of CMM to

implement procurement based on the Bank's Guidelines is inadequate. At present, all of procurement under the CMM is done through the Finance & Supply Department for which most of its staff are familiar with the country's procurement rules and regulations but not familiar with the Bank's Procurement and Consultants Guidelines as stipulated in the Grant Agreement. Therefore, the procurement risk to carry out the project is considered "substantial". The proposed action plan to strengthen the transaction of procurement process as stipulated in the draft Procurement Plan is provided in Section B of Annex 4. With the incorporation of the capacity strengthening measures including transparency and accountability in procurement process, the residual procurement risk is determined to be moderate.

46. *Financial Management*. A financial management assessment was conducted to determine whether the financial management capacity will be able to meet the requirements. The assessment concluded that the proposed implementing agency has the ability to satisfactorily manage the accounting and disbursement of the Project and to meet the minimum financial management requirements of the WB provided that the following arrangements will be added on to the current system of the CMM.

i) Establishing a supplementary accounting system to maintain the separate records and documentation of the project;

ii) Opening a DA in US dollar currency at a commercial bank acceptable to the Bank to receive the project funds;

iii) Establishing a financial reporting system to generate financial reports as required by the Bank periodically;

iv) Assigning at least two designated staff to be responsible for 1) finance and 2) accounting; and

v) Appointing external auditor acceptable to the Bank to conduct the project external audit according to a TOR acceptable to the Bank.

47. Financial management risk was considered to be substantial. With a set of appropriated mitigation measures to be put in place, the residual risk for financial management will be reduced to moderate. Periodic supervision missions of the financial management shall be conducted through reviews of interim financial management reports and timely advices upon request. Formal supervision will be conducted semi-annually with financial management training to be provided during the site visit.

IV. Social and Environment

48. The impacts associated with the proposed project are mainly benign, short term and site specific from street modification and renovation within the right of way during construction period. There will be minor civil works for the pilot demonstration component but they are unlikely to have major environmental and social impacts. The scope of civil works (where needed) will be limited to improvement of the quality of street pavement, improvement of curbs and pedestrian sidewalks, minor modification of cross-section at the pavement level to allow safe movement of non-motorized vehicles, traffic-lane marking, and installation of signages of which will not impact Physical cultural resources as all of these minor civil works will be within the right-of-ways. No resettlement is involved. The anticipated impacts from minor civil works are temporary traffic disruption, dust, noise, and spoil from street. All these are highly manageable.

These impacts will be mitigated by ensuring good engineering practices and compliance with domestic laws and regulations by CMM. Applicable environmental mitigation measures will be included in the design and contractor's contract to ensure that the contractor will follow good engineering practices and comply with domestic laws and regulations. CMM in cooperation with Police department will closely monitor and supervise the contractor throughout the entire construction period. As it is likely to have minimal adverse environmental impacts from the proposed project, the project is classified as Category C.

49. Public consultation will be conducted by CMM from the project design stage and feedbacks received from the public consultation will be incorporated in the project design and implementation.

50. In cooperation with police department, CMM will be responsible for road renovation and traffic management. CMM currently has five (5) officers under environmental quality promotion unit who have experiences in supervising the street renovation. They are capable and will be responsible to prepare applicable environmental mitigation measures and supervise the street renovation contractor in its implementation.

Annex 1: Background of Chiang Mai City

Chiang Mai is the second largest city in Thailand, with the population of 1,650,009 inhabitants and the area of 20,107 square kilometers. The city is one of the famous destinations in Asia and hosts approximately 4.8 million tourists per year. Chiang Mai is well known for its 700 years of multi-cultural heritages, where the city hosts about 1,000 Buddhism temples, several palaces, and old towns. Its virgin natural resources are equally popular attractions for both domestic and foreign tourists.

Figure A1. Location of Chiang Mai Province

Within the Chiang Mai urban plan area, as of 2005, residential, commercial and industrial areas in combine account for 48percent of the total space. The first fully comprehensive Urban Plan for Chiang Mai was developed by the Chiang Mai Public Works and Town and Country Planning Office in 2008. The key features of the Urban Plan are: the conservation and the restoration of agricultural spaces in defined areas; the conservation of the existing ecosystem; community organization; linking of transportation networks to provide more convenient access; improvement and development of efficient land transportation; provision of public transportation system or provincial transit system with feeder system in the old city center inside the moat. The figure below shows the current urban plan of Chiang Mai.

