Support of the Capacity Development on Low Carbon Development Policies at the Sub-national Level Through NAMAs in Thailand

Final Report

THAILAND ENVIRONMENT INSTITUTE

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TEI THAILAND ENVIRONMENT INSTITUTE

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AEDP	The renewable and alternative energy development plan
ARDA	The Agricultural Research Development Agency (Public Organization)
BAAC	Bank for Agriculture and Agricultural Co-operative
B.E.	Buddhist Era
BMA	Bangkok Metropolitan Administration
BRT	Bus Rapid Transit
CDM	Clean Development Mechanism
CPA	CDM Programme Activity
DIW	Department of Industrial Works
DMCR	Department of Marine and Coastal Resource, Ministry of Natural Resources and Environment
DOA	Department of Agriculture, Ministry of Agricultural and Cooperatives
DNP	Department of National Parks, Wild life and Plant Conservation, Ministry of Natural Resources and Environment
DEQP	Department of Environmental Quality Promotion, Ministry of Natural Resources and Environment
DELGOSEA	Partnership for Democratic Local Governance in Southeast-Asia
EGAT	Electricity Generating Authority of Thailand
EEDP	Energy Efficiency Development Plan
FIO	Forest Industry Organization
Forest	Department of Forestry, Ministry of Natural Resources and Environment
GHGs	Green House Gases
Industry	Ministry of Industry Thailand
LDD	Land Development Department, Ministry of Agricultural and Cooperatives
MOI	Ministry of Interior

MRTA	Mass Rapid Transit Authority of Thailand Environment Institute
MRV	Monitoring, Reporting, and Verification
MOE	Ministry of Energy
MOT	Ministry of Transport
MOPH	Ministry of Public Health
NAMAs	Nationally Appropriate Mitigation Actions
NCRT	National Research Council of Thailand
NESDB	Office of the National Economic and Social Development Board
NSTDA	National Science and Technology Development Agency
ONEB	Office of Natural Resources and Environmental Policy and Planning, Ministry of Natural Resources and Environment
ORRAF	Office of the Rubber Replanting Aid Fund, Ministry of Agricultural and Cooperatives
OTP	Office of Transport and Traffic Policy and Planning, Ministry of Transport
PAO	Provincial Administrative Organization
PCD	Pollution Control Department, Ministry of Natural Resources and Environment
PoA	Programme of Activities
REO	Regional environmental office, Ministry of Natural Resources and Environment
REDD	Reducing Emissions from Deforestation and Forest Degradation
Sq.m	square metre
Sq.km	square kilometer
SPP	Small Power Producer
TRF	Thailand Research Fund
TISI	Thai Industrial Standards Institute
TCG	Thai Credit Guarantee Corporation
TGO	Thailand Greenhouse Gas Management Organization
THAIAUTO	Thailand Automotive Institute

VSPP	Very Small Power Producer

Introduction

Background

The Institute for Global Environment Strategies (IGES) is going to conduct the capacity on establishing New Market Mechanism through the Development of Methodological and Institutional framework for MRV in Thailand from April 2012 to March 2013.

Governance and Capacity Group (GC) of IGES is in charge of the capacity development on low carbon development policies at the sub-national level in urban sectors, as well as development of relevant parts of nationally appropriate mitigation actions (NAMAs) guideline in Thailand and Philippine, as part of the above umbrella activity on MRV.

Objective

The objective of the activity is capacity development and study MRV in Asian countries with a view to support the new market mechanisms including clean development mechanism (CDM) and bilateral offset credit mechanism. The study aims to examine how to best utilize appropriate MRV mechanisms of NAMAs to incrementally promote low carbon development policies at the sub-national level.

Implementation

Thailand Environment Institute (TEI) was contracted by IGES and shall support the IGES field activities and report on items as the following.

1). Low carbon development policies and measures at the national and sub-national level in Thailand.

2). Relevant information on potential MRV mechanisms of NAMAs to enhance low carbon development at the sub-national level in Thailand.

For 1) and 2) items, TEI shall also arrange the meetings/interviews with persons and stakeholders for the above issues for the IGES field study.

3). Workshop organization for capacity development.

The workshop will be organizes, a half-day, in a capital city to share the study results and enhance capacity of relevant national/sub-national government officials and other climate policy experts with regard to NAMA development that will enhance low carbon development policies at sub-national in Thailand.

The Interim report consists of (I) The record of the IGES field study including interview and meetings., (II) The findings associated in low carbon development policies and measures at the national and sub-national level in Thailand., and (III) The findings associated in relevant information on potential MRV mechanisms of NAMAs to enhance low carbon development at the sub-national level in Thailand.

Part I: The record of the IGES field study

(1). Questions to be investigated.

(a). Low carbon development policies and measure at the national and sub-national level.

- Current status of national level preparation on low carbon development policies and measures, including that for NAMAs.

- Current status of sub-national level preparation on low carbon development policies.

i. Sectors

- National: Transport, commercial and residential buildings, waste and wastewater, energy supply, forest and agriculture.
- Sub-National: Transport, commercial and residential buildings, waste and wastewater.

ii.Typology

- Stakeholders: Planning & Target, economics, standards/labeling, information.
- Government: public infrastructure, public procurement.

- Division of responsibility between national and sub-national governments to develop and implement national action plan of low carbon development and/or NAMAs by sectors

(b). Relevant information on potential MRV mechanisms of NAMAs to enhance low carbon development at the sub-national level.

- Existing state of monitoring and evaluation mechanisms of policies at national and sub-national level (both province and city levels) in the sectors of energy supply, energy efficiency improvement, transport service and waste management

- Indicators used to measure progress and achievement, frequency of reporting, feedback mechanism (linkage with budgeting), and mechanism to disclose information to the public, and the division/department in charge of monitoring and evaluation of administration in general within national and sub-national governments.

(2) Interview Schedule

The schedule was arranged for 8 interviewee and every details are presented as follow.

Table 1: Interview schedule

Date	Time	Organization	Key Person	Position
2012/07/10	10:30 – 11:30	Thailand Greenhouse Gas Management Organization (TGO).	Dr. Chaiwat Muncharoen	Deputy Executive Director
			Dr. Puttipar Rotkittikhun	Senior Official
			Mr. Rongphet Bunchuaidee	Assistant Senior Official
2012/07/10	13:30 -14:30	Department of Alternative Energy Development and Efficiency (DEDE), Ministry of Energy.	Ms. Sirinthon Vongsoasup	Energy Efficiency Expert
			Ms. Kulsiri Sakprasith	Assistant
2012/07/10	16:00 -17:00	Office of the National Economic and Social Development Board (NESDB).	Ms. Ladawan Kumpa	Deputy Secretary-General
			Dr. Anupit Supnithadnaporn	Plan and Policy Analyst
2012/07/11	9:00 – 10:30	Bangkok Metropolitan Administration (BMA).	Mr. Wiruch Tanchanapradit	Chief, Environmental Impact Study and Analysis Sub-Division, Air Quality and Noise Management Division, Department of Environment
			Ms. Payalaln Thawanrat	Environmentalist, Environmental Impact Study and Analysis Sub-Division, Air Quality and Noise Management Division, Department of Environment
2012/07/11	14:00 – 15:00	Good Governance for Social Development and the Environment Institute (GSEI).	Dr. Buntoon Sethasiroj	Executive Director

Date	Time	Organization	Key Person	Position
2012/07/12	10:00 – 11:00	The Joint Graduate School of Energy and Environment (JGSEE), King Mongkut's Univeristy of Technology Thonburi (KMUTT).	Assoc. Prof. Dr. Sirintornthep Towprayoon	Director
2012/07/12	13:40 – 14:30	Electricity Generating Authority of Thailand (EGAT).	Ms Waraporn Kunawanakit	Chief, Technical and R&D Branch, Planning and Quality Development Division (PQDD)
2012/08/27	14:00 – 15:00	Muangklang Municipality, Rayong Province.	Mr Somchai Jariyachareon	Mayor
2012/10/26	12:30 – 13:00	-	Mrs. Nisakorn Kositratna	Environmental Specialist (Former Deputy Secretary General, ONEP)

Part II: Finding associated in Low carbon development policies and measures at the national and sub-national level

(1). Low carbon development policies and measures at the national level.

(1.1) The 11th National Economic and Social Development Plan.[1]

The basic concepts of the Eleventh Plan are derived from guiding principles of the Eighth through Tenth Plans. The Eleventh Plan adheres to the Philosophy of Sufficiency Economy, and focuses on progress that is people-centered and balances the various dimensions of development.

The direction of development will generate security and protection in each aspect and lead toward balanced and sustainable progress through strengthening the nation's capital endowment.

Thailand has to confront internal and external changes that are more complicated and unpredictable than ever before. Thus the formulation of strategies to direct development is

[1] The Eleventh National Economic and Social Development Plan

geared toward enhancing resilience to risk factors and strengthening the foundations of the country's evolution. Simultaneously, human resources must be improved to be able to adapt to changes, and to increase access to resources and to foster equitable benefits from economic and social development. Economic opportunities should be provided that are based on knowledge and innovation in environmentally healthy production and consumption. This will lead to more secure and sustainable development.

Major strategies in the Eleventh Plan are as follows:

- Strategy to promote a just society.
- Strategy to develop human qualities toward a sustainable knowledge based society that continues to learn.
- Strategy for strengthening the agricultural sector, as well as food and energy security.
- Strategy to restructure the economy toward quality and sustainability.
- Strategy to create regional connectivity for social and economic stability.
- Strategy for managing natural resources and the environment toward sustainability.

Strategy of managing natural resources and the environment toward sustainability emphasizes on a shift in the development paradigm and a transition to a green economy and a society that is environmentally sustainable, low carbon economy and society, embrace the following guidelines.

- Restructure production sectors toward an environmentally sound low-carbon economy.
- Increase energy efficiency in the transport sector to reduce greenhouse gas emission.
- Develop environmentally friendly cities with emphasize on integrated urban planning having cultural, social and ecological aspects.
- Modify consumption behavior to facilitate the transition to a low carbon and environmentally stable society.

In order to achieve the vision, mission and targets, the implementation of the Eleventh plan should be designed in accordance with national, regional and local agendas. In this

connection, the approach of Area, Function and Participation (AFP) has been upheld since its inception in the Eighth Plan. In addition to ministries and departments at the central level, agencies at the provincial level are also key actors in driving the six strategies. At the regional level, the province plays a critical role, synchronizing the national agenda with area–based development and local issues. In this regard, the provincial plan is expected to tackle problems and capitalize on the potential at the area and local levels. Action, knowledge, technology, innovation and creativity are major tools in driving development plans at all levels and in all segments of the society. Together with this, all development partners should collaborate through the cluster approach, and be responsive to problem solving and area development

To integrate action plans from the central to the local government in order to generate achievement, Implementation will be undertaken systematically as following.

- Create a common understanding among all development partners. – Public relations efforts via media and through activities at the national and local levels will be mobilized to reach target groups. Prepare an implementation handbook for citizens in order to stimulate participation.

- Enhance stakeholders' ability by providing an enabling environment. - Use research and development as essential tools to propel the nation's development in all dimensions. Create development databases that are easy to use for popular participation in development. Introduce channels for public participation in the development process.

- Enhance the efficiency of development methods to improve performance at local, regional and national levels.- Improve the efficiency of the methods and processes of public administration to be more efficient. Use the province as a focal point to translate the Eleventh Plan into action and evaluate it. Coordinate collaboration between the private sector and government agencies in the implementation process.

- Strengthen the ability of stakeholders to make effective contributions to progress at every level. - Strengthen Local Administrative Organizations. Encourage regional universities and vocational institutions to participate in community development. Encourage the media to deliver constructive messages. Motivate NGOs to provide active participation in development with regional and local organizations and with civil society.

For an overall monitoring and evaluation system for implementation, NESDB should launch guidelines to monitor performance, develop indicators for outcomes, apply informative auditing and evaluation methods, coordinate with national committees, evaluate impacts and report to the Cabinet annually. For monitoring and evaluating at the local level, the Policy Committee for Integrative Provincial and Clustering of Province Administration (PCC) and the Regional Supervision Committee should create evaluation systems for area-based achievement and improve the main inspection system so it will be an efficient tool to qualify and quantify implementation. A main apparatus composed of the inspectors-general of the ministries will be established to monitor the process of Plan formulation, the participation of all parties, and budget utilization. This group should have authority to recommend reconsideration of budget allocations. An inspection mechanism will be strength for Citizens to use to monitor and evaluate. Participation by citizen groups should be enhanced so they may take part in auditing the progress, transparency and achievement of development projects in their communities.

Moreover, Information networks of government agencies at the policy level should be developed to monitor and evaluate significant issues, changes and conditions that have affected the country's progress Databases at the local level should be established. All parties should assist in support of this effort. Government agencies and local academic institutions, with the participation of civil society and its communities, should join forces to provide technical assistance so that local people and their communities can set up databases to plan, monitor and evaluate. Finally, networks between central and local levels should be linked. The system should be user-friendly and provide every agency that is involved with accurate information for efficient planning, monitoring and evaluation at every level.

(1.2). National Master Plan on Climate Change[2]

Thailand ratified the UNFCCC in 1994 and the Kyoto protocol in 2002. In 2004, Office of Natural Resources and Environmental Policy and Planning (ONEP), the Ministry of Natural Resources and Environment, has been assigned as the national climate change focal point. Therefore, ONEP has worked to prepare policies and plans to support Thailand's actions on climate change.

ONEP is on the process of drafting the National Master Plan on Climate Change, B.E. 2554-2593 (2011-2050). The Master Plan has long term goal for 40 years and must be revised every 5 years. The ultimate goal is to reduce GHG emission and to be a Low Carbon Society in the next 40 years, 2050, by focusing on both adaptation and mitigation.

[2] (Drafting) The National Master Plan on Climate Change, B.E. 2554-2593

Roles of this plan are to enhancement capacity for resilience socio-economic development and ecosystems, to reconstruct economic development to a low carbon society, and to promote sustainable development in a Thai context.

Guidelines for greenhouse gas emission mitigation have been developed and applied within this national master plan. For the establishment of measures for GHG emission reduction properly, the implementing guidelines have been classified into sectors and some details is summarized as following, **Table 2**.

Table 2: (Draft) Implementing guidelines for GHG emission mitigation classified into sectors (National Master Plan on Climate Change)

Sectors	Implementing guidelines
Energy supply	1. Increase research budget for alternative fuel development.
	2. To reform price setting system of energy, imposition and fees.
	3. Support cleaner technology transfer. Using the concept of Polluters Pay Principle.
	4. Policy alignment, for both renewable energy and alternative energy. The policy should be more flexible and suitable. Moreover, the policy should be more incentive for utilization/implementation.
	5. Reducing/Canceling the use of fossil fuel. Timeframe to use and cancel should be clearly set.
Industry	1. Preparation of the national assessment for developing guideline and policy that support in industrial sector. Evaluation approaches have to be improved.
	2. Increase the efficiency of environmental management. Local community should have more of participation in sharing opinions and monitoring.
	3. Guideline and incentive for the investment support should be improved.
Transport	1. Rail transport and water transport should be more developed and increased.
	2. Support fuel switching for the reduction of pollutant emission, in term of co-benefit of implementation.

Sectors	Implementing guidelines
	3. Using economic measures to support in environmentally friendly transport and travel. Increasing permit for car owner, salvage tax and parking fee should be use for un-environmentally friendly transportation.
Agriculture	1. Support new rice cultivation technique e.g. the system of rice intensification.
	2. Support technology such as the use of nitrous oxide inhibitor in the cultivation.
	3. Production alignment by emphasis on high-valued batch process instead of mass crop production.
	4. Preparation of Nationally appropriate mitigation action for agriculture sector by using Project "Support in fertilizer usage for cost saving". Thus, N_2O emission can be reduced by using chemical fertilizer properly.
	5. Support agricultural products labeling e.g. chicken, Thai jasmine rice and crops cultivated from organic system. Small and medium enterprise should be targeted.
Waste	1. Create tax-incentive and permit for more import and manufacturing. Technologies for renewable energy production should be utilized.
	2. Establish regulation on energy management plan for livestock farm, both medium and big farm.
	3. Using green procurement procedures to support manufacturing and bio fertilizer usage.

Financial mechanism and Incentive mechanism will be used to support the action plan. The implementation should be evaluated annually and reported to national committee.

(1.3). Low carbon development policies and measures at the national level

(1.3.1). Energy sector[3]

The government delegated ministry of energy to develop the renewable and alternative energy development plan (2012-2021), AEDP, for the identification of framework and direction of Thailand renewable energy development. AEDP is targeting on using renewable and alternative energy at 25 % of total energy consumption by 2021, in 10 years. This would be an initial point to step into low carbon society by conducting renewable energy development and

[3] The renewable and alternative energy development plan (2012-2021)

promotion as measure to reduce GHG emission. Targets for renewable energy for power generation are presented as following, **Table 3**.

Table 3: Renewable energy targets for power generation

Sources	Target in 2021 (MW)	Sources	Target in 2021 (MW)
Solar energy	2,000	Waste	160
Wind energy	1,200	Biomass	3,630
Hydropower	1,608	Biogas	600

In the past 20 years (1990-2010)[4], energy consumptions in Thailand continuously increased at annual average rate of 4.4%. At present, energy consumption is 2.3 times the amount it was in 1990. In the next 20 years, if there is no energy conservation or energy efficiency, energy demand under the business as usual will increase 2.1 times the present amount. Therefore, Thailand 20-year Energy Efficiency Development Plan (EEDP) has been formulated by ministry of energy. A target is to reduce energy intensity by 25% in 2030, compared with that in 2005. This will be equivalent to the reduction of final energy consumption by 20% in 2030, or about 30,000 thousand tons of crude oil equivalent (ktoe). Implementation in pursuance of the EEDP will result in cumulative energy savings at an average of 14,500 ktoe/year, which is worth around 272 billion baht per year, and cumulative CO_2 emission reductions is at an average of 49 million tons/year. Both mandatory and supportive measures will be introduced in this plan. The mandatory measures include the enforcement of the energy conservation promotion act (1992), e.g. the establishment of minimum energy performance standards and energy efficiency labeling. For supportive and promotional measures, a major one will be the standard offer program or funding for the amount of energy saving achieved.

(1.3.2). Building sector

The New Building Energy Code is one of the mandatory basis approach that is developed for new and Retrofitting Buildings only, > 2000 sq.m., by ministry of energy. Basic requirements of building design are the standard values of building envelope, lighting system, air condition system, hot water generating system, renewable energy utilization and whole building performance.

[4] Thailand 20-Year Energy Efficiency Development Plan (2011 – 2030)

In 2010, Thailand Business Council for Sustainable development (TBCSD) and Thailand Environment Institute (TEI) launched voluntary basis approach, Carbon Reduction Certification, for building owner to reduce GHG from energy consumptions. As of August 2012, eight buildings were certified, resulting in greenhouse gas emission reduction around 16,000 tons CO_2 equivalent per year, compared to base year, 2002. Thai Green Buildings also have been awarded by Thai green building Institute.

Both mandatory and voluntary approaches affect in building awareness on energy consumption efficiency. Most of new building is constructed by applying the green concept.

(1.3.3). Forest sector [5]

The national forest policy of Thailand is to have at least 40% of the country's area as forest, which is to be utilized for two primary purposes. The first purpose is for conservation of soil, water, plant, and animal. The second purpose is for forest to be used as economic purpose. Therefore, Thailand has to increase forest areas into 40% of country's areas, 513,115.02 sq.km.. According to the statistic of forest areas reported by Royal Forest Department, **Table 4**, the forest area was decreased to about 25% in 1998 but continuously increased afterward. In 2551, the forest area is 33.4% of country's areas as a result of forest conservation and reforestation activities.[6]

Table 4: Forest Area, 1973-2008

Year	Area (sq.km)	%
1973	221,707.00	43.21
1976	198,417.00	38.67
1978	175,224.00	34.15
1982	156,600.00	30.52
1985	150,866.00	29.40
1988	143,803.00	28.03
1989	143,417.00	27.95
1991	136,689.00	26.64
1993	133,554.00	26.03
1995	131,485.00	25.62
1998	129,722.00	25.28

[5] http://www.forest.go.th/index.php?option=com_content&view=article&id=304&Itemid=413&lang=en.

[6] http://forestinfo.forest.go.th/55/Content.aspx?id=1.

Year	Area (sq.km)	%
2000	170,110.78	33.15
2004	167,590.98	32.66
2005	161,001.30	31.38
2006	158,652.59	30.92
2008	171,585.65	33.44

(Source: Office of the Forest Land Management, Royal Forest Department)

(1.3.4). Agriculture Sector[7]

Bases on the total GHG emissions of Thailand in 2000, Agricultural sector contributed 22.64% to total GHG emissions vice versa to the total energy consumption, 5% of total energy consumption. Methane is generated form rice paddy cultivation and inefficiency livestock management system. Meanwhile, Nitrous oxide is generated from fertilizer usage. The government of Thailand has recently implemented an agricultural plan on climate change. However, the implementation is on the early stage.

(1.3.5). Transport Sector[8]

Transport sector contributed 22% to total GHG emissions of energy and industry sector of the country in 2005. In Bangkok, the center for economic development, transport sector is the highest contributor of GHG emissions. AEDP promotes the use of biofuel, biodiesel and ethanol, on both the demand and supply sides. The use of gasoline 91 will be prohibited in October this year whereby the ethanol production is targeting at 9 million litres per day in 2021.

Gasohol E10, E20, and E85 are promoted to public continuously. Additionally, price incentives for consumers are implemented in some high-percentage biofuels.

The government also support to the use of compressed natural gas (CNG) by subsidizing the retail price. The concept of Tax value is up on the quantity of CO_2 emission is on the process of cabinet's consideration.

(1.3.6). Waste and Waste management

Thailand has rules and regulations for waste management and waste disposal as follows.

[7] National Master Plan on Climate Change (2010-2019)

[8] The renewable and alternative energy development plan (2012-2021)

Public Health Act B.E. 2535 – The Act provides a legal basis for MSW to local administrations in managing wastes generated by developing and issuing ordinances and regulation for collection and disposal waste generated.[9]

The Factory Act B.E. 2535 – The Act provides a legal basis for establishment and control of industrial operation including setting and enforcement of industrial standards. The import, export, manufacturing, storage, transport, use and disposal of hazardous substances are controlled according to the Hazardous Substance Act B.E. 2535.[10]

The Enhancement and Conservation of National Environment Quality Act B.E. 2535 – The Act empowers local administrations to conduct central disposal facility for public service either by themselves or by licensed private contractors. Environment fund is established to disburse as grants or loans to both government agencies and private sector for investment and operation of those central facilities.[11]

Base on Thailand State of Pollution Report, the amount of solid waste in 2010 was increased slightly more than a year before. There was 15.16 million tons of municipal waste generated thru the country or 41,532 tons per day, increased from 2009 about 0.05 tons. There was also inefficient proper waste management. The national average waste generated per person was 0.65 kg/day. Approximately 15.819 tons of waste per day was properly managed. Therefore, Pollution Control Department keeps focusing on campaigning on waste reduction and recycling of waste as well as hazardous chemical usage.[12]

Waste water generated from agriculture and factory has to be controlled by following regulation and The Factory Act B.E. 2535. Coastal water quality in 2010 was deteriorated comparing with during three years before. The estuaries of various rivers were ruined from the acceptance of community and industrial wastes.

(1.3.7). Others

Some of environment conservation and greenhouse gas mitigation have been promoted and supported by various public agencies. Some of them are presented as follow.

Green Procurement

[9] http://www.thailandlawyercenter.com/index.php?lay=show&ac=article&Id=538973889&Ntype=19

[10] http://www.diw.go.th/diw_web/html/versionthai/laws/act1.asp

[11] http://www.thailandlawyercenter.com/index.php?lay=show&ac=article&Id=538975847&Ntype=19

[12] Thailand State of Pollution Report, 2010

The Pollution Control Department established a green procurement pilot project (2008-2011) to elaborate public agencies to participate in procurement of environmental friendly products and services at 25% of all procured products and services in the first year, increased to 50%, 75%, and 100% by the end of project.

Green Label

Green label is a voluntary program launched by Thailand Environment Institute in associated with Ministry of Industry. The label is an environmental certification awarded to products and services that are shown to have minimum impact on the environment in comparison with others same function of products and services. As of 30 June 2012, there are 531 models of 24 product types have been awarded.

Carbon Reduction Label

Thailand Environment Institute corporate with Thailand Greenhouse Gas Management Organization launched Carbon Reduction Label to certify products and services that produced from friendly manufacturing process. GHG emission has to be reduced from production process comparing between base year and recent year. As for 20 August 2012, 163 products have been certified.

Green and Clean Hospital

The Department of Health developed project, 2010-2012, to promote global warming mitigation through sanitary health and environmental service. All public health service will demonstrate activities to initiate global warming and build awareness within organizations.

Table 5: The policies and measures both planned and implemented for national level.[13]

Sector	Policies and Measures	Typology of policies and measures							
		To influence stakeholders' behavior						To change national governments' activities	
		Regional planning & Target setting	Cap & Trade	Subsidies	Levies	Standards & Labeling	Information provision & Education	Infrastructure construction	Public procurement
Energy supply	1 Increase the efficiency of electricity production in the fossil fuel power plants	✓					✓	✓	✓
	2. Reduce electricity loss from the power lines and distribution systems	✓							
	3. Support the production and the use of efficient machines and electrical appliances in the business, public, and governmental sectors					✓	✓		✓
	4. Support energy saving activities in the business, public, and governmental sectors						✓		
	5. Encourage efficient production and efficient use of energy through measures, such as Clean Development Mechanism (CDM) and life cycle assessment for products								

[13] National Strategy on Climate Change B.E. 2551-2555

Sector	Policies and Measures	Typology of policies and measures							
		To influence stakeholders' behavior						To change national governments' activities	
		Regional planning & Target setting	Cap & Trade	Subsidies	Levies	Standards & Labeling	Information provision & Education	Infrastructure construction	Public procurement
	6. Increase the competitiveness of renewable energy, such as biofuels and biomass to be able compete with fossil fuels	✓					✓		
	7. Support the production and use of alternative energy that releases no greenhouse gases, such as nuclear power and hydropower.						✓	✓	
	8. Revise rules and regulations and enforce economic instruments to facilitate the production and use of renewable energy and biofuels, such as biodiesel.			✓	✓		✓		
	9. Revise rules and regulations and enforce economic instruments to facilitate the development of production technology and household use of renewable energy.			✓	✓		✓		
	10. Revise rules and regulations and enforce economic instruments to facilitate the production and use of electricity generated from renewable energy.			✓	✓		✓		
Transport	1. Promote the use of public transport.	✓					✓	✓	
	2. Promote walking and cycling as a mean for short-distance journey.							✓	

Sector	Policies and Measures	Typology of policies and measures							
		To influence stakeholders' behavior						To change national governments' activities	
		Regional planning & Target setting	Cap & Trade	Subsidies	Levies	Standards & Labeling	Information provision & Education	Infrastructure construction	Public procurement
	3. Minimize the need of commuting by using communication technologies in the business and governmental sectors.	✓					✓		✓
	4. Establish fuel consumption standards and improve the standard for new vehicles at the same time	✓						✓	
	5. Promote the maintenance for engines of vehicles in order to save fuel.	✓					✓		
	6. Control the number of private vehicles in some areas and periods that have serious traffic congestion	✓					✓		
	7. Develop the use of efficient and effective logistic system through the logistic management.	✓					✓		
	8. Create incentives to increase the efficiency for fuel use in the transport sector, such as promoting CDM projects		✓				✓		
Buildings	1. Promote the renovation and construction for energy efficiency homes, office buildings, and commercial buildings					✓	✓		

Sector	Policies and Measures	Typology of policies and measures							
		To influence stakeholders' behavior						To change national governments' activities	
		Regional planning & Target setting	Cap & Trade	Subsidies	Levies	Standards & Labeling	Information provision & Education	Infrastructure construction	Public procurement
Waste and wastewater	1. Revise rules and regulations to facilitate the reduction of wastes generated from the industrial, agricultural, business, and household sectors, such as developing technologies for waste minimization in the production processes and for waste reutilization	✓				✓	✓		
	2. Promote the implementation of deposit and refund system, such as for plastic, glass, and aluminum bottles			✓			✓		
	3. Support the use of degradable packages, such as bio-plastic.						✓		
	4. Encourage entrepreneurs to reduce the excessive packaging and to safely reuse the packaging.						✓		
	5. Promote the Sufficiency Economy principles for the production and consumption.						✓		
	6. Promote the use of electronic communications for reducing paper and ink used.						✓		

Sector	Policies and Measures	Typology of policies and measures							
		To influence stakeholders' behavior						To change national governments' activities	
		Regional planning & Target setting	Cap & Trade	Subsidies	Levies	Standards & Labeling	Information provision & Education	Infrastructure construction	Public procurement
	7. . Promote the reduction of waste through the concept of life cycle assessment and eco-design.					✓	✓		
	8. Create incentives for people waste separation, which will enable to have effective waste systems			✓			✓		
	9. Decrease open burning for waste.	✓					✓		
	10 Support local governments to formulate as a cluster to work on waste management and waste reutilization systems, such as making organic fertilizers and waste-to-energy projects	✓					✓	✓	
	11. Support for establishing CDM projects to improve waste management and reduce greenhouse gases		✓				✓		
Industry	1. Enforce companies that emit a lot of greenhouse gases to have greenhouse gas reduction plan and measures in the policy of companies and assess annual greenhouse gas emissions.	✓					✓		

Sector	Policies and Measures	Typology of policies and measures							
		To influence stakeholders' behavior						To change national governments' activities	
		Regional planning & Target setting	Cap & Trade	Subsidies	Levies	Standards & Labeling	Information provision & Education	Infrastructure construction	Public procurement
	2. Support the adoption of cleaner technologies, environmentally sound production, and improvement of production processes to reduce greenhouse gas emissions, such as promoting CDM projects and using the support from the Environmental Fund			✓			✓		
	3. Establish incentives for financial institutions to use environmental criteria as a part of criteria for loan approval for entrepreneurs			✓			✓		
Agriculture	1 Promote changes in the agricultural practices of farmers by adopting the concept of resource efficiency and low-chemical input agricultures						✓		
	2. Develop low greenhouse gas emission systems for agriculture, such as rice cultivation and pig farm						✓		
	3 Increase the effectiveness for controlling open burning by using incentives and law enforcement	✓					✓		
	4. Promote the improvement of animal feeds in order to reduce methane released from digestive system of animals						✓		

Sector	Policies and Measures	Typology of policies and measures							
		To influence stakeholders' behavior						To change national governments' activities	
		Regional planning & Target setting	Cap & Trade	Subsidies	Levies	Standards & Labeling	Information provision & Education	Infrastructure construction	Public procurement
Forestry	1. Encourage private sector, especially the paper pulp, and any industries using small-sized wood, to grow economic plants on their lands.			✓			✓		
	2. Promote conservation, revival and increase of mangrove areas in order to serve as GHG absorption areas, and reduce coastal erosion.	✓					✓		
	3. Promote economical use of wood, and substitution of wood with other materials.						✓		
	4. Encourage cultivators to plant substitute forest by adopting the principles of "3 types of forest of 3 uses" –editable trees, construction trees, multi use trees and conservation trees.	✓					✓		
	5. Encourage increasing in natural forest areas outside conservation areas, by motivating communities to use their common lands as communities forest areas.	✓					✓		
	6. Encourage development of green areas at every level.	✓					✓		

Sector	Policies and Measures	Typology of policies and measures							
		To influence stakeholders' behavior						To change national governments' activities	
		Regional planning & Target setting	Cap & Trade	Subsidies	Levies	Standards & Labeling	Information provision & Education	Infrastructure construction	Public procurement
	7. Monitor and assess reforestation managed by private sector and communities in order to determine approaches to additional forest expansion.	✓							

In Thailand, the sub-national level has no roles to plan the national low carbon development policies and measures. Therefore, only the different roles to implement policies and measures for sectors/sub-sectors among national, provincial and city/municipal governments are presented as follow, **Table 6.**

Table 6: The different roles of national, provincial and municipal governments to implement the national low carbon policies and measures

Sector	Policies and Measures	National Government	Provincial Government	City/Municipal Government
Energy supply	1 Increase the efficiency of electricity production in the fossil fuel power plants	✓	-	-
	2. Reduce electricity loss from the power lines and distribution systems	✓	-	-
	3. Support the production and the use of efficient machines and electrical appliances in the business, public, and governmental sectors	✓	✓	✓