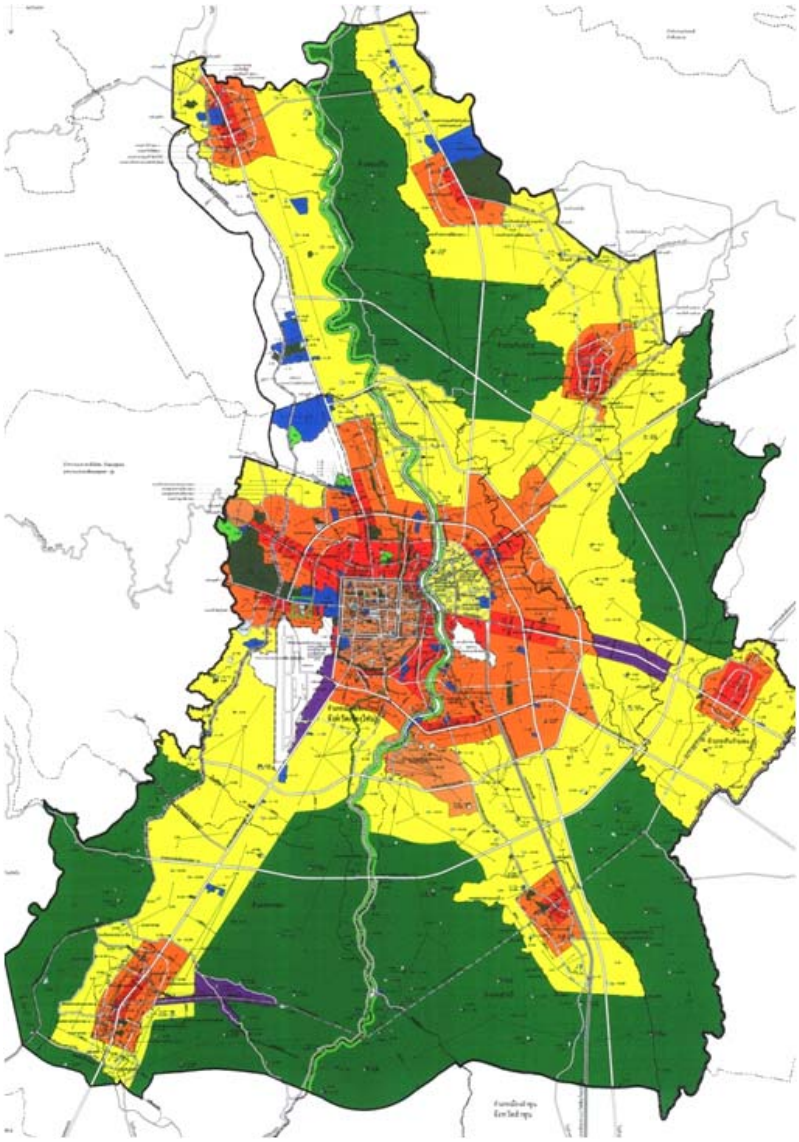
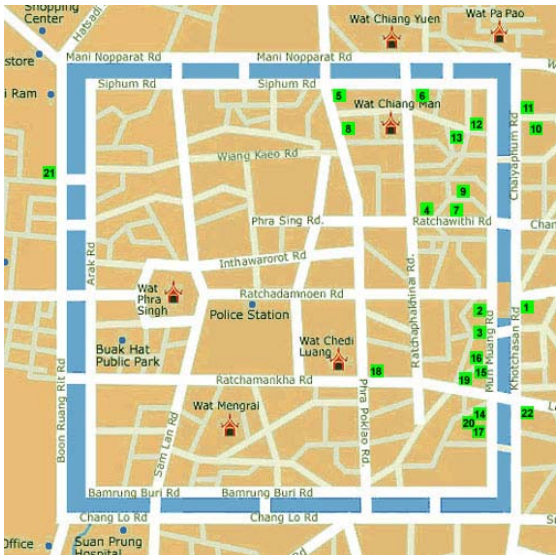


Figure A2: The City's First Fully-Comprehensive Zoning Plan

Chiang Mai's CBD area is situated in and around the old town area. The old town area is quite unique due to the fact that Chiang Mai partially conserve its city wall, which are surrounded by moats, and the traffic can get into the area through five gates. Many of the historical buildings age more than 700 years, and are nationally preserved buildings and temples. Therefore, expansions of existing and constructions of new roads are almost impossible. Moreover, these buildings can be damaged by the vibration of the traffic. On the contrary, the area hosts many attractions for tourists and consequently creates more traffic each year.

The area of the Chiang Mai old town is approximately 2.25 square kilometers. In day time there are 15,000 populations including those who live there and those who come to work there, from neighboring areas. The key characteristic of the old town area is its square shape, surrounded by moats. Even though the walls of the town had collapsed but the five gates remain to be seen.



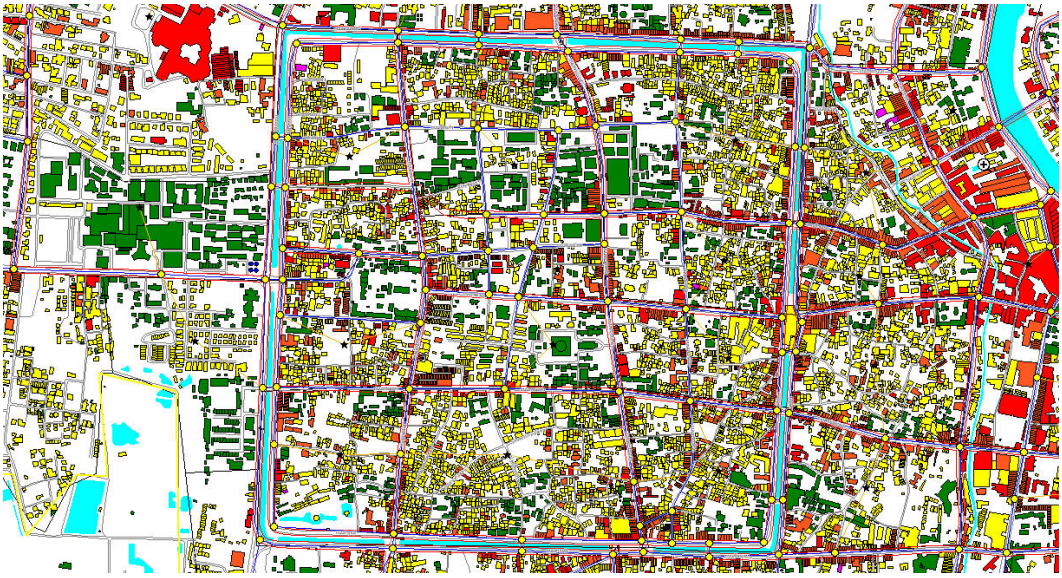


Figure A3: Map and Land Use Pattern in the Old Town Area

The modal split of Chiang Mai study area is characterized by dominating roles of personal cars and motorcycles with public transport taking a very limited share.

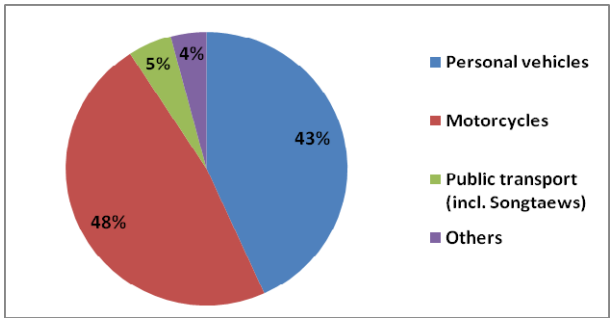


Figure A4: Modal Shares in Chiang Mai City in 2005

Public transportation in Chiang Mai includes songthaew (the latter known locally as rot daeng, literally "red car"), city bus, and different kinds of taxi.