Sector	Policies and Measures	National Government	Provincial Government	City/Municipal Government
	4. Support energy saving activities in the business, public, and governmental sectors	✓	✓	✓
	5. Encourage efficient production and efficient use of energy through measures, such as Clean Development Mechanism (CDM) and life cycle assessment for products	✓	-	-
	6. Increase the competitiveness of renewable energy, such as biofuels and biomass to be able compete with fossil fuels	✓	-	-
	7. Support the production and use of alternative energy that releases no greenhouse gases, such as nuclear power and hydropower.	✓	-	-
	8. Revise rules and regulations and enforce economic instruments to facilitate the production and use of renewable energy and biofuels, such as biodiesel.	✓	-	-
	9. Revise rules and regulations and enforce economic instruments to facilitate the development of production technology and household use of renewable energy.	✓	-	-
	10. Revise rules and regulations and enforce economic instruments to facilitate the production and use of electricity generated from renewable energy.	✓	-	-
Transport	1. Promote the use of public transport.	✓	✓	✓
	2. Promote walking and cycling as a mean for short-distance journey.	✓	✓	✓
	3. Minimize the need of commuting by using communication technologies in the business and governmental sectors.	✓	✓	✓
	4. Establish fuel consumption standards and improve the standard for new	✓	-	-

Sector	Policies and Measures	National Government	Provincial Government	City/Municipal Government
	vehicles at the same time			
	5. Promote the maintenance for engines of vehicles in order to save fuel.	✓	-	-
	6. Control the number of private vehicles in some areas and periods that have serious traffic congestion	✓	-	-
	7. Develop the use of efficient and effective logistic system through the logistic management.	✓	-	-
	8. Create incentives to increase the efficiency for fuel use in the transport sector, such as promoting CDM projects	✓	-	-
Building	1. Promote the renovation and construction for energy efficiency homes, office buildings, and commercial buildings	✓	-	-
Waste and wastewater	1. Revise rules and regulations to facilitate the reduction of wastes generated from the industrial, agricultural, business, and household sectors, such as developing technologies for waste minimization in the production processes and for waste reutilization	✓	✓	✓
	2. Promote the implementation of deposit and refund system, such as for plastic, glass, and aluminum bottles	✓	-	-
	3. Support the use of degradable packages, such as bio-plastic.	✓	-	-
	4. Encourage entrepreneurs to reduce the excessive packaging and to safely reuse the packaging.	✓	-	-
	5. Promote the Sufficiency Economy principles for the production and consumption.	✓	✓	✓
	6. Promote the use of electronic communications for reducing paper and	✓	✓	✓

Sector	Policies and Measures	National Government	Provincial Government	City/Municipal Government
	ink used.			
	7. Promote the reduction of waste through the concept of life cycle assessment and eco-design.	✓	-	-
	8. Create incentives for people waste separation, which will enable to have effective waste systems	✓	✓	✓
	9. Decrease open burning for waste.	✓	-	-
	10 Support local governments to formulate as a cluster to work on waste management and waste reutilization systems, such as making organic fertilizers and waste-to-energy projects			
	11. Support for establishing CDM projects to improve waste management and reduce greenhouse gases	✓	-	-
Industry	1. Enforce companies that emit a lot of greenhouse gases to have greenhouse gas reduction plan and measures in the policy of companies and assess annual greenhouse gas emissions.	✓	-	-
	2. Support the adoption of cleaner technologies, environmentally sound production, and improvement of production processes to reduce greenhouse gas emissions, such as promoting CDM projects and using the support from the Environmental Fund.	✓	-	-
	3. Establish incentives for financial institutions to use environmental criteria as a part of criteria for loan approval for entrepreneurs.	✓	-	-
Agriculture	1 Promote changes in the agricultural practices of farmers by adopting the concept of resource efficiency and low-chemical input agricultures.	✓	-	-

Sector	Policies and Measures	National Government	Provincial Government	City/Municipal Government
	2. Develop low greenhouse gas emission systems for agriculture, such as rice cultivation and pig farm.	✓	-	-
	3 Increase the effectiveness for controlling open burning by using incentives and law enforcement.	✓	✓	✓
	4. Promote the improvement of animal feeds in order to reduce methane released from digestive system of animals.	✓	-	-
Forestry	1. Encourage private sector, especially the paper pulp, and any industries using small-sized wood, to grow economic plants on their lands.	✓	-	-
	2. Promote conservation, revival and increase of mangrove areas in order to serve as GHG absorption areas, and reduce coastal erosion.	✓	✓	✓
	3. Promote economical use of wood, and substitution of wood with other materials.	✓	-	-
	4. Encourage cultivators to plant substitute forest by adopting the principles of “3 types of forest of 3 uses” –editable trees, construction trees, multi use trees and conservation trees.	✓	✓	✓
	5. Encourage increasing in natural forest areas outside conservation areas, by motivating communities to use their common lands as communities forest areas.	✓	✓	✓
	6. Encourage development of green areas at every level.	✓	✓	✓
	7. Monitor and assess reforestation managed by private sector and communities in order to determine approaches to additional forest expansion.	✓	✓	✓

The potential emission reductions and development co-benefits are indicated for each sector. They are presented in term of indicators, **Table 7**.

Table 7: The potential emission reductions and development co-benefits for sector

Level sector	Indicators
Energy supply	1. Electric intensity per economic growth decrease. 2. Specific energy consumption decrease. 3. GHG emissions from energy sector per Economic growth decrease. 4. Electric Intensity per capita decrease. 5. The consumption of renewable energy for electric power generation increase. 6. The consumption of renewable energy for industrial sector increase. 7. The consumption of renewable energy for household use increase. 8. The consumption of renewable energy for transport sector increase.
Transport	1. Energy consumption per economic growth decrease. 2. The distance traveled per unit volume of fuel used of each vehicle increase. 3. GHG emissions from transport sector per economic growth decrease. 4. The use of Public transport within city increase. 5. Walking and Cycling for short-distance journey increase
Waste	1. The amount of waste generated per capita decrease. 2. The amount of waste generated per economic growth decrease. 3. GHG emissions per waste generated decrease.
Industry	1. Energy consumption per output value of industrial production decrease. 2. GHG emissions per output value of industrial production decrease.
Agriculture	1. GHG emissions per output value of agricultural production decrease.
Forest	1. GHG absorptions increase.

(2). Low carbon development policies and measures at the sub-national level.

In Thailand, low carbon development policies and measures at the sub-national level are unclear at the present. Meanwhile, the government has been trying to firstly initiate policies at national level, in which building capacity of sub-national level will be performed as the next plan.

(2.1) Advanced provincial local government

Province is the largest unit of local administration having a governor as a leader, who implements policies directed by the prime minister. In each province, there is the Provincial Administrative Organization (PAO), established with the objectives to democratically engage local people in their local governing and to implement local activities as desired by local people – seen as a decentralization of the local government. PAOs were established under the Provincial Administration Organization Act of 1997. There are 75 PAOs in all provinces (one PAO in each province, except Bangkok – a special local administrative authority having a status as a legal entity[14]).

Currently, policies and plans for Low Carbon Development at the provincial level are mostly implemented as action plans and pilot projects. Moreover, adaptation activities do not directly focus on climate change, but rather focus on supporting provincial agencies to prevent and solve environmental problems prescribed under the Enhancement and Conservation of National Environmental Quality Act, B.E. 2535 (Section 37-41). Even though the Determining Plans and Process of Decentralization to Local Government Organization Act of 1999 direct the Office of Natural Resources and Environmental Policy and Planning to distribute duties and budgets (according to provincial action plans) to local administrations, but local administrations are not ready to do so. Therefore, the Office of Natural Resources and Environmental Policy and Planning takes charge in analyzing and prioritizing projects based upon the importance of issue, the constraint of budget, and the readiness of the local administration, and proposes for the project approval from the National Environmental Board. Later on, the approved projects are proposed to the committee of decentralization to local government organization for allocating budgets to local administrations.

Current projects concerning environmental prevention and remediation under the action plans at the provincial level are mianly comprised of 1) municipal wastewater and

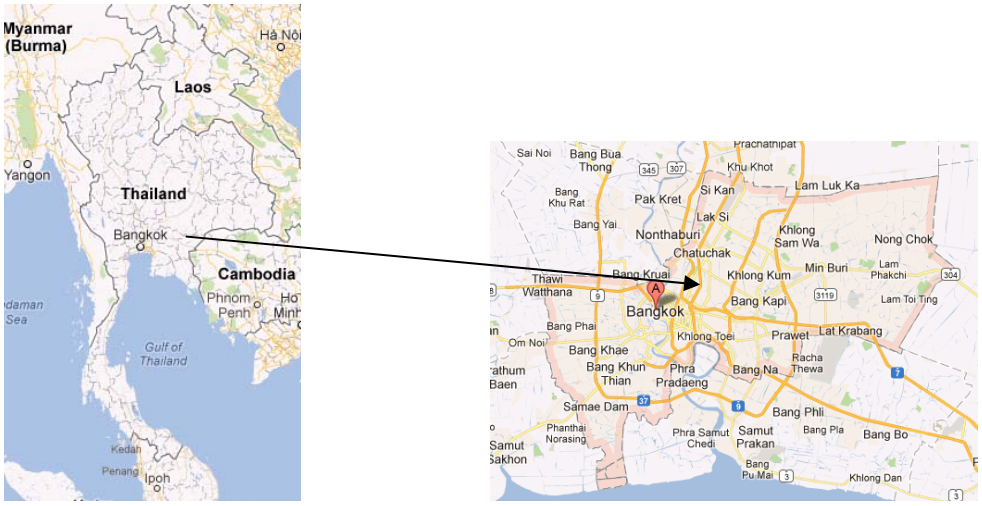
[14] Department of Local Administration, http://www.dla.go.th/

2) muicipal waste [15]. Additionally, the Office of National Environment Board prepared a handbook for formulating environmental improvement action plan at the provincial level [16].

(2.1.1) Case study: Bangkok

Profile

Bangkok is the capital city of Thailand and is a primate city. Bangkok is special local administrative authority having the total area of 1,568.737 square kilometer and the population of 5,671,525 people* (not including 4 milliom non-registered population). The administrative division of Bangkok has 50 districts, 169 sub-districts, and 1984 villages (in 2011). Bangkok has the Chao Phraya River and the Tha-Jeen Rivers as a main rivers and has the annual average rainfall of 1,600 milliliter[17].



Bangkok is a central hub for the national economy and development. With the fast paced development of Bangkok, there is a gap, in terms of development between Bangkok and other cities in Thailand, making Bangkok to be one of the cities in the world with highest greenhouse gas emissions. Therefore, Bangkok Metropolitan Administration started raising awareness of the people in Bangkok on climate change,

[15] http://www.onep.go.th/oneb/Group1_Plan.htm

[16] http://www.onep.go.th/oneb/Group1_Download.htm

[17] Bangkok General Information, 2012, http://th.wikipedia.org/wiki/%E0%B8%81%E0%B8%A3%E0%B8%B8%E0%B8%87%E0%B9%80%E0%B8%97%E0%B8%9E%E0%B8%A1%E0%B8%AB%E0%B8%B2%E0%B8%99%E0%B8%84%E0%B8%A3

promoting the reduction of greenhouse gas emissions, and creating new green areas since 2007.

Programs and Projects

Bangkok began to develop into a low carbon city in 2007. **The Action Plan on Global Warming Mitigation 2007-2012** has been prepared by Bangkok Metropolitan Administration (BMA). This action plan aims at least 15% of the total GHG emission reduction, anticipated in 2012 under business as usual projects. The implementation of activities is under 5 initiatives;

1. **Expand mass transit and improve traffic systems.**
    - Expand the mass transit rail system within the Bangkok Metropolitan area.
    - Improve and develop public bus system.
    - Improve traffic system.
2. **Promote the use of renewable energy.**
    - Promote the use of Bio-fuel.
3. **Improve building electricity consumption efficiency.**
    - Improve Building energy consumption efficiency.
    - Electricity conservation campaign for Bangkokians.
4. **Improve solid waste management and wastewater treatment efficiency.**
    - Increase efficiency in solid waste management.
    - Increase efficiency in wastewater treatment.
5. **Expand park areas.**
    - Plant trees in the Bangkok Metropolitan area.
    - Plant trees in the neighboring province areas.

According to the action plan, results can be summarized as follows.

- Bangkok can reduce 1.16 million ton of CO_2 in 2008-2010 - evaluated from 2 initiatives; promote the use of renewable energy and expand park areas.
- Bangkok can reduce 2.51 million ton of CO_2 in 2011 - evaluated from 4 initiatives; promote the use of renewable energy, improve building electricity consumption efficiency, improve solid waste management and wastewater treatment efficiency and expand park areas.
- Total reduction of CO_2 emission is 3.67 million ton in 2008 – 2011.

To carry on the reduction of greenhouse gas of Bangkok, department of environment, Bangkok metropolitan administration has established **Bangkok Master Plan on Climate Change 2013 – 2023 Project**, which is a partnership between Bangkok metropolitan administration and Japan international Cooperation Agency (JICA). The purpose of this master plan aims to prepare climate change plan in Bangkok, including with the action plan to actual practice. The plan will be divided into 2 parts, master plan and the development of the BMA personnel, 2 years period. It is expected to start in late 2012 or early. This master plan will be consistent with the National Master Plan on Climate Change, 2011 – 2050.

Low carbon development policies and measures for Bangkok are presented in **Table 8**[18].

[18] Action Plan on Global Warming 2007 – 2012, *Executive Summary*, by Bangkok Metropolitan Administration.

Table 8: Low carbon development policies in Bangkok, Thailand.

Sector	Policies and measure	Typology of policies and measures							
		To influence stakeholders' behaviour						To change local governments ' activities	
		Regional planning & Target setting	Cap & Trade	Subsidies	Levies	Standards & labeling	Information provision & Education	Infrastructure construction	Public procurement
Transport service	1. Expand the mass transit rail system within the Bangkok. - Support the implementation of mass transit rail systems throughout city and its surrounding area for four projects substantial within 5 years. - Develop more park and ride facilities to support passenger car driver's use of mass transit when traveling to the inner city area. - build more bike lanes to encourage greater use of bicycles. - Implement and promote a common ticket system for public transit users in Bangkok.							✓	
	2. Improve public bus system. - Implement a Bus Rapid Transit System: BRT. - Restructure bus route to increase efficiency and to facilitate passenger connection with other mass							✓	

Sector	Policies and measure	Typology of policies and measures							
		To influence stakeholders' behaviour						To change local governments ' activities	
		Regional planning & Target setting	Cap & Trade	Subsidies	Levies	Standards & labeling	Information provision & Education	Infrastructure construction	Public procurement
	transit systems. - Grant privileges to bus routes.								
	3. Improve public system. - Improve the road network. - Improve waterway transportation. - Improve pedestrian walkways.							✓	
Energy Supply	1. Promote the Use of Biofuels. - Promote the Use of Gasohol. - Promote the Use of Bio-Diesel.								✓
Commercial and residential building	1. Improve Building Energy consumption Efficiency. - Improve energy efficiency of Bangkok Metropolitan administration's Building (New Building Code). - Promote and support the implementation of energy conservation schemes in privately owned building.					✓			
Energy Efficiency Improvemnt	2. Electricity Conservation Campaign for Bangkokians. - Campaign for efficient use of electrical appliance.						✓		

Sector	Policies and measure	Typology of policies and measures							
		To influence stakeholders' behaviour						To change local governments ' activities	
		Regional planning & Target setting	Cap & Trade	Subsidies	Levies	Standards & labeling	Information provision & Education	Infrastructure construction	Public procurement
	- Campaign for reduced use of air-conditioning. - Support Energy efficiency labeling of, and proper maintenance schemes for, electrical appliance. - Promote the use of energy-saving appliances - for example, use electrical appliance with 1 Watt power consumption in stand-by mode. - Promote the Use of energy-saving light bulbs.								
Waste and Waste water management	1. Increase Efficiency in solid waste management. - Improve efficiency in organic waste management. - Support solid wastes reuse and recycling.	✓					✓		
	2. Increase Efficiency in wastewater Treatment. - Increase wastewater treatment capacity. - Reduce household wastewater.						✓	✓	
Green area	1. Plant trees in the Bangkok Metropolitan Area. - Plant trees in those public areas under the jurisdiction of the BMA area. - Campaign and support tree planting on private	✓							

Sector	Policies and measure	Typology of policies and measures							
		To influence stakeholders' behaviour						To change local governments ' activities	
		Regional planning & Target setting	Cap & Trade	Subsidies	Levies	Standards & labeling	Information provision & Education	Infrastructure construction	Public procurement
	land in Bangkok.						✓		
	2. Plant trees in the Neighboring Province Areas. - BMA will co-operate with neighboring provincial administrations and private sector to plant trees in the areas adjacent to Bangkok.						✓		

Monitoring and Reporting

The Bangkok Assessment Report on Climate Change 2009 was made by Bangkok Metropolitan Administration, Green Leaf Foundation, and United Nations Environment Programme in order to follow up the implementation under the Action Plan on Global Warming Mitigation 2007 – 2012. Additionally, 2010-2011 environmental status report of Bangkok was also made. The implementation result under the Action Plan for reducing greenhouse gases is summarized in the **table 9**.