- *Songthaew*: The main public transport in Chiang Mai city is local songthaew (basically pick-up trucks that were modified to transport up to 10 passengers). The fare is usually 20–100 Thai baht per person per trip in and around the city. The first passenger will determine the destination of each trip and the drive will then do random stops waiting for roadside passengers who are heading in the same direction of the agreed route. If the group of people is larger, the fare per person will be less. The number of the red cars is around 2,000 -2,500 vehicles, which operates mainly in the city area as non-fixed route condition. Other types of songthaew are operating as fixed route condition, such as from the city to other districts. There are about 800 of these vehicles.
- *City Bus*: In 2005, CMM introduced Chiang Mai City Bus: It consists of five routes and 25 buses (31 seats per bus). The fare is 15 baths fixed.
- *Other types of taxi*. There are tuktuk, tricycle, and metered taxi. There are around 1,000 tuktuk in Chiang Mai. Its fare is usually at least 50 baht per trip (comfortable for two, but each vehicle can accommodate up to four passengers); fare increases with distance. They operate mainly in the city area. For tricycles, there are only 200-300 drivers left. They can be found only in the areas nearby city markets. There are around 60 metered taxis in Chiang Mai. At present the service is available for passengers from the airport and key business areas.

References:

Chanoknuch Jindawattananon and Warayu Pradipasen (2008), Non-motorized and Public Transport Development in the Urban Area, Chiang Mai, Thailand, the Office of Transport and Traffic Policy and Planning.

Annex 2: Results Framework and Monitoring

Table A2.1: Project Outcome and Output Indicators and Arrangement for Result Monitoring

Outcome Indicators	Output Indicators			Frequency and Reports	Data Collection Instruments	Responsibility for Data Collection
	Baseline	Year 1	Year 2			
(i) 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)	Non-existant	A strategic plan to integrate land use and sustainable urban transport planning for the city developed		Bi-annual Progress Report	Status of Project Implementation	CMM
	Non-existant	10 staff received on-the-job training in developing the plans		Bi-annual Progress Report	Status of Project Implementation	CMM
	Non-existant	2 training courses conducted by international experts		Bi-annual Progress Report	Status of Project Implementation	CMM
(ii) Technical skills acquired by CMM for the planning, design and implementation of NMT improvement	Non-existant	A pilot demonstration for NMT improvement at selected site designed	A pilot demonstration for NMT improvement at selected site implemented	Bi-annual Progress Report	Status of Project Implementation	CMM
	Non-existant	10 staff received on-the-job training in preparing the pilot demonstration project	10 staff received on-the-job training in implementing the pilot demonstration project	Bi-annual Progress Report	Status of Project Implementation	CMM
	Non-existant		5 staff gained international experiences on planning/implementing sustainable urban transport	Bi-annual Progress Report	Status of Project Implementation	CMM
	Non-existant		2 workshops to disseminate experiences of Chiang Mai sustainable urban transport project	Bi-annual Progress Report	Status of Project Implementation	CMM
(iii) Share of person trips by non-motorized transport within the historical city center of Chiang Mai increased to 10% (from baseline of 4%)	4%	A pilot demonstration for NMT improvement at selected site designed	A pilot demonstration for NMT improvement at selected site implemented	Bi-annual Progress Report	Status of Project Implementation	CMM

Annex 3: Project Costs

Table A3.1: Cost Estimation by Category and Component

	Year 1	Year 2	Total	Budget explanation
Component 1. Integrated Sustainable Urban Transport Plan				
Consultants	**$100,000**		**$100,000**	
Inter. Consultants (Fees)	$72,000		$72,000	Expertise in land use, NMT, PT
Local Consultant (Fees)	$13,000		$13,000	
Inter. Consultants (Travel)	$15,000		$15,000	
Training and workshops				
Goods and Works				
Incremental Operating Costs				
Other				
Sub-total Component 1	**$100,000**		**$100,000**	
Component 2. Pilot Demonstration of NMT Improvement				
Consultants	**$110,000**		**$110,000**	
Inter. Consultants (Fees)	$57,600	$14,400	$72,000	Detailed design of NMT improvement, bicycle taxis improvement scheme ,implementation supervision, training, dissemination activities
Local Consultants (Fees)	$14,400	$3,600	$18,000	
Inter. Consultants (Travel)	$20,000		$20,000	
Training and workshops		**$61,670**	**$61,670**	
Dissemination Activities		$24,350	$24,350	Dissemination workshops, site visits
Publications		$7,320	$7,320	
International Training		$30,000	$30,000	
Goods and Works		**$400,000**	**$400,000**	
Civil works and goods		$400,000	$400,000	
Incremental Operating Costs				
Other				
Sub-total Component 2	**$92,000**	**$479,670**	**$571,670**	
Component 3. Project Management				
Consultants	**$17,500**	**$17,500**	**$35,000**	
Project Coordination and M&E	$17,500	$17,500	$35,000	
Training and workshops				
Goods and Works				
Incremental Operating Costs	**$11,480**	**$11,480**	**$22,960**	
Travel	$6,188	$6,188	$12,375	OTP and CMM staff travels
Audit Report	$3,500	$3,500	$7,000	2 annual audit reports
Others	$1,793	$1,793	$3,585	Office supplies, communication services
Other				
Sub-total Component 3	**$28,980**	**$28,980**	**$57,960**	
Total	**$220,980**	**$508,650**	**$729,630**	

Table A3.2: Costs Estimation by Categories

Categories	Year 1	Year 2	Total
Consultants	$227,500	$17,500	$245,000
Training and Workshop	$0	$61,670	$61,670
Goods and Works	$0	$400,000	$400,000
Incremental Operating Costs	$11,480	$11,480	$22,960
Total	**$220,980**	**$508,650**	**$729,630**

Table A3.3: Detailed Financing Plan

Component	Co-Financing					Total
	OTP			CMM		
	Cash	In-kind	Parallel Financing in Cash	Cash	In-kind	
Component 1 : Integrated Sustainable Urban Transport Plan	-	9,427	1,439,394	-	90,137	1,538,957
Component 2: Pilot Demonstration of NMT Improvement	-	5,907	-	25,000	108,823	139,730
Component 3: Project Management	-	13,300	-	-	73,491	86,791
Total	**-**	**28,633**	**1,439,394**	**25,000**	**272,450**	**1,765,478**

Annex 4: Procurement Arrangement

A. General

Procurement for the proposed Project will be carried out in accordance with the World Bank's "Guidelines: Procurement under IBRD Loans and IDA Credits" dated May 2004, revised October 2006 & May 2010; and "Guidelines: Selection and Employment of Consultants by World Bank Borrowers" dated May 2004, revised October 2006 & May 2010 and the provisions stipulated in the Legal Agreements. The general descriptions of various items under different expenditure category are described below.