Table 9: Result of GHGs reduction under action plan on BMA's reduction of Global warming (2007-2010)[19]

action plan on BMA's reduction of Global warming (2007-2012)	2012 Target of CO_2 reduction (million tons)	CO_2 reduction (million tons) from 2007-2010
1. Development of mass transit and traffic systems	5.53	Gathering data
2. Support the use of alternatives fuels	0.61	Year 2008 – 0.70 Year 2009 – 0.91 Year 2010 – 0.88
3. Improvement of building energy usage	2.25	0.66
4. Actions on garbage and wastewater treatment	0.46	0.44
5. Increase of green areas	1.00	0.25

(2.2) Advanced City Local Government

Low carbon policies and measures at the local level are not tangibly solidified into the regulations and the actual implementation yet. The supports from the government, private sector, and NGOs for low carbon policies and measures are evident only as study projects (mostly case-by-case basis).

Currently, Thailand Greenhouse Gas Management Organization (Public Organization) made a handbook for assessing carbon footprint for local administration in order to encourage local administrations to pursue low carbon cities. The assessment was developed to assess greenhouse gas from 3 scopes as prescribed by ISO 14064.

[19] Bangkok State of environment 2010-2011, by Department of Environment, BMA.

Addtionally, the National Municipal League of Thailand and the European Union innitiated a 'Low Carbon Municipality' project to Commemorate the King's 84th Birthday. The project selected at least 84 municipalities to join the project, which has the implementation period from 2012-2015. Four key strategies for pursuing low carbon cities are:

1. **City of trees**

   Successful criteria

   - Have the ratio of green area per pepulation at least 5 square meters/population.
   - Pay attention on land use for green area in the city.

2. **City without pollutions**

   Successful criteria

   - Reduce the amount of municipal waste (before treatment) at least 10%.
   - Not exceed the air and water quality standards (if measurable)

3. **City of energy efficiency**

   Successful criteria

   - Reduce at least 10% of electricity consumption or electicity cost (comparing with the level before joining the project).
   - Reduce at least 10% of fuel consumption or fuel cost (comparing with the level before joining the project).
   - Implement energy conservation and efficiency and/or renewable/alternative energy projects/activities at least 1 project/activity.

4. **City of sustainable consumption**

   Successful criteria

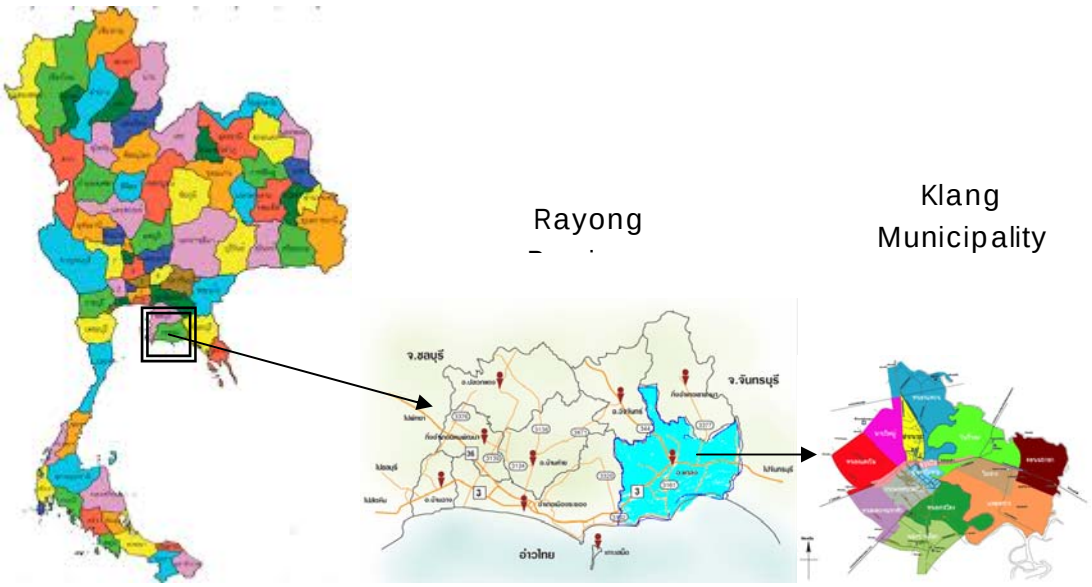
   - Have purchasing volume on green products and services (green procurement) at least 25% of the total purchasing volume.

Initiate at least 1 project/activity that reflects the sufficiency economy principles for tangibly promoting sustainable consumption

(2.2.1) Case study: Muangklang Municipality, Rayong Province.

Profile

Muangklang Municipality is located in Klaeng district, Rayong province. The municipality has the area of 14.5 square kilometer, the population of 17,254 people (17,283 in 2011) from 13 villages (population density is 1,189 people/square kilometer), and the annual average rainfall of 1,638.12 mililiter.



Muangklang Municipality is an example of the city that has development policies and measures to reduce greenhouse gases. The municipality intends to be low carbon city and has continuously implemented environmental and energy projects, resulted in several nominations for awards on environment and climate change. The awards include the award on livable and sustainable municipality in 2005, the certification on ISO 14001 (including energy management as well) in 2006, and the participation in the Cities for Climate Protection Campaign in the ASEAN level since 2005[20].

A majority of areas in the municipality are used for residentail and comercial purposes and small fringe areas are utilized as agriculural land. Therefore, environmental problems include waste, wastewater, and air pollutions become the concern, especailly municaipal wastes. Twenty tons of municipal wastes are generated

[20] Journal of Environment management Volume 7 Number 1 January-June 2011 *"Local authority and Global Warming Mitigation: A case study of Muangklang Municipality"* Chamlong Poboon

everyday becoming the burden of the city, in terms of management costs and other environmental problems. This amount of wastes incurs the mangement costs for 20,00 Baht/day and becomes a problem for the limited capacity of the landfill located outside the city. With the limited capacity of the landfill, some waste are tranhed in the Prasae River, causing water pollutions. The municipality also faces problems on a rapid growth of the city and a reduction of green areas in the city.

Programs and Projects

With environmental problems of the municipality, Mr. Somchai Chariyacharoen, Mayor of Muangklang Municipality, decided to take a new development approach under the concept 'Livable city and Sustainable living'. The reduction of greenhouse gases is carried out by participating carbon footprint project initiated by the Thailand Greenhouse Gas Management Organization (Public Organization)[21]. Muangklang Municipality is approved as a pilot organization for the carbon footprint of local administration on 16 December 2011. The '**Klaeng Model'**[22] is employed with a vision to 'Pursue low carbon city for better quality of live based on the sufficiency economy principles' by having 4 key strategies.

1. **City of trees**

Promoting tree plantation in all empty spaces, including houses, temples, schools, and governmental offices by using two concepts: 'Plant trees anywhere get benefits' and 'Plant trees on empty lands for controlling weeds and preventing illegal waste dumping'.

2. **City of waste minimization**

[21] A pilot project on Low Carbon City initiated by Thailand Greenhouse Gas Management Organization (Public Organization) has a purpose to develop methodologies to do greenhouse gas inventory for small cities. The result of this development will be a Thai guideline for local governments, which can be practically used for developing low carbon cities.

[22] The Klaeng Model is a development concept for Muangklang Municipality, This concept reflects the roots and efforts of local communities in several aspects, which are closely linked together, and differs from other development concepts relying on 'Money' more than 'Cooperation of people in the community' (Source: http://www.ryt9.com/s/nnd/932016)

Promote systematic waste management through waste reduction and waste reutilization. The latter will be promoted as a concept of 'Wastes should not be wasted' (e.g. do organic waste composting to get composts).

For wastewater, the municipality will promulgate a municipal ordinance for new houses to install septic tanks. Additionally, responsible officials will have to inspect the septic tank before issuing house numbers.

3. City of energy efficiency

Promote enregy efficieny through several methods. Methods include creating awareness and providing training to officials, upgrading electrical appliances, promoting cycling, using bio diesel for some municipality's vehicles, establishing a public transport system using LPG for the city to transport students and people in rush hours, producing 4,250 kilograms of biogas a day, and turning oil and grease from septic tanks to be fuel for boiling water in the Slaughterhouse.

4. City of sustainable lifestyles

Promote a gricultural approch through 'agriculture for the city' by encouraging people who used to be farmers to grow non-chemical rice and vetgetables in available areas in the city. This will create edible landscape in the city, which will create beautiful view and utilize avaialble spaces in the city. Adiitionally, local people will have local, safe, and inexpensive produces to consumers. In terms of carbon emission, the practice will reduce the greenhouse gas emissions from the transport of agricultural products.

Some of the programs and projects of Muangklang city government towards low carbon development presented in Table 10:

Table 10: Potential Co-benefits of low carbon development policies and measure

Sector	Policies and measure	Potential Co-benefits
waste and wastewater	1. School recycling programme.	Children learn the value of waste;
	2. Set up a municipal waste separating center.	Good quality of life due to better air and water quality;
	3. Animal town in farm. - discarded fruit and vegetable from market, mowed grass from offices' lawns	Promote the value of waste;

Sector	Policies and measure	Potential Co-benefits
	in town, trimmed leaf and so on are perfect feed for some animals for example, rabbit, cow, goat, pig.	
	4. 3R Programme - reduces, reuse and recycle.	Children learn the value of waste;
	5. Missing Bin - reduce the number of trash bins in public area.	Good quality of life due to better air and water quality;
	6. Compost E.M. and Biogas produced from local garbage and organic waste - Instead of buying chemical fertilizers.	Promote the value of waste;
	7. Landfill management. - waste will be transfer to be used as fuel within factory.	Promote the value of waste;
	8. Raising awareness of the need to separate waste from resources.	Good quality of life due to better air and water quality;
	9. River monitoring Programmed.	
	10. Raising awareness to water conservation.	
	11. Planting along riverbank.	
	12. Dredging.	
	13. Waterway resurrection.	
	14. Grease trap installation for building and new houses.	
	15. Use E.M. for water quality improvement.	
Energy Efficiency	1. Replaced old light bulb with energy saving ones in office building.	Reduced Electricity consumption; Reduced Electricity cost;
	2. Adding reflectors in office building.	
	3. Using string switch in office building.	
	4. Energy saving campaign - for example, monthly air conditioner filters clean up, replacement of deflective electric devices	
	5. ISO 14001.	
	6. Decreasing of commercial building construction.	
	7. Biogas (By-product) from compost production serve the needs of the municipal slaughterhouse – to reduce the	Reduced fuel consumption;

Sector	Policies and measure	Potential Co-benefits
	firewood use.	
Transport	1. Traffic control and re-design - for example, one-way street, restriction of non-parking area	Reduced vehicular traffic; Reduced air pollution;
	2. NGV Bus –to promote free of charge public transportation for the residents.	
	3. Reduced truck trip to the landfill.	
Green Area	1. Planting trees around town and weeded vacant urban area.	Better air quality; Improved environment for the people;
Agriculture	1. Urban agriculture (Paddy field; being replaced by city expansion.	Better Land use;
	2. Backyard organic vegetables.	Better soil quality; reduced chemical contaminated;
	3. Rabbit, goat and pig and their manure bagged for sale.	Increased family income;

Characteristics of the climate-related policies and measures

The next table summarizes the characteristics of the climate-related policies and measures of Muangklang city to influence stakeholders' behavior and change government agencies.

Table 11[23]: Low carbon development policies in Muangklang municipality, Rayong Province, Thailand.

Sector	Policies and measure	Typology of policies and measures							
		To influence stakeholders' behaviour						To change local governments ' activities	
		Regional planning & Target setting	Cap & Trade	Subsidies	Levies	Standards & labeling	Information provision & Education	Infrastructure construction	Public procurement
waste and wastewater	1. School recycling programme.						✓		
	2. Set up a municipal waste separating center.							✓	
	3. Animal town in farm. - discarded fruit and vegetable from market, mowed grass from offices' lawns in town, trimmed leaf and so on are perfect feed for some animals for example, rabbit, cow, goat, pig.						✓		
	4. 3R Programme - reduces, reuse and recycle.						✓		

[23] Detailed description of Best Practices/Success Stories from Selected Local Governments in Cambodia, Indonesia, Philippine, Thailand and Vietnam. http://erc-sumc53.muangklang.com/DownloadDocument/LowCarbonCityDataMKM.pdf

Sector	Policies and measure	Typology of policies and measures							
		To influence stakeholders' behaviour						To change local governments ' activities	
		Regional planning & Target setting	Cap & Trade	Subsidies	Levies	Standards & labeling	Information provision & Education	Infrastructure construction	Public procurement
	5. Missing Bin - reduce the number of trash bins in public area.							✓	
	6. Compost E.M. and Biogas produced from local garbage and organic waste - Instead of buying chemical fertilizers.						✓		
	7. Landfill management. - waste will be transfer to be used as fuel within factory.	✓							
	8. Raising awareness of the need to separate waste from resources.						✓		
	9. River monitoring Programmed.						✓		
	10. Raising awareness to water conservation.						✓		
	11. Planting along riverbank.	✓							
	12. Dredging.							✓	
	13. Waterway resurrection.							✓	

Sector	Policies and measure	Typology of policies and measures							
		To influence stakeholders' behaviour						To change local governments ' activities	
		Regional planning & Target setting	Cap & Trade	Subsidies	Levies	Standards & labeling	Information provision & Education	Infrastructure construction	Public procurement
	14. Grease trap installation for building and new houses.					✓			
	15. Use E.M. for water quality improvement.						✓		
Energy Efficiency	1. Replaced old light bulb with energy saving ones in office building.							✓	
	2. Adding reflectors in office building.							✓	
	3. Using string switch in office building.							✓	
	4. Energy saving campaign - for example, monthly air conditioner filters clean up, replacement of deflective electric devices						✓		
	5. ISO 14001.					✓			
	6. Decreasing of commercial building construction.	✓							
	7. Biogas (By-product) from compost production serve the needs of the							✓	

Sector	Policies and measure	Typology of policies and measures							
		To influence stakeholders' behaviour						To change local governments ' activities	
		Regional planning & Target setting	Cap & Trade	Subsidies	Levies	Standards & labeling	Information provision & Education	Infrastructure construction	Public procurement
	municipal slaughterhouse – to reduce the firewood use.								
Transport	1. Traffic control and re-design - for example, one-way street, restriction of non-parking area							✓	
	2. NGV Bus –to promote free of charge public transportation for the residents.							✓	
	3. Reduced truck trip to the landfill.						✓		
Green Area	1. Planting trees around town and weeded vacant urban area.	✓					✓		
Agriculture	1. Urban agriculture (Paddy field; being replaced by city expansion.							✓	
	2. Backyard organic vegetables.						✓		
	3. Rabbit, goat and pig and their manure bagged for sale.						✓		

Monitoring and Reporting

The assessment of greenhouse gas (GHG) emission of Muangklang municipality activities, after participated in carbon footprint for local organization project, has been supported by Thailand Greenhouse Gas Management Organization (Public Organization). The study has shown that Muangklang municipality activities generated 38,349 ton CO_2 equivalent in 2009, excluding the forest sector absorption. The major sources of GHG emission of Muangklang municipality activities in 2009 are consequently presented as following; building & residential sector (46%), transportation sector (29%), Industrial sector (17%) and others from waste and agriculture (6% and 2%, respectively). For the forest sector, green area, both inside and outside, has been increased by municipality's policy. As a result, 887 ton of CO_2 is absorbed, about 2.3% of total emissions. In 2010, the study has shown that 5,000 ton CO_2 equivalent has been generated from municipality activities.

Carbon Footprint project will be processed in other cities later because the evaluating and monitoring will be affected by various factors e.g. Government activities and public activities. The reducing target has been proposed to various organizations such as local administration and stakeholders. Then, Muangklang has to reduce 6,000 tons CO_2e in 2020.

Part III. Relevant information on potential MRV mechanisms of NAMAs to enhance low carbon development at the sub-national level in Thailand.

(1). Updated progress of national climate change mitigation action plan.[24]

The national climate change mitigation action plan is under the on-going process of discussion and consultation among relevance governmental organizations. The progress of NAMAs development and MRV mechanisms is not already officially disclosed into public.