For each contract to be financed by the Grant, the procurement methods or consultant selection methods, estimated costs, prior review requirements, and time frame are agreed between the Recipient and the Bank and reflected in the Procurement Plan. The Procurement Plan will be updated at least annually or as required to reflect the actual Project implementation needs and improvements in institutional capacity.

Procurement of Works: Works financed by the Grant may be procured through National Competitive Bidding (NCB) method and the procedures, with the Bank's prior concurrence, will be followed subject to the improvements listed in the NCB-Annex to the Legal Agreement. Works estimated to cost less than US$50,000 per contract may be procured through Shopping method.

Procurement of Goods: Goods financed by the Grant may be procured through NCB method and the procedures, with the Bank's prior concurrence, will be followed subject to the improvements listed in the NCB-Annex to the Legal Agreement. Goods estimated to cost less than US$50,000 per contract may be procured through Shopping method. With the prior concurrence of the Bank, goods that meet the circumstances specified in paragraph 3.6 of the Procurement Guidelines may be procured through Direct Contracting.

Selection of Consultants. Depending on the nature and size of the assignment, methods of selection of firms may include Quality and Cost Based Selection, Least Cost Selection, and Selection Based on Consultants' Qualifications. Contracts with firms estimated to cost equal or less than US$100,000 may be procured through the method Selection Based on Consultants' Qualifications. Specific assignments that meet the criterion under paragraph 3.10 of the Consultant Guidelines may be awarded, with prior concurrence of the Bank, through Single-Source Selection method.

Individual Consultants may be selected in accordance with the provisions of paragraphs 5.1 to 5.4 of the Consultants Guidelines. Under the circumstances described in paragraph 5.4 of the Consultant Guidelines, such contract may be awarded to individual consultant on a sole-source basis, subject to the prior approval of the Bank

B. Assessment of the Agency's Capacity to Implement Procurement

Based on the discussion with the Mayor of CMM and his staff particularly from Finance & Supply Department and Pollution Air Quality Control Bureau on May 31, 2010 and the information provided, the CMM has past experience in implementing the work program with SIDA on Capacity Building for Wastewater Management Project since 2004. Most of the procurement and contract management at that time were done through SIDA Consultant staff and endorsed by the Project Management Committee (PMC) under the Project Steering Committee.

At the present, all of procurement under CMM would be done through the Finance & Supply Department. Most of its staff are familiar with the country's procurement rules and regulations but not with the Bank's Procurement and Consultants Guidelines as stipulated in the Grant Agreement. Therefore, the procurement risk to carry out the GEF Sustainable Urban Transport in Chiang Mai is considered "Substantial". Action plan to strengthen the procurement process as stipulated in the draft Procurement Plan is proposed as follows:

- As required by the Grant Agreement, the CMM shall agree to apply the World Bank's Procurement & Consultants Guidelines and procedures for procurement of goods & non-consultants services (if any) and consulting services under the proposed project.
- An additional procurement consultant, who has some experience in procurement of international organization, should be recruited on a part time basis to assist the CMM for carrying out procurement aspects when the activities on the proposed project start.
- CMM shall assign qualified government staff to serve as the focal point for coordination and follow-up of procurement activities with the line departments/bureaus, with support by the procurement consultant. In addition, each department/bureau concerned to the project will also assign at least one relevant staff for purposes of serving as procurement focal points for their respective department/bureau.
- Procurement training will be provided by WB and MOF representative before the effectiveness and periodically during the implementation of the project.
- Enhancing publication and disclosure of procurement information including annual procurement plan and updates, bids opening records, quarterly summaries of contract award information for all procurement packages.
- Adopting a project procurement record and filing system acceptable to the Bank, and further improvements in procurement/contract management system as recommended by the procurement consultant.

With the incorporation of the capacity strengthening measures including transparency and accountability in procurement process, the residual procurement risk is determined to be Moderate.

C. Procurement Plan

A detailed Procurement Plan for the project should be prepared and will be discussed with the Bank. The Procurement Plan will be updated in agreement with the Task Team annually as required to reflect the actual project implementation needs and improvement.

D. The Bank's Procurement Review Requirements

The following contracts shall be subject to Bank's prior review in accordance with the Procurement Guidelines or Consultant Guidelines:

A.1.1. All contracts for goods and works procured through ICB;

A.1.2. The first NCB and first Shopping contract for procurement of goods and works by the implementing agency;

A.1.3. All contracts for goods and works procured through direct contracting;

A.1.4. The first contract for hiring of consulting firms and the first contract for hiring of individuals regardless of value, and all subsequent consulting services contracts exceeding US$100,000 equivalent for firms and US$$50,000 equivalent for individuals per contract respectively.

A.1.5. All contracts for hiring of consulting firms procured through single source selection, and all contracts for the recruitment of individual consultants through sole-source selection.

All other contracts shall be subject to ex-post review by the Bank, and will also include checks for transparency in the procurement process and verification of end-use deliveries, in addition to verification of compliance with the agreed procurement procedures. The percentage to apply to the sample for ex-post review will be 20percent,

Frequency of Supervision. In addition to the prior review, the assessment of the capacity of the Project Implementing Agencies recommended, that procurement supervision mission including post review will be conducted at least twice per year..

E. Details of Procurement Arrangements for Items to Be Procured

Contracts for goods and services under the draft procurement plan are summarized in Table below.

Table A4.1: Goods and Works Procurement Schedule

1	2	3	4	5	6	7	8
Ref. No.	**Contract (Description)**	**Estimated cost (US$)**	**Proc. Method**	**Domestic Preference (yes/no)**	**Review by World Bank (Prior / Post)**	**Expected Bid/ Quotation Opening Date**	**Comments**
Component 2: Area Improvement for NMT							
1	Civil works/Goods	400,000	NCB		Prior	February 2012	

Table A4.2: Consulting Service Procurement Schedule

1	2	3	4	5	6	7
Ref. no.	**Contract (description)**	**Cost estimate (US$)**	**Selection method**	**Review by World Bank (Prior/ Post)**	**Proposal opening date**	**Comments**
Component 1: Integrated Land Use and Sustainable Urban Transport Planning						
1	SUT and LU Consulting services	100,000	CQS	Prior	June 2011	
Component 2: Area Improvement for NMT						
2	Consulting services for detailed design of area	110,000	LCS	Prior	June 2011	

	improvement and related activities under Component 2					
Component 3: Project Management						
3	Project Coordination and M&E	35,000	IC: comparing at least three candidates	Prior	June 2011	

Annex 5: Financial Management and Disbursement Arrangements

Financial Management Assessment: The assessment of financial management was conducted in May 31 and June 1, 2010 at Chiang Mai Municipality (CMM) with an aim to ensure that CMM would have sufficient financial management capacity and acceptable system to take on the project financial management as required by the Bank.

The assessment reveals the current status and suggests some adjustments for the project financial management arrangements as following.

1. *Accounting Organization and Staffing*: CMM will be responsible for implementing the project. CMM currently comprises 5 (five) divisions, 2 (two) technical units and 4 (four) sub-municipalities with staffing around 2,000 persons. The project financial management functions including accounting, financial reporting and disbursements will be responsible by the financial division under CMM. CMM shall assign at least 2 (two) qualified staff designated to the project consisting of; 1) one financial staff to be responsible for preparing withdrawal applications together with preparing supporting statements and evidences for withdrawals, as well as managing payments and project bank account (DA), and 2) one professional accountant to maintain project records and documentation, prepare project financial reports as required by the Bank and the project management team. As CMM financial staffs do not have experiences in implementing the World Bank project, the World Bank staff will provide training on procedures for withdrawals and disbursements as well as report requirements, once those designated staffs are appointed.
2. *Accounting System and Procedures:* CMM accounting system and procedures follow the government system and regulations. The project accounting and control procedures will follow the current system of the municipality. As the Bank requires any Bank funded project to provide financial report of the project, CMM will have to establish a supplemental system within the current system to track accounting records of the project. Such system should be capable to i) maintain separate accounting records and documentation of the project ; ii) produce periodic financial reports; and iii) maintain systematic control procedures to ensure that project expenditures are properly verified and duly authorized before payments are made. The records will be maintained in excel spreadsheet. The basis of accounting will be cash and financial reports will be prepared in accordance with the Thailand accounting standards, which are compatible with IAS. Documentation and supporting documents are maintained at CMM for subsequent reviews and audits.
3. *Reporting Arrangement*. The current reporting system is mainly for statutory purpose but not for project monitoring. In order for the Bank and the project management team to monitor project progress, interim financial management reports (IFR) will be required. The IFRs are not required to be audited but would be submitted to the World Bank semi-annually within 45 days after the end of the period. The report package shall include the following; i) Narrative description of the Project Progress in each project component, procurement activities and financial summary, ii) Statement Sources and Uses of Funds by expenditure category and iii) Uses of fund by project component compared with the plan and iv) procurement status and future plan. The format of the financial statements shall be agreed upon project starts.

   The annual financial statements will be prepared in accordance with the Thailand accounting standards and policies and the format/content will be agreed with the World Bank. The

annual financial statements prepared will include, as a minimum, statements of source and use of funds, Project financial position (balance sheet) and statement of the DA.

4. *Audit Arrangement*. CMM is subjected to be audited annually by the Office of the Auditor General. However, in order to meet the Bank audit requirement, the audit of the Project will be conducted annually by an independent auditor acceptable to the Bank and the audit shall be carried out in accordance with TOR acceptable to the Bank. The Auditor shall be appointed within 6 months from the date the Project starts. Initially, the project team will seek possibility to appoint the Office of the Auditor General to be the project external auditor. If this arrangement is not possible, one of SEC approved firms shall be recruited in accordance with the Bank's procurement process. The auditor is required to provide audit opinions on the annual financial statements and management letters addressing any deficiencies and weaknesses found during the course of audits. The financial year of the project is consistent with government fiscal year which starts from October 1 and ends September 30. The audit reports are required to be submitted annually by March 31 of each year.

Disbursement Arrangement and Funds Flow: Disbursement of the Grant proceeds will be made through direct payment from grant account for major consultant contracts and from a designated account for small payments i.e. local consultants, goods, training and workshop with reimbursements made based on full documentation or against Statement of Expenditure (SOE) depending on procurement prior review thresholds.

To receive the advance from the Grant, the designated account (DA) shall be open in US dollar currency at a local commercial bank acceptable to the Bank with a ceiling of USD 70,000. The DA will be used exclusively for project eligible expenditure. Replenishments of the DA shall be made on a monthly basis.

Conclusion and Financial Management Action Plan: The assessment concluded that that CMM has adequate capacity and acceptable system to adapt for the project with minor modifications including the following

1. Establishing a supplementary accounting system to maintain the project records and documentation;
2. Opening a US dollar designated bank account (DA) to be maintained at a commercial bank acceptable to the Bank to receive and disburse the project fund;
3. Agree format of the interim financial reports for project monitoring and annual financial statements for external audit. Appointment of a designated financial staff to be responsible for Grant withdrawals, managing the USD bank account, and preparing supporting statements and documents for Grant withdrawals;
4. Appointment of a designated accounting staff to be responsible for maintaining project accounting records and documentation as well as preparing financial reports as required by the Bank;
5. Appointment of an external auditing firm acceptable to the Bank to be appointed to conduct the project external audit.

Risk Assessment: The FM risk is considered to be substantial due to lack of experience in implementing Bank's projects and inadequate understanding of the Bank's requirements. To mitigate the risk, the Bank would provide procurement and disbursement training to concerned

staff before grant effectiveness and provide close guidance through periodic supervision. The Bank will conduct semi-annual formal supervision missions to update the project implementation, inform the Bank management about the project status, and take decisions about adjustments if needed.