The available information relating to NAMAs is output from Multilateral Environment Agreements Think Tank Project. For Thailand, MRV system is available in various implementations, both mandatory and voluntary, but GHG emission reduction is not involved in reporting system. For energy sector, energy management of designated factory and building, enforced by The Energy Conservation Promotion Act, is one of implementation relating to NAMAs, mandatory system. The system already consists of monitoring, reporting and verification processes, except for the output is not specified to be reported in term of GHG emission reduction. At present, there is no mandatory GHG emission reduction project for industry sector. However depend on the regulation; some factories are enforced to submit toxic chemical report to Department of Industrial Work. The monitoring, reporting, and verification processes are already established by Department of Industrial Work. Nevertheless, carbon dioxide and methane gases are not regulated to be reported. Carbon footprint and Carbon Reduction Label, voluntary projects, have also been conducted by monitoring and reporting of GHG emission together with verification system.

Presently, monitoring, reporting and verification are preceded by many organizations, although GHG emission reduction is not completely included into reporting system. Meanwhile, data collection system for GHG emission and reduction is not centralized. Therefore, considering issues relating to NAMAs implementation are presented as follows.

- Domestic Guideline for NAMAs should be developed previously. GHG assessment for each sector such as energy and agriculture should be included. Standard Reporting Format and Verification Process should be established.

[24] http://www.measwatch.org/book/4100

- NAMAs of governmental organization – The implementations that relate to GHG emission reduction, both projects and policies, have to register for NAMAs project before applying for budget as usual. If REDD/REDD Plus projects are classified to be NAMAs. REDD Plus projects have to registered for NAMAs project through Royal Forest Department. Low carbon city Project might be NAMAs which is under the responsibility of Ministry of Interior. The registry for NAMAs project is conducted by local administrative organization.

- NAMAs of non-governmental organization – Private sector, State enterprise, or NGO can formulate their own NAMAs project by following Domestic Guideline. Financial support is unclear for this moment. As for private company that implements NAMAs project as corporate social responsibility, budget should belong to their own organizations. The creating more of incentive for NAMA project is probably discussed more between relevance organizations.

- For registry – TGO should be a center of registration.

- Monitoring of GHG emission should follow CDM methodology.

- Reporting system - For NAMAs of governmental organization, the progress of implementation should be reported to their own head offices for verification and report to TGO for data recording. For non-governmental organization, the progress of implementation should be reported to TGO directly for both verification and data recording.

- For verification and accreditation – The verification of NAMAs project should follow Domestic Guideline. The verification organization should be classified into 3 groups;

    1). Governmental organization – Project owner accredit their own implementations for awareness of their own efficiency and improving later.

    2) TGO – Accreditation for non-governmental organization's project.

    3). Third-Party organization – Register every two years, at TGO.

(2). The existing state of monitoring and evaluation mechanisms of policies at national level

For MNRE, e-Project Tracking has been developed to be a tool for monitoring and evaluation project/activity, which is implemented by departments under MNRE. Progress of the implementation is reported through e-Project Tracking system via MNRE website and will be updated every three months. Ministry of MNRE can monitor and follow progress of project through web-based report. Moreover, ministry can send any messages as well as expressing impressive/unimpressive to project responsibility person thru the system. Ministry has an authority to approve/prohibit or revise budget by operating through the system as well.

For ONEP, under MNRE, is the organization that has a responsibility on climate change policy development. The monitoring and evaluation of project implementations to follow up national policies are always formulated in each national plan. However, In Thailand M&V are not active officially.[25] For instances, the monitoring mechanism of ONEP is performed by sending a questionnaire to project implementer or/and having a phone call. Site visit is operated randomly. During project implementation, ONEP keeps giving suggestion and consultation to project implementer therefore the progress is always followed up. •In addition, the implementation is voluntarily and there is no rules for running processes, thus M&E process will not be affected to budget, except for helping to figure out how to reallocate budget from other resource to project developer in case of acquired budget is not enough for project implementation.

The monitoring and verification mechanisms for mandatory activities are presented.

(2.1). Energy Sector [26]

Designated factory has been enforced to conserve energy via the efficient and economical energy production and usage. The law of conservation of energy states that the owner of designated factory shall has to submit the information on energy production, consumption and conservation to Department of Alternative Energy Development and Efficiency (DEDE) using the Form Bor Por Ror 1, in July and January every year. All of information including with the quantity of energy consumption and installation or modification of machinery or instrument that affect in level of energy

[25] Based on information received from an interview and making a phone call.

[26] Manual Explanation of Energy Conservation Act B.E. 2535. For Designated Factory / Designated Building

consumption and conservation, shall be recorded monthly using the Form Bor Por Ror 2. Furthermore, designated factory has to monitor and assess the energy consumption within factory. Monitoring report has to be submitted to DEDE every three years.

Every three years, the owner of a designated factory shall establish energy conservation targets and plan for the facility and implement the plans as approved by the DEDE. The owner of a designated factory shall assess and monitor the implementation of the plans as approved by the DEDE, and report to the DEDE on an annual basis.

Designated building has also been enforced to conserve energy via the efficient and economical energy usage. The procedures of data and report submission are similar to designated factory. The distinction is that the monthly recorded information will be kept onsite for five years for DEDE to assess and work on.

In the execution of the Energy Conservation Act B.E. 2535, the competent officer is appointed by the Ministry of Energy to have power on making an enquiry about or inspecting the records on conservations of the designated factory, designated building, equipment, and other matters relevance to energy conservation. Practically, DEDE will evaluate report case by case. There are no specific criteria for the evaluation and consideration. The consideration for each factory/building is upon data reported and will not be disclosed to public. Report feedback will be informed to building owner and factory owner through official letter such as how to adjust and improve energy management system more effective. The evaluation will not be affected to grant or subsidy that is for investment and operation of energy conservation. The budget will be transferred to designated factory/building that apply for the money and is qualified only. In addition, DEDE will give them suggestion and consultation during the implementation.

(2.2). Waste management[27]

Pollution Control Department, PCD, is responsible for development of environmental quality management plans and measures to control, prevent, and mitigate environmental pollution, including monitoring environmental quality and preparing an annual report on the state of pollution.

According to The Enhancement and Conservation of the National Environmental Quality Act B.E. 2535 (1992), which stipulates that the Pollution Control Committee

[27] Thailand State of Pollution Report 2010

must prepare a report on the state of pollution and propose to the National Environment Board once a year with a view to disseminate information of Thailand's pollution situation. This report provides data and information on air quality, noise level, water surface, underground water, coastal water, solid waste, hazardous substances, chemical accidents, pollution problem complaints, important pollution events and the overall pollution management.

For instance;

- Pollution Control Department, Department of Groundwater Resources, Department of Environmental Quality Promotion, Office of Natural Resources and Environmental Policy and Planning and Map Ta Phut Industrial Estate Office collaborated to examine and collect groundwater samples, to assess for the chemical contamination which would affect the groundwater quality in the Industrial Estate area.

- Pollution Control Department, Environmental Regional Office and Provincial Office of Natural Resources and Environment, under Ministry of Natural Resources and Environment, have continuously supported the Local Administrative Organizations in solving the waste problems efficiently. In 2010, the operation to strengthen the management capacity of waste and hazardous substances was conducted in 94 communities in local administrative organizations at the municipality level. As a result, there were 90 municipalities that had developed efficient capacity in waste management.

In addition, follow The Enhancement and Conservation of the National Environmental Quality Act B.E. 2535 (1992), designated project that belong to public organization, state enterprise and private, has to report environmental impact assessment to The National Environment Board whereon ONEP is responsible for monitoring assessment report.

Some factories are enforced to submit toxic chemical report, both for waste water and air pollutant, to Department of Industrial Works every 6 months via electronic media that is established by DIW. The report has to be also kept onsite for recall of assessing by DIW anytime. At present, DIW only collects report that has to follow criteria and system that are already established in Ministerial Regulation. For instance, the analysis of toxic value has to be performed by Government Lab or Laboratory that already register to DIW. Environmental personnel and toxicity controller have to register to DIW. Report has to be approved by environmental personnel, toxicity controller and

industry owner before submission. The official verification system is not already performed in the present, excepting for receiving complaint from community. The systems are planned to use recently. Solid waste report is submitted every year.

According to The Enhancement and Conservation of National Environment Quality Act B.E. 2535, the owner of the point source of pollution,[28] shall have the duty to submit report summarizing the functioning results of the facility, equipment or instrument to the local official of the locality where such point source is situate at least once a month. The collection of statistics and data, the making of reports shall be in accordance with the rules, procedures, methods and format specified by ministerial regulation. In case the facility for treatment is performed by a monitoring control operator[29] as determined by the pollution control official, the monitoring control operator shall have the duty to act on behalf of the owner or possessor. The Service Contractor licensed to render wastewater treatment or waste disposal services shall have the duty to do the same as the owner or possessor of the point source of pollution is required. In order to perform functions under this Act, the pollution control official[30] is empowered such as 1) To enter into the place and inspect the functioning process of wastewater treatment or waste disposal facility, air pollution control system or equipment and other instrument for the control of polluted air or other pollutants, as well as to examine the statistics data on the functioning of the said facility. And 2) To issue an order to correct or improve the facility or other equipment. If the point source of pollution is a factory, the official under the law on industrial plants shall be notified to take action within his power and duty. If such official fails to do so, the pollution control official shall have the power to take action in accordance with this Act.

Any owner or possessor of the point source of pollution or any Monitoring Control Operator who refrains from collecting statistics or data or from making reports as required shall be punished by imprisonment not exceeding one month or fine not

[28] A person who have his own facility for treatment of polluted air, equipment or instrument for control of the discharge of polluted air or other pollutants or the wastewater treatment or waste disposal facility

[29] Monitoring Control Operator means the person licensed to monitor, control, assess, operate and maintain wastewater treatment or waste disposal facility, or equipment, instrument, tools, appliances for control, treatment or disposal of any other pollution, which the owner or possessor of point source of pollution manages to construct and bring into operation by his own investment and expenses for the treatment of wastewaters or disposal of wastes or any other pollutants.

[30] Pollution Control Official means the person appointed by the Minister to perform the functions concerning pollution control under this Act.

exceeding ten thousand baht, or both. Any Monitoring Control Operator who intentionally makes such notes or reports showing false information or statements shall be punished by imprisonment not exceeding one year or fine not exceeding one hundred thousand baht, or both.

(2.3) Transport sector

The Office of Transport and Traffic Policy and Planning (OTP) is responsible for submitting policies, formulating transport and traffic plans, and working out transport safety measures that are consistent with the master plans so as to bring about unity of the national transport and traffic policy. According to the Ministerial Regulation on Internal Organization of the Office of Transport and Traffic Policy and Planning ministry of Transport, B.E. 2545 (2002), it is the OTP's mission to make comprehensive studies and analysis, set up the database of information system, supervise and expedite the operations of agencies under the Ministry of Transport, Carry out continuous assessment of their performance in compliance with plans, projects, and budget constraints. The OTP is also required to convey its opinions to the National Transport Policy Board and the Commission for the Management of Land Traffic so that the law on the national land transport as well as legislation having implications for transport and traffic management will be made or amended.

Campaign on activities of environmental friendly transportation has been transferred to communities via TV, printing, radio as well as exhibition. The objective is to spread progress information and data to communities.

(3). Monitoring and reporting of programs and projects at the local level.

(3.1). Muangklang City: River conservation program[31]

Prasae River becomes one of the town's symbols and has been a vital part of town in every way. Water transportation used to be the essential links from town to remote destinations. But after the land transportation became more popular, the river played less important roles toward the town. More of river's pollutants have been caused.

[31] Detailed description of Best Practices/Success Stories from Selected Local Governments in Cambodia, Indonesia, Philippine, Thailand and Vietnam

With a budget of only 1,000 Euro (DELGOSEA), local government annual budget, and some contribution (financial and material) from private companies such as Apina Industry, projects and activities have been conducted.

The present Mayer of Muangklang municipality has been working on conservation measures of the river continuously. River conservation is one of projects initiated without waiting for budget allocation. Therefore, instead of building waste water treatment plant for river, municipality solved the problems by using effective microorganism (E.M.) and grease traps to reduce massive organic load containing inside river. They are not costly at all. Moreover, neighboring area like Rayong Province supported grease traps for Muangklang municipality to install in houses.

Prasae River Conservation Groups was formed to be stakeholders of the river. The problem and proposed activities were discussed and solved among stakeholders. The conservation was promoted to the local residents and visitors continuously. Moreover, local radio channel was established to share the information to the people.

The monitoring program for river conservation is to train young residents to be inspectors. Students were trained to evaluate the basic information of the river such as pH, temperature, color, odor, velocity and existing animals found inside. The trainings were arranged into various sessions for different local schools. Therefore, a large effective network of water monitoring was formed. The number of participating students is presented in **Table 1**2. The information received form monitoring was usually published in local printed matters. For example, the sighting of more fish and amount of collected grease and oil were reported in local print.

Table 12: Number of Participating students in river monitoring system

Year	Number of Participating students
2008	131
2009	148
2010	180

(4). Sub-national government engagement of GHG emissions inventory development.

Thailand Greenhouse Gas Management Organization (Public Organization) or TGO received the financial support from EU to create a project with the objective of to

encourage and promote carbon footprint for local administration for becoming low carbon city. The operational period was 270 days, December 20, 2010 to September 19, 2011. Institute of Field Robotics was designated to be a consultant having a responsible for project operation. The National Guideline Carbon Footprint for Local Administration was developed for being an approach to assess GHG emissions which are the consequence of organization's activities.[32] Four of local administrative organizations applied to be pilot municipality e.g. Phuket Municipality (Phuket Province), Sikhiu Municipality (Nakhonratchasima Province), Muangklang Municipality (Rayong Province), and Amphawa Subdistrict Municipality (Samut Songkhram). Implementing Guidelines are as follows.[33]

1). Conduct a baseline emission inventory and forecast.

2). Adopt an emissions reduction target for the forecast year

3). Develop a Local Climate Action Plan.

4). Implement policies and measures.

5). Monitor and verify results.

Project achievements were presented in term of the national guideline carbon footprint for local administrative organization and guideline of GHG mitigation for local administration activities. Project achievement was disseminated through workshop and pilot municipalities received certificate on December last year. At present, project activity is extended to more of local administration, targets are twenty municipalities. Management System Certification Institute (Thailand) is responsible for project implementation. Now, twenty-three municipalities are qualified.[34]

Knonkaen Province: Khoenkaen is the second largest of the north-eastern province of Thailand that committed and signed the Declaration on low carbon action on September, 2009. The greenhouse gas inventory has been implemented with the corporation between German International Cooperation (GIZ) and Khonkaen University. However, data have not been approved yet.

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[32] http://www.tgo.or.th/english/index.php?option=com_content&view=article&id=211&Itemid=79

[33] http://www.manager.co.th/qol/viewnews.aspx?NewsID=9540000161714

[34] http://www.tgo.or.th/index.php?option=com_content&view=article&id=2%3A1st-qtr-2011&catid=61%3Atgo-progress-report2009&Itemid=54

(5). Sub-national governments' engagement in CDM projects.

As for Thailand, the Thailand Greenhouse Gas Management Organization (Public Organization) or TGO is performing role as the country's Designated National Authority, DNA. Main responsibility is to formulate the necessary procedures to review and approve CDM projects for the issuance of the Letter of Approval (LoA). TGO also establishes necessary criteria for evaluating whether or not the candidate CDM projects will lead to economic, social and environmental benefits. The engagement of sub-national governments toward CDM projects, both review and approve, is not presented in Thailand. In addition, Thailand CDM projects have been only conducted by private sector in the present.

As of 6 August 2012, TGO issued Letter of Approval for 191 CDM projects and with the expected average annual Certified Emission Reduction at 11,101,922 tCO2. Seventy three Projects has already been registered at CDM Executive Board and project types include 16.52%, 68.41%, and 15.07% of biomass, biogas and other types of project, respectively.

(6). The state of difficulties to secure initial investment and to conduct monitoring of GHG emission reduction, for selected programmatic CDM project in Thailand under validation or registration.

(6.1) Programmatic CDM Project: Biomass Power Development Program in Thailand.[35]

For this Biomass Power Development Program, each CPA is a standalone biomass power project, which are connected to the national power grid and emission reductions are achieved through the replacement of an equivalent amount of grid based electricity generation.