Annex 6: Incremental Cost and Global Benefits Analysis

Baseline or BAU Scenario (without GEF Intervention)

The baseline scenario assumes that CMM's technical capacity to plan and implement integrated land use and urban transport planning in a sustainable manner remains limited. Public support could not be secured to implement urban transport program (e.g. traffic demand policies and investment in NMT) due to lack of understanding and opposition from certain stakeholder groups. Financial resources remain a constraint in the implementation of the plan.

As a result, the role of NMT is further marginalized. Public transportation system still relies on energy inefficient vehicles and experiences decreasing share. With no effective public transport or NMT options, the share of personal motorized transport increases.

Sustainable Urban Transport Planning and Implementation Scenario (with GEF Intervention)

The sustainable urban transport planning and implementation scenario assumes that Chiang Mai could move on the sustainable urban transport path and fully implement the sustainable urban transport plan and policies, which integrate land use and urban transport planning. It is assumed that this outcome could not be achieved without the initial strategic intervention by GEF.

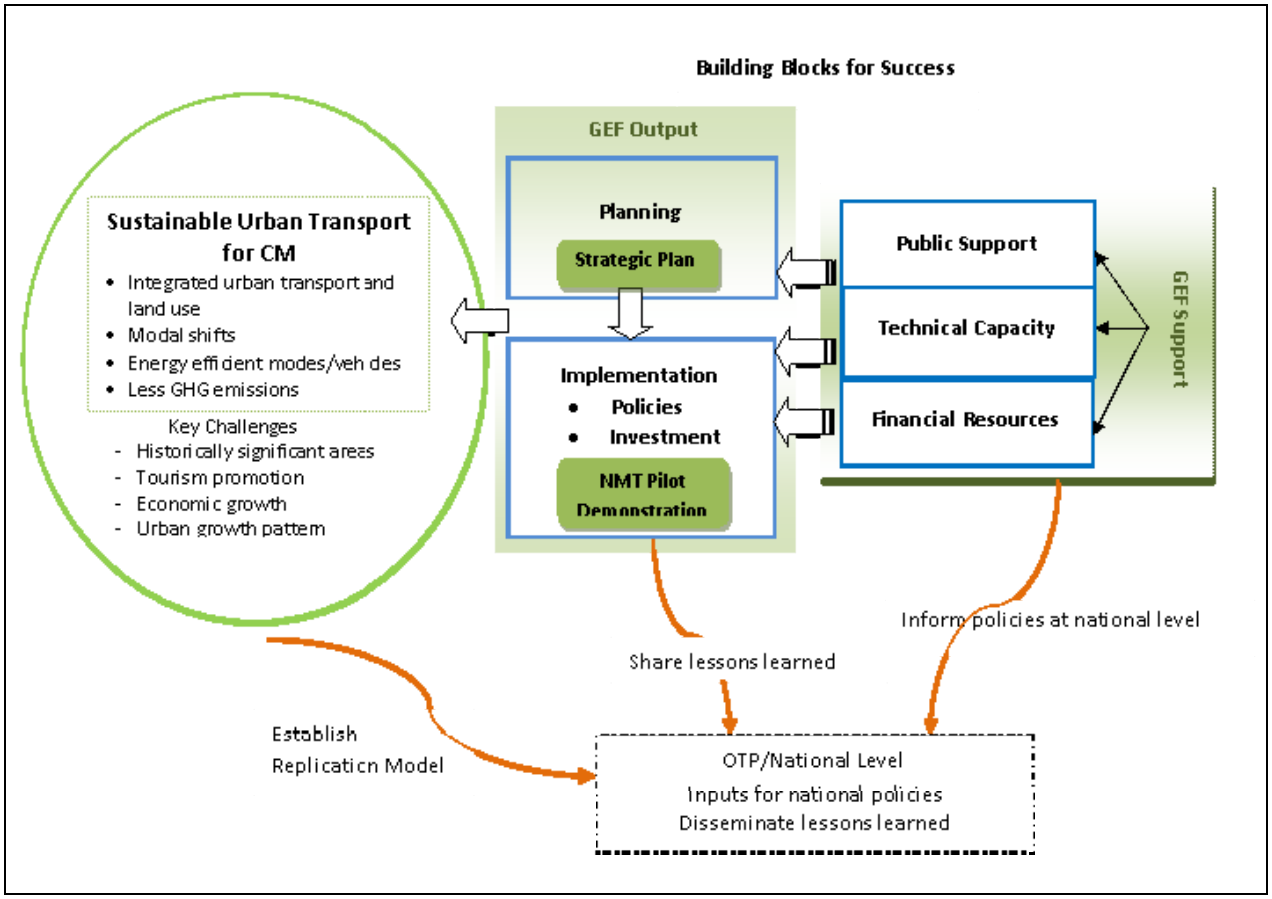
The figure below shows how GEF support through technical assistance and capacity building activities contribute to the final outcome of a more sustainable urban transport system in the city of Chiang Mai.

For the project's **direct impacts**, the development of the strategic plan for integrated urban transport and land use and NMT pilot demonstration will provide recommendations for future directions of sustainable urban transport development for CMM. The successful implementation of the NMT pilot demonstration will improve NMT infrastructure and directly benefit Chiang Mai residents in terms of reduced motorized activities and better air pollution, albeit in a limited manner.

More importantly, the project will have **indirect impacts** on the development of sustainable urban transport in the long run. Through the implementation of these activities, GEF will help lay technical and institutional foundation for long-term development of sustainable urban transport with increased role of more effective and less energy-intensive forms of urban travel using a comprehensive approach including an improved public transport system and NMT (walking, bicycles, bicycle taxis) which will result in long-term reduction of vehicular greenhouse gas. GEF support will strategically contribute to each building block or key success factor by: i) improving technical capacity of CMM staff and relevant stakeholders through on the job training and learning from international experts; ii) establish a mechanism and process to develop and implement a well-planned transport system in a sustainable and participatory manner; iii) increasing public awareness about integrated urban transport and the role of NMT as a basis for public support in the long run; and iv) providing recommendations on how to

overcome financial barriers in the development of sustainable urban transport at local level in the strategic plan.