In Thailand, Financing renewable energy projects is difficult for the local financial institutions as they do not have a dedicated technical evaluation team to evaluate the project risk. The project cost for renewable energy projects, especially biomass power projects, is high due to the import of components from abroad and limitations on the in-country production. Therefore, local financial institutions provide a lower amount of the debt to equity ratio, discounted the risk that they are not willing to undertake. Few

[35] http://cdm.unfccc.int/ProgrammeOfActivities/Validation/DB/I06DE6UCRK368XWLQWEYH35LWQMDAF/view.html

financial institutions also increase the loan margin in order to compensate for the risks. Both the lower debt to equity ratio and higher interest rate has created unnecessary financial barrier to the project developer of small scale renewable energy projects.

Currently, development of renewable energy projects is voluntary and there is no regulation on the development. A higher tariff is granted to Very Small Power Producers (VSPP), ≤10 MW, and Small Power Producers (SPP), >10 MW to ≤90 MW, by providing adder on top of the normal tariff for 7 years. Individual CPAs in this PoA are VSPP and receives incentives in the form of adder. CPAs financial includes this adder, even with its inclusion, the project financials are not attractive for the project developer to develop this project.

CPAs will generate additional income from the carbon credits that would help the project developers to close the gap of the working capita fund during the course of its initial year of project operation. The revenue from the sale of carbon credits is crucial as an incentive for project developers to consider implementation of CPAs, which are difficult to implement based on the existing financial barriers in the Thai market.

Another major risk is lack of consistency in the policy decisions and electricity generation target for renewable energies. This variation is due to the political chaos in recent years.

(6.2) Programmatic CDM Project: **Thailand Small Scale Livestock Waste Management Program.**[36]

The proposed activity will reduce greenhouse gas emissions from livestock manure by converting anaerobic lagoons to flow closed anaerobic treatment digesters with biogas capture and power generation in Thailand.

A major problem associated with increased livestock production is that it also results in an increased amount of manure and dead animals during the grow-out period. Environmental problems may result if these by-products of the production process are improperly utilized or disposed of. Water pollution may occur if nutrients from manure enter the water table because they are either improperly used or disposed of, or may be associated with improper disposition of dead animals that consequently release nutrients into the ground water as they decompose. The PoA aims to reduce the environmental problem related to livestock production Dependence and energy security

[36] http://cdm.unfccc.int/ProgrammeOfActivities/Validation/DB/6V7V9IQGKLEM7IU7RT9MDZWB2GDN16/view.html

are important issues in Thailand, particularly with regards to imported fuel supplies. The high level of oil prices affects local manufacturers and households and has a negative impact on development. Renewable energy generation in the Thai economy are therefore essential to address concerns but are constrained by insufficient financial. Besides financial barriers, the implementation of anaerobic livestock waste treatment system is constrained in Thailand due to a lack of awareness among farmers in the country.

The opportunity cost for investment into biogas systems is high relative to investing in additional swine livestock. The capital expenditure required to install the anaerobic digestion system and the electricity generation units are very high while the same investment could have been made to buy feed and additional fattening pigs for the farms. There continues to be low confidence amongst investors in the efficacy and operating costs of anaerobic treatment technologies as it is largely unproven as yet on a commercial scale in Thailand.

As a result, unless additional incentive from the potential sales of the Certified Emission Reduction (CER) is available, the participating farm will not be interested to invest in the project activity.

Project is designed to measure biogas by using gas measuring meter as well as manual record daily. Data of measurement meter will be transfer to computer system directly. Acquiring data from systems will be checked and compared to each other. However, project is on the validation process so the monitoring of biogas has not been measured and recorded.

Part IV: Record of the Workshop

The workshop, National-Sub-national Linkage to Enhance Low Carbon Development at the Sub-national Level in Thailand, was organized and supported by Institute for Global Environmental Strategies (IGES) and Thailand Environment Institute (TEI) at TK Palace Hotel, Bangkok on November 21, 2012.[37]

The objective was to present and share the study results on low carbon development polices and measures at the national and sub-national level in Thailand and the potential mechanisms to link national and sub-national policies to strengthen low carbon development policies at the sub-national level under the financial support of the Ministry of the Environment, Japan since June 2012. In addition, the workshop aimed to share the study results with relevant officials, practitioners and researchers to discuss the potential of such mechanisms and to articulate the effective ideas.

The result of studying was described to all of participants by IGES representative, Hidenori Nakamura, Ph.D. Details of presentation is presented in Appendix IV.

[37] Workshop agenda is presented in Appendix III.

Regarding to studying result from Dr. Hidenori Nakamura, four main things to be suggested for the consideration of National and sub-national linkage mechanisms are as follow;

1. Incentive provision and ownership development

2. Effective monitoring and evaluation of policies

3. Diverse local conditions

4. Support of policy diffusion and mutual learning

All of comments and suggestions from participants for further studying the linkage between the national and sub-national levels together in Thailand are described as following.

- For the studying of the different role of national level and sub-national to plan and implement policies and measures, the analyzing should be performed case by case to find out the reason and obstacle that why provincial and city/municipal governments could not implement some national policies within their region.
- The linkage between sub-national and national levels in Thailand can be studied and analyzed from type of implementing policies;

  - **Laws and Regulations policy**: There is a freedom for sub-national level to implement the law therefore laws and regulations should be explored more. For example the law of waste management is fully tried by sub-national governments.

  - **Awareness and capacity building policy**: Awareness and capacity policy for increasing the capacity building for sub-national level to be a green organization is necessary.

  - **Public relationship policy**: The construction of a readiness for the community is used to link national and sub-national levels together.

  - **Incentive and financial policy**: The linkage of policy levels might be come up by searching for the relation of activities that have already been implemented by sub-national government to the incentive policy or financial mechanism.

- For the studying of GHG emission inventory development: Five years ago, BMA had an action plan to reduce GHG emission. However, at that time there was no actual monitoring and evaluating processes as well as no real measurement so after that the new action plan should be more developed on the evaluation process presently. Additionally, The GHG inventories preparation for various levels are different from each other in term of difficulty such as the availability of emission factor for national level, the un-carefully performing that can affect on double counting in sub-national level and knowing of source of emission itself is important for the declaration of the emission reduction in the future as well.
- For more information of the involvement of municipality in GHG mitigation: TGO run project with municipality in GHG mitigation in organization level by applying the ISO guideline for the implementation. The implementation included helping municipalities to develop the plan for GHG reducing boundary and control. Target setting and monitoring of GHG emission reduction were developed as well. The achievement of each municipality was just presented on the beginning of November, 2012.

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Appendix I

2012/07/10

Time	10:30 – 11:30	Venue	Thailand Greenhouse Gas Management Organization (TGO)
Participants	TGO: Dr Chaiwat Muncharoen, Deputy Executive Director; Dr Puttipar Rotkittikhun, Senior Official; Mr Rongphet Bunchuaidee, Assistant Senior Official TEI: Dr Namphung Vongvanich, Ms Kanokwan Noochouy IGES: Hidenori Nakamura		
Meeting Title	TGO interview	reporter	Nakamura

National level low carbon development policies

- At national level, Thailand government has developed two basic documents:
  - 11th National Economic and Social Development Plan (October 2011 – September 2016), focusing on low carbon society, in 2011
  - Climate Change Master Plan, developed by Office of Natural Resources and Environmental Planning (ONEP), Ministry of Natural Resources and Environment, in 2012; this master plan does not include M&E mechanism to review and revise the plan; only consultation with various stakeholders are mandated.
- In terms of NAMA development, consultation workshops with relevant ministries, such as Ministry of Energy, Ministry of Natural Resources and Environment, its Forestry Department, Ministry of Agriculture, Ministry of Transport, etc, have been conducted. But no date of completion of NAMA is set since definition of NAMA, including domestic and internationally supported NAMA, is unclear.
- However it is certain that NAMA shall be based on existing relevant policies.
- No other national level action plan for low carbon development is developed other than NAMA, since NAMA should be based on existing relevant policies.
- National level low carbon development includes:
  - Cabinet resolution for governmental agencies to take measures for energy efficiency
  - MNRE set the green procurement guideline, governmental bodies have to follow
  - Carbon tax is not possible at this moment, but taxation for purchasing less-efficient vehicles has legislated
  - Ministry of Energy has building codes that regulated energy efficiency.
  - Others (to be studies by TEI, including the above policies)

Sub-national level low carbon development policies

- No consultation with sub-national governments was conducted in terms of NAMA development since it starts from national level. Ideally consultation with sub-national level shall be done in the future.
- Bangkok metropolitan administration (BMA)'s initiative for climate change mitigation is exceptional since it receives the support from JICA and TGO, but no other support was made so far. TGO wants to develop

capacity of sub-national governments in the future.

- Priority areas for sub-national governments in terms of climate change mitigations are 1) solid waste management, 2) renewable energy (energy supply), and 3) energy efficiency (buildings), because of provincial/municipal governments' authorities and mandates.
- Transport sector is important, but difficult for MRV. Therefore TGO does not treat it as priority at local level mitigation.
- GHG emissions from agriculture are limited in Thailand.
- Forest is important in terms of GHG emissions/absorption, but the authority of forest management is complicated: Both governments and private are engaged, and both national and sub-national governments are owners case by case.
- Sub-national level low carbon development: not yet, except for several local governments that are committed to environmental protection; because local government officials do not know the climate change issues, and they do not show interests for low carbon development. But TGO wants to enhance the roles of local governments step by step.
- Only Bangkok metropolitan administration and Muangklang town in Rayong Province, have developed regional GHG inventories, with the support of TGO. There is a duplication of supports.
- Preparation of National Communications, and national GHG inventory in Thailand, was conducted by line ministries and national consultants, without engagement of sub-national governments.

General M&E of policies

- In terms of general M&E of policies, no such mechanism exists in Thailand, both national and sub-national level. Each ministry develops their policies with budget independently, with no accounting on the progress or achievement, nor reflection on the following budgeting process. No indicators are used to monitor the policy planning and progress monitoring.
- In terms of energy consumption reporting, Ministry of Energy has a mechanism where energy users, i.e., factories and buildings, directly report to the ministry.

2012/07/10

Time	13:30 : 14:30	Venue	Central Plaza Ladprao	
Participants	Ms Sirinthon Vongsoasup, Energy Efficiency Expert, Department of Alternative Energy Development and Efficiency (DEDE), Ministry of Energy; Ms Kulsiri Sakprasith, Assistant, DEDE TEI: Dr Namphung Vongvanich, Ms Kanokwan Noochouy IGES: Hidenori Nakamura			
Meeting Title	DEDE interview		Reporter	Nakamura

RE and EE

- In terms of renewable energy, recent Alternative Energy Development Plan, AEDP 2012 – 2021 has set the target of 25% of RE among total energy consumption, including electricity and non-electricity heat consumption
- Regarding energy efficiency (EE), the recent national plan (Energy Efficiency Development Plan) published in 2011 sets the target of energy intensity reduction [toe/baht] by 25% by 2030, compared to business as usual under the conditions of GDP growth with 4.3% per annum and population growth with 0.3% per annum. All energy utilisation modes are included. 90% will be achieved though end-use while 10% will be achieved by power generation sector. Contribution of industries is high, while transport sector contributes less, in terms of energy consumption. Residential and commercial sectors comprise around 20%.
- DEDE of Ministry of Energy has two roles: Implementation of RE polices and EE policies. Energy Policy and Planning Office (EPPO) of Ministry of Energy has a responsibility of national energy policy planning.

Scheme and strategy to support EE policies and to encourage EE improvement

- 1. Law and Regulation
    - Energy Management for Designated factories and buildings under ECP Act.
    - Building Energy Code
    - Standard and labeling for equipment and materials (MEPS)
- 2. Administration/Financial Support
    - Soft loan/Revolving fund
    - Tax incentive
    - Direct subsidy
    - ESCO fund
- 3. Capacity Building
    - Research and Development
    - Training
- 4. Social Measures
    - Creating Awareness
    - Thailand Energy Awards
    - Public Relation through Media
    - EE Display Center
    - EE Networking/Voluntary Agreement
    - Standard and Labeling for equipment and materials (HEPS)

Industrial and building EE

- (According to Energy Conservation Promotion Act) EMS requires designated factories and buildings which have energy demand from 1 MW to report energy consumption annually. They also have to set the target of energy consumption, action plan, and report the results. Such PDCA cycle is mandatory. Though there is no minimum mandatory energy efficiency for industries, since it is difficult to set such figure because of complex and diverse situations.
- DEDE prepare the feedback report to each user, including the distribution of max-min energy efficiency among various categories, and each user's ranking.
- Designated facilities have to assign at least one person who is responsible for Energy (PRE) at each company (consuming more than 3 MW), and is trained by DEDE. PRE shall be responsible for energy management system. But in designated facilities consuming energy from 3 MW have to appoint PRE 2 persons which 1 person has to be senior PRE.

Building sector EE

- There is minimum energy efficiency code for buildings, for heating, air conditioning, and lighting (energy consumption / m^2) for buildings with the floor areas larger than 2,000 m^2. Both for new construction or renovation
- Building energy code is set by Ministry of Energy, while license for building construction is issued by Ministry of Interior (or local authorities in rural area). Since MOI is reluctant to enforce building owners to comply energy code (unlike safety regulation). The fully enforcement is under consideration. MOE is conducting training for architects and engineers on new building energy code.
- Best companies and buildings in terms of EE improvement are awarded by MOE. There is no mechanism of naming and shaming the "bad performers."
- For EMS implementation and support, regional offices of MOE are in charge (not provincial or municipal governments).

Equipment EE

- Standard and labelling for electric appliances as well as non-electric in-house equipment and electrical equipment in industry (such as insulation, LPG stove, and small engine) are important and effective. The committee are established from experts and relevant persons, DEDE is the secretariat. MOE/DEDE sets the standards of minimum energy performance and high energy performance. Among 20 standards, two, namely for air conditioner and refrigerator are mandatory, others are voluntary. Among five levels to rate the EE, number 5 is considered excellent EE, while rates 3 or 4 are lower performance accordingly.
- The standards/codes are upgraded every five years, after the survey of market as well as suppliers manufacturing processes.

2012/07/10

Time	16:00 – 17:00	Venue	Office of the National Economic and Social Development Board (NESDB)		
Participants	NESDB: Ms Ladawan Kumpa, Deputy Secretary-General; Dr Anupit Supnithadnaporn, Plan and Policy Analyst TEI: Dr Namphung Vongvanich, Ms Kanokwan Noochouy IGES: Hidenori Nakamura				
Meeting Title	NESDB interview			reporter	Nakamura

National Plan

- National Economic and Social Development Plan (October 2011 – September 2016) identifies climate change as one of key factors that may affect sustainable development in the future. The need to plan to achieve low carbon society in the near future is recognised. One of the six strategies is low carbon development.
- Ideas/directions presented in National Plan shall be reflected by Action Plans by line ministries. Relevant ministries have to achieve low carbon society. Line ministries develop their action plans following National Plan.
- More in general, sustainable consumption and production is taken into account for relevant ministries: change from chemical fertilisers to organic ones in agriculture; change to cleaner technology in manufacturing; ecologically friendly tourism; more public transport; reduce and recycling for waste management; reforestation for better water management after the flood
- National Plan has targets and indicators, including CO_2 emissions, which are monitored annually

Provincial Plan

- Planning Unit of provincial government, whose governor is appointed by National Government, prepares Provincial Plan, according to National Plan. This practice started in 2008.
- Provincial governments receive the budget (8 billion bahts; 100 to 200 million to each province) from national government to implement provincial plan. Provincial governments also develop their own visions and indicators to monitor the progress of the plan
- For provincial governments, priority is increasing the quality of life or reducing poverty. Therefore low carbon development is a next step after these objectives are met.
- Provincial government annually report the progress, i.e., what projects are completed, what are not, to national government (cabinet). National government collate the annual report, which is disclosed to the public.
- Under each province, there are three categories of projects that are implemented: 1) project budgeted under Provincial Plan, financed by National Government (rather small), 2) projects conducted under local authorities, financed by National Government, and 3) projects conducted by line ministries (rather large). Thirty seven activities including education, water management are decentralised to local authorities.
- Local authorities report the progress of the projects directly to national government.
- Line ministries develop their own annual reports, including budget, staffing, project status, which are different from the National Plan annual report.

Relationship between policy/project performance and budgeting

- Budget strategy follows national plan every year. They cannot be reduced usually, even if the performance of some polices are not good (no performance-based budgeting). Moreover new projects and priorities shall be financed in some ways.

2012/07/11

Time	9:00 – 10:30	Venue	Bangkok Metropolitan Administration		
Participants	BMA: Mr Wiruch Tanchanapradit, Chief, Environmental Impact Study and Analysis Sub-Division, Air Quality and Noise Management Division, Department of Environment; Ms Payalaln Thawanrat, Environmentalist, Environmental Impact Study and Analysis Sub-Division, Air Quality and Noise Management Division, Department of Environment TEI: Dr Namphung Vongvanich, Ms Kanokwan Noochouy IGES: Hidenori Nakamura				
Meeting Title	BMA interview			reporter	Nakamura

Low carbon development polices at BMA

- BMA has developed Action Plan on Global Warming Mitigation 2007-2012, and has implemented. BMA budget has been secured for the plan. The plan is on-going. JICA has provided technical assistance for the plan. BMA with assistance from JICA is preparing evaluation now. The plan has target of GHG emissions reduction, with divided targets for each activity.
- Under the auspices of UNEP, BMA has also prepared Bangkok Assessment Report on Climate Change 2009.
- The Action Plan is comprised of five initiatives; 1) expand mass transit and improve traffic system, 2) promote the use of renewable energy, 3) improve building electricity consumption efficiency, 4) improve solid waste management and wastewater treatment efficiency, and 5) expand park area.
- Most of them are BMA's own pubic infrastructure development, public service management, or public procurement ("demonstration by the government"). The needed budget for such public projects is secured by BMA itself. Mass Transit Rail Systems are planned by BMA, implemented by Ministry of Transport, using the budget of BMA. When BMA introduced government-owned vehicles running with bio-ethanol, Ministry of Energy financially assisted BMA in terms of installation of new equipment to the vehicles. BMA reduced solid waste management by 10% by means of fertiliser development from organic wastes, using BMA factory. The fertilisers are sold at the market; the selling status is good because of fertiliser shortage in the market.
- The policies to make influence on stakeholders' behaviours include strong and continuous media campaign, such as those for utilisation of bio-fuels. No mandatory regulation is developed. Regarding building energy efficiency improvement, BMA has conducted seminars with 35 building owners to encourage them to comply with the new building code, jointly with DEDE of Ministry of Energy. Other measure includes incentive for greening, i.e., BMA allows more building volume when the building adopts wider area of greening.

Relationship with national government

- So far two officials of Department of Environment from BMA have attended the committees discussing the NAMA.

M&E mechanisms in BMA

- Twice a year, each department develop progress reports with indicators for internal monitoring purpose. Environment Department reports air pollutants statistics, ambient environmental quality, CO_2 emissions, for example. These documents are not disclosed to the public.
- BMA does not make reporting to national government.
- The performance of each policy/project described in internal progress reports might affect the budgeting for the next period. The example includes current governor, who is not so enthusiastic about climate change mitigation, finally decided to increase the budget for low carbon development projects based on the relatively good performance of the project, which was originally initiated by former governor who promoted climate change mitigation initiatives.
- In terms of the reporting on low carbon issues, the format of report is not determined yet.
- BMA does not receive shared information on energy consumptions by large factories/buildings, which are submitted to DEDE annually.

2012/07/11

Time	14:00 – 15:00	Venue	Good Governance for Social Development and the Environment Institute (GSEI)	
Participants	GSEI: Dr Buntoon Sethasiroj, Executive Director TEI: Dr Namphung Vongvanich, Ms Kanokwan Noochouy IGES: Hidenori Nakamura			
Meeting Title	GSEI interview		reporter	Nakamura

Guidelines for MRV of NAMA in Thailand

- Dr Buntoon is currently serving as Project Manager for Multilateral Environmental Agreements Watch (MEAs Watch) project funded by The Thailand Research Fund (TRF), independent governmental foundation, starting from 2008.
- Under the above project, four activities are implemented to propose guidelines for MRV of NAMA in Thailand; 1) MRV of waste management, 2) MRV of rice cultivation, 3) MRV of chemical industry, and 4) national level MRV of whole sectors. This research is conducted in collaboration with TGO.
- Guidelines will be developed both for 1) mitigation and 2) inventory. Research on MRV of inventory is also supported by European Committee.
- Professors at King Mongkut's University of Technology Thomburi (KMUTT), participating in guideline development, also covers the study of procedures/steps of NAMA design and implementation, roles of each authority, as well as preparation of every-two year reporting for NAMA

- Climate Change Master Plan, by MNRE/ONEP is nearly completing
- TRF is also funding carbon market research including 1) “forest bond” and 2) incentive mechanisms to support mitigation.

Local level low carbon development

- EC also funded several local initiatives for low carbon strategy; e.g. Muangklang municipality (town) in Rayong Province selected as pilot area.
- Khon Kaen municipality (city) in Kohn Kaen Province, is also selected as pilot area for low carbon strategy, supported by GIZ, and by KMUTT
- BMA also showed commitment for climate change mitigation, shown by the ex-governor’s signing of C40, climate leader cities, low carbon development plan, and GHG emissions reduction target development
- Thai Health Promotion Fund has supported research on local low carbon development, selecting two to three towns/communities
- There is also a community-level EE and RE promotion project, focusing on solar cooking and biomass utilisation for RE, which obtained many awards
- Community-based low carbon development projects that generate voluntary carbon credits (Verified Emissions Reduction, VER) for carbon offsetting are important, but the information of these projects, such as location, mitigation methodology, owner’s country/organisation, are scattered. TGO tries to collate the data, in collaboration with Ministry of Finance: When project proponent registers the project with MOF/TGO, they receive tax reduction.
- TGO also has relevant data on CDM projects that have community-engagement.
- So far, no direct policy to engage local authorities to climate change mitigation, though 11th National Plan indicates the direction towards low carbon society, which is a reflection of proposal in a research report prepared by GSEI

Relevant existing M&E or MRV mechanisms:

Industry level

- In energy sector, large energy users (buildings) have to report consumption annually, including energy efficiency. But no verification mechanism exists at this moment
- Large companies, including SCG (Thai company), have prepared Sustainability Report, to monitor and report the environmental management data. GHG emissions are included.
- Member companies for network called TBCSD, whose secretariat is Thailand Environment Institute, develop sustainability report
- Hotels who obtain Green Leaf by Green Leaf Foundation also reports their environmental management data, and receive annual verification by Green Leaf Foundation.
- Institutional mechanism for MRV of GHG emissions in Thailand is still under development.

Policy level

- MNRE has conducted environmental survey and produces Thailand Environment Situation Report annually. University experts and others conduct the study. This report is used to monitor the achievement of long term environmental policy, as well as specific target area, in order to see if the policy succeeded for failed. MNRE has appointed monitoring official at provincial level to collect necessary environmental data for monitoring purpose (including those for national park, department of forest)
- NESDB develops annual progress report for five-year National Plan. Recently mid-term assessment report for 10th National Plan (2006 – 2011) was released in 2011. NESDB has also set up progress monitoring mechanism at provincial level
- NESDB is trying to develop indicators for well-being, to reflect the discussion at Rio+20, in particular Green Economy Policy for Thailand

2012/07/12

Time	10:00 – 11:00	Venue	The Joint Graduate School of Energy and Environment (JGSEE), King Mongkut's Univeristy of Technology Thonburi (KMUTT)	
Participants	JGSEE: Assoc Prof Dr Sirintornthep Towprayoon, Director TEI: Dr Namphung Vongvanich, Ms Kanokwan Noochouy IGES: Hidenori Nakamura			
Meeting Title	JGSEE interview		reporter	Nakamura

Current status of low carbon policy

National level/top-down

- In terms of << energy policy >>, main focus is energy security, not climate change (GHG emissions) mitigation, though 11th National Plan includes the direction of low carbon society. No clear linkage to GHG emissions mitigation is given.
- The Version Three of Power Development Plan (PDP) in 2010 aims to reduce energy intensity by 2030; by promoting renewable energy and energy efficiency
- No clear methodology to estimate GHG emissions reduction by means of policy implementation is described in the PDP.
- The role of sub-national governments are not described in PDP
- "20-Year Energy Efficiency Development Plan (2011 - 2030)" is implemented
- Action Plan for EE is under development. Action Plan will include plans for sub-sectors such as buildings and transport. Perhaps, sub-national/regional action plans might be included

Sub-national/bottom-up

- TGO have conducted “Low Carbon City” pilot projects
- The Guideline for Low Carbon City was prepared by TGO and KMUTT. It includes “nine steps” to plan and implement low carbon city. These steps include public participation and action plan development with stakeholder engagement, to ensure the implementation.
- The guideline uses the inventory to understand GHG emissions by sectors. At local level, more accurate energy consumption data is expected to be collated

MRV of GHG emissions in Thailand

- There are two MRV: 1) MRV for inventory and 2) MRV for mitigation (both research are assisted by TRF)
- MRV for inventory is basically national-level. Inventory development at sub-national/regional/local level is difficult due to the lack of data. Inventory development is not mandated for provincial governments; not included in TOR of officials; not a priority for them
- MRV for mitigation (estimation or verification of GHG emissions reduction through mitigation measures) could be either project-level or policy-level. However there is still technical difficulty to obtain valid reduction amount for policy-level mitigation.
- MRV of mitigation by policy is difficult. ISO does not provide such methodology either. For instance, percentage of recycling is used as a policy target in waste sector, but how to measure it in Thailand? Survey of waste generation is needed. Uncertainty of policy-based mitigation is much higher than project-based mitigation (CDM)
- MRV of mitigation by policy could be used at national level. MRV of mitigation by project can be used at sub-national level
- Methodology for MRV of mitigation is clear, Research community has such capacity and ADB has assisted researchers’ capacity development. On the other hand, Government has activity data, and they plan and implement policies. Capacity development of government officials to understand the methodology is needed, through training of trainers (TOTs)

Sector specific issues

Waste

- Potential NAMA for waste sector includes semi-aerobic land-filling, recycling, composting, and so on.
- Landfill design is determined by national government (MNRE), while its construction is conducted by local governments

Energy Efficiency

- Compliance and enforcement of building code on energy efficiency has been an issue for more than a decade.
- There is a gap between Ministry of Energy (promoting EE code) and Ministry of Interior (authorising building construction). Ministry of Interior has some concerns on EE improvement. EE building code shall start from voluntary basis, before fully regulates and mandates the minimum standards
- Ministry of Interior has also started to understand the importance of low carbon development. High level

decision within the ministry is needed to fully make progress on compliance and enforcement.

- Incentives such as subsidies, tax reduction and awards would be good mechanisms to match with voluntary code

Renewable Energy

- MRV methodological development is progressing in Thailand
- Large provincial governments have developed Provincial Energy Plan, incorporating the appropriate energy mix reflecting regional characters. RE includes solar, wind, biomass and so on.
- Major concern is smart grid development so that variation of RE-based power generation is smoothed. Plus, local distribution infrastructure shall be developed, too.
- Provincial governments have to more closely collaborate with Provincial Electricity Authorities (PEAs), state-owned power distributing companies
- DEDE of Ministry of Energy is promoting demonstration projects for Zero Carbon Energy Plan. This plan could be jointly promoted with sub-national governments.
- Renewable Energy sector NAMA could include community-based RE project where local people are trained for operation and maintenance of RE such as solar and wind. There is a research on such capacity development, following the principle of Sufficiency Economy

Transportation

- For fuel use, people's attitudes and perception matters. Therefore, the role of sub-national governments to change individuals' attitudes and behaviours though media campaign and others is large
- As for the city/town infrastructure, construction of pedestrian roads and bicycle-friendly facilities are important

Urban Planning/Land Use Management

- Plan and zoning regulations exist; however no enforcement and implementation. This is the case even for agriculture/forestry zoning
- Ministry of Interior is in charge of urban planning
- This might be depend on people's perception since academic people understands the need of low carbon planning, as exemplified by Zero Carbon Campus development

Monitoring and Evaluation in the government

- MNRE has used Key Performance Indicators to monitor and evaluate the work as well as performance of officials, both at national and provincial levels.
- KPI might be able to include indicators related to low carbon development; such change of KPIs require high level statesperson or senior officials' decision, not the decision by operation-level officials

Reporting mechanism in the industry

- Energy industry has to report energy consumption and intensity to DEDE annually. Other industries such as petrochemicals are voluntarily report energy consumption but it is not mandatory at this moment.
- DEDE does not have enough staffs to maintain and use the database, based on the data reported by industries
- This reporting mechanism will be a basis of MRV of GHG emissions and reductions. JGSEE has studied on restructuring this existing reporting mechanism towards MRV of GHG emissions.

2012/07/12

Time	13:40 – 14:30	Venue	Electricity Generating Authority of Thailand (EGAT)		
Participants	EGAT: Ms Waraporn Kunawanakit, Chief, Technical and R&D Branch, Planning and Quality Development Division (PQDD) TEI: Dr Namphung Vongvanich, Ms Kanokwan Noochouy IGES: Hidenori Nakamura				
Meeting Title	EGAT interview			reporter	Nakamura

Thailand institution of electricity generation and distribution

- EGAT is a state-owned electricity generation company. EGAT owns nation-wide distribution grid.
- There are 76 Provincial Electricity Authorities (PEAs) and 1 Metropolitan Electricity Authority (for Bangkok metropolis) for electricity distribution to end-users
- Renewable energy-based electricity generation is done by private electricity companies other than EGAT. EGAT conducts only research and development for RE-based electricity generation as of now
- RE-based electricity generating companies can sell the electricity to EGAT when the volume is larger than 10 MW, while they sell to PEAs when the volume is smaller than 10 MW. EGAT is obliged to buy the electricity from RE-based electricity generating companies.

PQDD's role

- Promoting clean technology for power plants
- Promoting renewable energy, energy efficiency, and demand-side management
- Initial assessment of energy efficiency for new technology introduced in EGAT
- Financing for new technology introduced in EGAT, with financial feasibility study
- R&D of technology
- Knowledge production and capacity development in EGAT
- Analysis of risk factors for management of EGAT

National government's low carbon development-related policy relevant to EGAT

- Increase up to 20% of all energy to be derived from renewable sources by 2021
- Reduce energy intensity by 25% in 2030, compared with that in 2005

GHG emissions reporting

- So far only energy consumption is reported to DEDE
- Energy Report is annually produced and disclosed to public through the web page. This does not include GHG emissions either at this moment.
- In the future, new division in charge of GHG emissions monitoring and reporting, as well as mitigation, will be created

Relationship with national and sub-national governments

- EGAT develops power plants according to Power Development Plan and Ministry of Energy's decision
- EGAT does not have collaboration with provincial/city governments.

2012/08/27

Time	14:00 – 15:00	Venue	Muangklang Municipality, Rayong Province		
Participants	MSM: Mr. Somchai Jariyacharoen, Mayor of Muangklang Municipality TEI: Dr. Namphung Vongvanich, Ms. Kanokwan Noochouy				
Meeting Title	Muangklang Municipality interview			reporter	Kanokwan

Local level low carbon development policies

- Muangklang municipality is local authority conducting the energy and environmental projects continuously since 2003. The operating approach follows 4 guiding strategies as presenting;
    - City of trees - To increase green area and promote planting around town.
    - City of waste minimization - Solid waste management and Water Quality management
    - City of energy efficiency - Energy consumption in transportation and building management
    - City of sustainable consumption - Urban agriculture
- Low carbon development policies of Muangklang municipality are going to emphasis on better management in the future plan. For example, today municipality encourages people in the waste community to separate wastes and reuse them. In the future, the residue will be delivered to heavy industry, e.g. cement production, to be used as solid fuel. This will help reducing waste to landfill and decreasing landfill area. Furturemore, from the food fermentation, biogas has been developed to be used as an engine fuel.

- Muangklang Municipality has started to develop in environment and energy since 2003, no enforcement from national or sub-national governments.
- Muangklang Municipality has been certified to ISO 14001 since 2005. The municipality keeps using criteria of ISO 14001 to be guideline for the operation until today.
- Muangklang Municipality doesn't have low carbon development policies and measures focusing directly on the amount of greenhouse gas emission reduction in each year. However, their livelihoods depend on philosophies of sufficient economy, thus the GHG reduction is the indirect driving reward.
- Muangklang has been used as a city model, Klang Model, for the study of environment and energy management. Other organizations have not involved in any policy development and any implementation.
- Budget of Muangklang municipality is the results of profit returned from various activities that follow four of guiding strategies. For example, effective waste management and promotion of agriculture to public, such as paddy-field and livestock (feed from organic waste) etc.

Muangklang Municipality doesn't have MRV process to evaluate GHG emission. Satisfaction of people in community is the success for activities implementation.