GEF support will also contribute to the national policy issue of how to promote the development of more sustainable urban transport system in secondary cities in Thailand by: i) inform national policy making based on Chiang Mai experiences; and ii) establish a model which could be replicated in the future.



Global Benefits Analysis

Calculating Direct Impacts

Due to lack of sound baseline data on existing travel patterns in the old town, an *indicative potential* for GHG emission reductions as *direct impacts* from area improvement under NMT component in the old town area could be quantified.

It is estimated that investment in area improvement could potentially increase modal share of NMT by 8 percent in the project case compared to the BAU case in 2022. To take into account a dynamic baseline scenario where efficiency improvement occurs regardless of the project (e.g. technological improvement, changes in fuel economy of vehicles, etc.), one percent overall efficiency improvement is assumed in the BAU case. The majority of the shifts away from cars

and motorcycles trips are expected to come from trips made by tourists. It is assumed that the GHG emission reductions will start in 2013 (given that the project will complete in year 2012) and direct impact will occur in the next ten years which is the assumed lifetime of investment.

The estimated GHG emissions and savings under the 2022 - BAU scenario and 2022- Project NMT improvement scenario are shown in the table below.

Table A6.1: GHG Emission Reductions as Direct Impacts

Year	Business as Usual Scenario* (tCO2e)	Project NMT Improvement Scenario (tCO2e)	Annual Savings (tCO2e)	Accumulated Savings (tCO2e)
2010	10,035.11	10,035.11	0.00	0.00
2011	10,119.52	10,119.52	0.00	0.00
2012	10,203.93	10,203.93	0.00	0.00
2013	10,288.34	10,234.65	53.69	53.69
2014	10,372.75	10,265.37	107.37	161.06
2015	10,457.16	10,296.10	161.06	322.12
2016	10,541.57	10,326.82	214.75	536.86
2017	10,625.98	10,357.54	268.43	805.30
2018	10,710.38	10,388.27	322.12	1,127.41
2019	10,794.79	10,418.99	375.80	1,503.22
2020	10,879.20	10,449.71	429.49	1,932.71
2021	10,963.61	10,480.44	483.18	2,415.89
2022	11,048.02	10,511.16	536.86	2,952.75
			Total Savings	**2,952.75**
			Average Annual Savings over 10 Years	**295.28**
Cost Effectiveness				
		Total CO2e Reduction	**Total Cost**	**US$/tCO2e**
Cost Effectiveness of GEF (for Component 2)		2,952.75	400,000.00	193.61
Cost Effectiveness of Total Project (for Component 2)		2,952.75	571,670.00	135.47

Note: *Assume 1% overall efficiency improvement in the BAU case regardless of the project.
Notes to Calculation: 1. The travel data on Old Town is based on Chanoknuch Jindawattananon and Warayu Pradipasen (2008), Non-motorized and Public Transport Development in the Urban Area, Chiang Mai, Thailand, the Office of Transport and Traffic Policy and Planning and assumptions made by the project team. The GHG calculation was based on the methodology developed by Wright & Fulton (2005) and was further modified by GTZ and WB team. 2. Key assumptions are: (a) 90,000 trips per day in the old town area, 50% of which are trips made by tourists; (b) no major improvement in public transport during the period; (c) average annual population (including tourists) growth of 2%; (d) NMT trips also included bicycle taxi trips; and (e) average distance per trip for motorized trip is 2 km.

The table below shows changes in modal shares in year 2010 (base year) and in 2022 under BAU case and the project NMT improvement scenario as a direct impact of project intervention.

Table A6.2: Changes in Modal Shares Project Case vs. BAU Case

Modes	2010	2022 BAU	2022 Project NMT Improvement Scenario	2022 Change
Private automobiles	45%	47%	43%	-4%
Motorcycle	43%	45%	41%	-4%
Public Transport	8%	6%	6%	0%
NMT	4%	2%	10%	8%

Calculating Indirect Impacts

The *whole potential* of GHG emission reductions that could be achieved in the city of Chiang Mai if the final outcome of sustainable transport planning and implementation could be fully realized are also quantified as indirect impacts of the project. It is acknowledged that GEF support will not directly lead to the desired outcome but will indirectly but strategically sets up the process that will enable the city to achieve the final outcome with sustained efforts in the long run.

The GHG savings at a point in time is calculated as the difference between what emissions are forecasted to be under the BAU scenario and what emissions are forecasted to be under the sustainable urban transport planning and implementation scenario. To take into account a dynamic baseline scenario where efficiency improvement may occur regardless of the project (e.g. technological improvement, changes in fuel economy of vehicles, etc.), 2 percent overall efficiency improvement is assumed in the BAU case. It is assumed that the project influence period will be 15 years and the new modal shares under the sustainable urban transport planning and implementation scenario will be fully achieved in the year 2030. Savings are assumed to start after 2015 when impacts from some measures or investments begin to be realized.

The estimated GHG emissions and savings under the 2030 - BAU scenario and 2030-sustainable urban transport planning and implementation scenario are shown in the table below.

Table A6.3: GHG Emission Reductions as Indirect Impacts

Year	Business as Usual Scenario* (tCO2e)	Sustainable Urban Transport Planning and Implementation Scenario (tCO2e)	Annual Savings (tCO2e)	Accumulated Savings (tCO2e)
2010	538,653.96	538,653.96	0.00	0.00
2011	550,970.76	550,970.76	0.00	0.00
2012	563,287.56	563,287.56	0.00	0.00
2013	575,604.36	575,604.36	0.00	0.00
2014	587,921.16	587,921.16	0.00	0.00
2015	600,237.96	600,237.96	0.00	0.00
2016	612,554.76	602,925.26	9,629.51	9,629.51
2017	624,871.56	605,612.55	19,259.02	28,888.53
2018	637,188.36	608,299.84	28,888.53	57,777.05
2019	649,505.16	610,987.13	38,518.03	96,295.08
2020	661,821.96	613,674.42	48,147.54	144,442.63
2021	674,138.77	616,361.71	57,777.05	202,219.68
2022	686,455.57	619,049.01	67,406.56	269,626.24
2023	698,772.37	621,736.30	77,036.07	346,662.30
2024	711,089.17	624,423.59	86,665.58	433,327.88
2025	723,405.97	627,110.88	96,295.08	529,622.96
2026	735,722.77	629,798.17	105,924.59	635,547.56
2027	748,039.57	632,485.47	115,554.10	751,101.66
2028	760,356.37	635,172.76	125,183.61	876,285.27
2029	772,673.17	637,860.05	134,813.12	1,011,098.39
2030	784,989.97	640,547.34	144,442.63	1,155,541.01
			Total Savings	**1,155,541.01**
			Average Annual Savings over 15 Years	**77,036.07**

Note: *Assume 2% overall efficiency improvement in the BAU case regardless of the project.
Notes to Calculation: 1. The GHG calculation was based on the methodology developed by Wright & Fulton (2005) and was further modified by GTZ and WB team. 2. The baseline information and assumptions were primarily based on the information and data provided in OTP-funded study called “The Master Plan and Preliminary Design of Mass Transit System for Chiang Mai City”.

Scenario: Base case - Year 2010

Mode	Mode share 2010	Trips per day	Passengers per vehicle-km	Vehicle km	Litres per 100 km	Litres of fuel	kg CO2 per litre of fuel	kg CO2 per day	Days per year	Tons of CO2 per year
Private automobiles	43%	741,750	0.150	4,945,000.00	10.80	534,060.00	2.42	1,290,288.96	312.5	403,215.3
Motorcycle	39%	672,750	0.150	4,485,000.00	2.50	112,125.00	2.42	270,894.00	312.5	84,654.4
Pubic Buses/songtaew	4%	69,000	0.400	172,500.00	24.00	41,400.00	2.87	118,611.00	312.5	37,065.9
Improved PT	0%	0	3.00	0.00	64.10	0.00	2.87	0.00	312.5	0.0
Taxis	1%	17,250	0.15	115,000.00	10.80	12,420.00	2.42	30,006.72	312.5	9,377.1
Tuk Tuk	1%	17,250	0.15	115,000.00	5.00	5,750.00	2.42	13,892.00	312.5	4,341.3
Walking	8%	138,000	1.000	138,000.00	0.00	0.00	0.00	0.00	312.5	0.0
Cycling	2%	34,500	1.000	34,500.00	0.00	0.00	0.00	0.00	312.5	0.0
Others (Samlor)	2%	34,500	1.000	34,500.00	0.00	0.00	0.00	0.00	312.5	0.0
Total	**1.00**	**1,725,000.00**	**-**	**10,039,500.00**	**117.20**	**705,755.00**	**15.40**	**1,723,692.68**	**2,812.50**	**538,653.96**

Scenario: BAU Scenario - Year 2030

Mode	Mode share 2030	Trips per day	Passengers per vehicle-km	Vehicle km	Litres per 100 km	Litres of fuel	kg CO2 per litre of fuel	kg CO2 per day	Days per year	Tons of CO2 per year
Private automobiles	50%	1,150,000	0.150	7,666,666.67	10.80	828,000.00	2.42	2,000,448.00	312.5	625,140.0
Motorcycle	33%	759,000	0.150	5,060,000.00	2.50	126,500.00	2.42	305,624.00	312.5	95,507.5
Pubic Buses/songtaew	3%	69,000	0.400	172,500.00	24.00	41,400.00	2.87	118,611.00	312.5	37,065.9
Improved PT	0%	0	3.00	0.00	64.10	0.00	2.87	0.00	312.5	0.0
Taxis	3%	69,000	0.15	460,000.00	10.80	49,680.00	2.42	120,026.88	312.5	37,508.4
Tuk Tuk	1%	23,000	0.15	153,333.33	5.00	7,666.67	2.42	18,522.67	312.5	5,788.3
Walking	7%	161,000	1.000	161,000.00	0.00	0.00	0.00	0.00	312.5	0.0
Cycling	2%	46,000	1.000	46,000.00	0.00	0.00	0.00	0.00	312.5	0.0
Others (Samlor)	1%	23,000	1.000	23,000.00	0.00	0.00	0.00	0.00	312.5	0.0
Total	**1.00**	**2,300,000.00**	**-**	**13,742,500.00**	**117.20**	**1,053,246.67**	**15.40**	**2,563,232.55**	**2,812.50**	**801,010.17**

Scenario: Sustainable Urban Transport Planning and Implementation Scenario - Year 2030

Mode	Mode share 2030	Trips per day	Passengers per vehicle-km	Vehicle km	Litres per 100 km	Litres of fuel	kg CO2 per litre of fuel	kg CO2 per day	Days per year	Tons of CO2 per year
Private automobiles	36%	828,000	0.150	5,520,000.00	10.80	596,160.00	2.42	1,440,322.56	312.5	450,100.8
Motorcycle	28%	644,000	0.150	4,293,333.33	2.50	107,333.33	2.42	259,317.33	312.5	81,036.7
Pubic Buses/songtaew	0%	0	0.400	0.00	24.00	0.00	2.87	0.00	312.5	0.0
Improved PT	15%	345,000	3.00	115,000.00	64.10	73,715.00	2.87	211,562.05	312.5	66,113.1
Taxis	3%	69,000	0.15	460,000.00	10.80	49,680.00	2.42	120,026.88	312.5	37,508.4
Tuk Tuk	1%	23,000	0.15	153,333.33	5.00	7,666.67	2.42	18,522.67	312.5	5,788.3
Walking	12%	276,000	1.000	276,000.00	0.00	0.00	0.00	0.00	312.5	0.0
Cycling	4%	92,000	1.000	92,000.00	0.00	0.00	0.00	0.00	312.5	0.0
Others (Samlor)	1%	23,000	1.000	23,000.00	0.00	0.00	0.00	0.00	312.5	0.0
Total	**1.00**	**2,300,000.00**	**-**	**10,932,666.67**	**117.20**	**834,555.00**	**15.40**	**2,049,751.49**	**2,812.50**	**640,547.34**