2012/10/26

Time	12:30 – 13:15	Venue	TEI		
Participants	Mrs. Nisakorn Kositratna TEI: Namphung Vongvanich				
Meeting Title	Environmental Specialist (Former Deputy Secretary-General ONEP)			Reporter	Namphung

- Low carbon society policy is already formulated in The 11th Plan, as broad aspects, by NESDB.
- ONEP is responsible for directly establishment of national policy and plan with an emphasis on climate change (For instance, The National Strategy on Climate Change B.E. 2008-2012, The Environmental Management Plan B.E. 2012-2016, and The National Climate Change Master Plan B.E. 2010-2019 etc.).
- Both adaptation and mitigation on climate change are also established in former National Climate Change Master Plan B.E. 2010-2019, which is long term development.
- In Thailand, the policies and measures relating to GHG reduction are presented clearly. The linkage between available policies and existing projects with the corporation of various organizations such as public organization, local, business and society will produce the action of plans. The public organizations have to take action first.
- TGO is responsible for initiate and support every sector to reduce GHG emission and provide information of reducing GHG technology.
- ONEP attempts to force and persuade local organizations to concern in low carbon society through projects running, trainings etc. The awareness and capacity building are initiated by using the concept of good

corporate image. Nevertheless, without the hand of ministry of Interior, the achievement of low carbon society through local community is not dominant.

- ONEP keeps supporting the relevant organizations on projects implementation by always giving instruction and knowledge. Partnership is the way of work. On the fact that people always brake the rule and don't want any command, therefore mandate will not be involved in any process.

- In case of acquired budget is not enough for project implementation, ONEP helps to figure out how to reallocate budget from other resource to project developer. In case of budget is left from project running, the admiration will be given to developing organization.

- For ONEP, M&V for national policy is not operated officially even though the monitoring process is established in each national plan. Normally, project implementation organizations will establish their own committee to revise and monitor their own works before report to ONEP committee. The discussions and suggestions among project implementers and ONEP are always operated during the ongoing process of implementation.

- For MRV system, Thailand is so apprehensive about GHG mitigation regulation that is the reason why we really aim to the reducing amount of GHG emission whereas we still do not know exactly of how much GHG is generated. The measurement method of GHG emission is still unclear. GHG Inventory is derived from modeling. MRV is on the ongoing process of discussion. The knowledge of measuring should be transferred first as well as the method of data collection. The development process of MRV system should be initiated thru various levels such as government agency, local government, private sector, business sector, research institute and academy.

- Energy and Transport Sectors are more ready for MRV development according to their available data.

- Other tools for low carbon society are tax intensive such as paying less tax for the reducing of GHG emission activity as well as for activity that is performed for local society to reduce GHG emission. Technology transfer is an option as well. Fund is also important but sometime Thailand should give priority to project that will be initiated by using the less amount of budget first. ASEAN can be cooperated together via adaptation.

Appendix II: Projects both planned and implemented to reduce GHG emission and increase sources of GHG absorption on the basis of sustainable development for national level.

Sector	Projects	Typology of policies and measures							
		To influence stakeholders' behavior						To change local governments' activities	
		Regional planning & Target setting	Cap & Trade	Subsidies	Levies	Standards & Labeling	Information provision & Education	Infrastructure construction	Public procurement
Agriculture	1. Reduce N_2O gas from the application of nitrogen-based fertilizer for the export crops and crops that have genetic diversity e.g. Sugarcane. - To study genetic diversity of bacterial nitrogen fixation and to study sugarcane species that is able to receive the benefit from biological nitrogen fixation. Period – 10 yr (2010-2019) Organization – DOA/LDD Budget – 5 billion baht	✓							
	2. Promote an option on low carbon agriculture to cultivators. - To promote planting without burning and transfer knowledge of toxic generated.						✓		

Sector	Projects	Typology of policies and measures							
		To influence stakeholders' behavior						To change local governments' activities	
		Regional planning & Target setting	Cap & Trade	Subsidies	Levies	Standards & Labeling	Information provision & Education	Infrastructure construction	Public procurement
	Period – 3 yr (2010-2012) Organization – LDD/ORRAF Budget – 20 billion baht								
	3. Support production of organic fertilizer that use agricultural inputs to reduce crops destruction. Period – 3 yr (2010-2012) Organization – LDD/local administrative org. Budget – 30 billion baht						✓		
	4. Support organic fertilizer production that use leaves and sticks as input to reduce crops destruction. Period – 3 yr (2010-2012) Organization – Tambol administrative org. Budget – 3 billion baht						✓		

Sector	Projects	Typology of policies and measures							
		To influence stakeholders' behavior						To change local governments' activities	
		Regional planning & Target setting	Cap & Trade	Subsidies	Levies	Standards & Labeling	Information provision & Education	Infrastructure construction	Public procurement
	5. Reduce crops destruction and campaign for stubble plowing to alleviate global warming. Period – 10 yr (2010-2019) Organization – LDD Budget – 50 billion baht per year	✓					✓		
	6. N_2O gas emission reduction from the use of nitrogen-based fertilizer. - Select new species of nitrogen fixing microorganisms from natural resources. Develop the increasing of nitrogen fixation to reduce chemical fertilizer usage. Period – 3 yr (2010-2012) Organization – LDD Budget – 3 billion baht per year	✓							
	7. Enhance research capacity on GHG emission	✓					✓		

Sector	Projects	Typology of policies and measures							
		To influence stakeholders' behavior						To change local governments' activities	
		Regional planning & Target setting	Cap & Trade	Subsidies	Levies	Standards & Labeling	Information provision & Education	Infrastructure construction	Public procurement
	within livestock sector. - Select applied projects to participate in research and development. - Publish research data to cultivators and private sector. Period – 10 yr (2010-2019) Organization – ARDA Budget – 200 billion baht								
Building	1. Promote low carbon building. - To study and establish standard for low carbon building. - To prepare Handbook of energy consumption and publish to governmental sector, private sector and communities. Period – 10 yr (2010-2019)					✓	✓		

Sector	Projects	Typology of policies and measures							
		To influence stakeholders' behavior						To change local governments' activities	
		Regional planning & Target setting	Cap & Trade	Subsidies	Levies	Standards & Labeling	Information provision & Education	Infrastructure construction	Public procurement
	Organization – MOI/MOE Budget – 5 billion baht within 2010-2011 and 1 billion baht within 2012-2019								
Energy	1. Support and develop cost reduction of bio-energy/biomass. - Support research and development in bio-energy field for research institute. - Research low carbon technology for the community level. Period – 3 yr (2010-2012) Organization – NSTDA/NCRT/MOE Budget – 4 billion baht						✓	✓	
	2. Research carbon footprint of electricity generations.	✓							

Sector	Projects	Typology of policies and measures							
		To influence stakeholders' behavior						To change local governments' activities	
		Regional planning & Target setting	Cap & Trade	Subsidies	Levies	Standards & Labeling	Information provision & Education	Infrastructure construction	Public procurement
	Period – 2 yr (2011-2012) Organization – TGO/MOE/NSTDA/EGAT Budget – 4 billion baht								
	3. Support alternative energy usage in community level. - Choose the suitable areas and corporate with local governments. Period – 10 yr (2010-2019) Organization – MOE Budget – 10 billion baht	✓							
	4. Study efficiency and pollution of alternative fuels. - Analysis air pollution that has been produced from alternative fuels usage in vehicles and campaign for suitable alternative fuels usage.						✓		

Sector	Projects	Typology of policies and measures							
		To influence stakeholders' behavior						To change local governments' activities	
		Regional planning & Target setting	Cap & Trade	Subsidies	Levies	Standards & Labeling	Information provision & Education	Infrastructure construction	Public procurement
	Period – 1 yr (2011) Organization – Thaiauto/PCD Budget – 2.5 billion baht								
	5. 1 Community 1 Forest 1 Renewable Power Station. - Renewable Power station will be built for the local community and will be expanded to various local communities in Thailand. Period – 15 yr (2010-2024) Organization – FIO Budget – 77 billion baht per 1 power station	✓					✓	✓	
Forest	1. ECO National Park - Prepare guidelines and measures for national park management that covers the effect of climate change together with the indicators preparation that	✓				✓			

Sector	Projects	Typology of policies and measures							
		To influence stakeholders' behavior						To change local governments' activities	
		Regional planning & Target setting	Cap & Trade	Subsidies	Levies	Standards & Labeling	Information provision & Education	Infrastructure construction	Public procurement
	will be used for the assessment e.g. Environmental management and service. Then measures will be applied for the implementation. Period – 10 yr (2010-2019) Organization – DNP/DMCR Budget – 20 billion baht								
	2. Participate in global warming reduction by increasing efficiency of community forest. - Knowledge transfer of reforestation that increases efficiency of GHG absorption to the community. Period – 3 yr (2010-2012) Organization – FOREST Budget – 15 billion baht						✓		
	3. Develop monitoring system on the change of carbon absorption quantity that has been happened						✓	✓	

Sector	Projects	Typology of policies and measures							
		To influence stakeholders' behavior						To change local governments' activities	
		Regional planning & Target setting	Cap & Trade	Subsidies	Levies	Standards & Labeling	Information provision & Education	Infrastructure construction	Public procurement
	from the loss of forest areas. - Develop GIS system to monitor carbon quantity. The system will be installed at the national park research centers later. Period – 10 yr (2010-2019) Organization – DNP Budget – 10 billion baht								
	4. Establish approval criteria for CDM project and guideline of EIA report for forest sector. Period – 1 yr (2010) Organization – TGO Budget – 3.5 billion baht					✓			
	5. Support capacity in GHG emission mitigation through forest management (REDD +). - Guideline preparation, knowledge transfer and			✓			✓		

Sector	Projects	Typology of policies and measures							
		To influence stakeholders' behavior						To change local governments' activities	
		Regional planning & Target setting	Cap & Trade	Subsidies	Levies	Standards & Labeling	Information provision & Education	Infrastructure construction	Public procurement
	workshops for all sectors. Period – 10 yr (2010-2019) Organization – DNP/FOREST/local community Budget – 50 billion baht								
	6. Support carbon off-set in forest sector. - Train forest and climate change to the community. - Cooperate with international organization to promote VERS development. Period – 3 yr (2010-2012) Organization – DNP		✓				✓		
	7. Evaluate carbon absorption within forest ecosystem. - Evaluate the amount of carbon absorption within various forest types by studying carbon cycling and	✓							

Sector	Projects	Typology of policies and measures							
		To influence stakeholders' behavior						To change local governments' activities	
		Regional planning & Target setting	Cap & Trade	Subsidies	Levies	Standards & Labeling	Information provision & Education	Infrastructure construction	Public procurement
	carbon flux. Period – 10 yr (2010-2019) Organization – DNP/Forest/DMCR Budget – 20 billion baht								
	8. Study potential of planted mangroves to increase GHG absorption source within Chanthaburi province. Period – 1 yr (2010) Organization – TGO Budget – 20 billion baht	✓	✓				✓		
	9. Support society to participate in GHG mitigation, in which GHGs have been produced from wildfire. Period – 3 yr (2010-2012) Organization – Forest/DNP	✓					✓		

Sector	Projects	Typology of policies and measures							
		To influence stakeholders' behavior						To change local governments' activities	
		Regional planning & Target setting	Cap & Trade	Subsidies	Levies	Standards & Labeling	Information provision & Education	Infrastructure construction	Public procurement
	Budget – 37 billion baht/yr								
	10. Credit support for cultivators to handle with climate change. Period – 10 yr (2010-2019) Organization – BAAC. Budget – 50 billion baht			✓			✓		
Industry	1. Guideline preparation for increasing energy efficiency in industry sector. - Support increasing efficiency of Cross-cutting technology. - Develop energy consumption and GHG emission data for various sectors. - Promote cleaner technology. Period – 3 yr (2010-2012)	✓							

Sector	Projects	Typology of policies and measures							
		To influence stakeholders' behavior						To change local governments' activities	
		Regional planning & Target setting	Cap & Trade	Subsidies	Levies	Standards & Labeling	Information provision & Education	Infrastructure construction	Public procurement
	Organization – TGO/MOE Budget – 10 billion baht								
	2. Research and development in the increasing of energy consumption efficiency of export industry and service. Period – 2 yr (2011-2012) Organization – TRF/NSTDA/MOPH Budget – 16 billion baht	✓							
	3. Evaluate the potential of GHG emission reduction in each sector. Period – 2 yr (2010-2012) Organization – ONEP Budget – 50 billion baht	✓							
	4. Potential enhancement of manufacturers' international standard that relates to climate					✓	✓		

Sector	Projects	Typology of policies and measures							
		To influence stakeholders' behavior						To change local governments' activities	
		Regional planning & Target setting	Cap & Trade	Subsidies	Levies	Standards & Labeling	Information provision & Education	Infrastructure construction	Public procurement
	change. - Train environmental international standard that relates to climate change to public sector. - Apply international standards, such as ISO 14064 and Eco labels, into One tambon one product (OTOP) in Thailand. Period – 5 yr (2010-2014) Organization – TISI Budget – 3 billion baht								
	5. Support credit to Small and medium enterprise (SMEs) for purchasing low carbon technology. Period – 8 yr (2012-2019) Organization – TCG Budget – 50 billion baht				✓				

Sector	Projects	Typology of policies and measures							
		To influence stakeholders' behavior						To change local governments' activities	
		Regional planning & Target setting	Cap & Trade	Subsidies	Levies	Standards & Labeling	Information provision & Education	Infrastructure construction	Public procurement
	6. Support Thailand's Web-based Carbon Footprint calculator. Period – 1 yr (2011) Organization – TGO. Budget – 5 million baht	✓					✓		
	7. System development and market promotion of carbon label products in Thailand. -- Study labeling system in both national and international levels. - Seminar Preparation for manufacturers as well as Press releases. Period – 10 yr (2010-2019) Organization – TGO. Budget – 8 billion baht for the first year and 6 billion baht for each year left.					✓	✓		

Sector	Projects	Typology of policies and measures							
		To influence stakeholders' behavior						To change local governments' activities	
		Regional planning & Target setting	Cap & Trade	Subsidies	Levies	Standards & Labeling	Information provision & Education	Infrastructure construction	Public procurement
	8. Support carbon labeling in manufacturing products and services. Period – 5 yr (2010-2014) Organization – Industry/TGO. Budget – 5 billion baht -					✓	✓		
Transport	1. Study the possibility of rail transport promotion within the main cities. Period – 10 yr (2010-2019) Organization – MOT Budget – 20 billion baht						✓		
	2. Study the possibility of water transportation promotion within coastal cities. Period – 10 yr (2010-2019) Organization – MOT						✓		

Sector	Projects	Typology of policies and measures							
		To influence stakeholders' behavior						To change local governments' activities	
		Regional planning & Target setting	Cap & Trade	Subsidies	Levies	Standards & Labeling	Information provision & Education	Infrastructure construction	Public procurement
	Budget – 20 billion baht								
	3. Global warming mitigation plan for Transportation. - Arrange provinces into order of traffic density consequently. - Increase the alternative way for less carbon consumption transportation. Period – 10 yr (2010-2019) Organization – MOT Budget – 1 billion baht x 5 provinces per year	✓					✓		
	4. Support and promote the use of alternative vehicles technology. - Promote the use of electrical bicycle by studying the potential of alternative vehicles technology that is suitable for Thailand.						✓		

Sector	Projects	Typology of policies and measures							
		To influence stakeholders' behavior						To change local governments' activities	
		Regional planning & Target setting	Cap & Trade	Subsidies	Levies	Standards & Labeling	Information provision & Education	Infrastructure construction	Public procurement
	- Prepare for the availability of used fuel. Period – 3 yr (2010-2012) Organization – Thaiauto Budget – 3 billion baht								
	5. Study the suitability of CDM implementation for transportation sector, Bangkok mass transit system. - Develop new methodology and propose to UNFCCC committees. Period – 10 yr (2010-2019) Organization – OTP/MRTA Budget – 300 billion baht (10 projects, 30 billion baht for each projects)	✓							
Waste and Wastewater	1. Promote GHG emission reduction that has been emitted from community waste by using 3Rs/5Rs activity and recycling.	✓					✓		

Sector	Projects	Typology of policies and measures							
		To influence stakeholders' behavior						To change local governments' activities	
		Regional planning & Target setting	Cap & Trade	Subsidies	Levies	Standards & Labeling	Information provision & Education	Infrastructure construction	Public procurement
	Period – 3 yr (2010-2012) Organization – DEQP/ REO Budget – 10 billion baht								
	2. Community Hazardous waste management center. - Find the place for waste separation and build the network of sending and purchasing waste within provinces. Period – 2 yr (2010-2011) Organization – local administrative org. Budget – 30 billion baht						✓	✓	
	3. Build awareness in waste reduction for students. - Promote waste separation at schools/houses/tempers.						✓		

Sector	Projects	Typology of policies and measures							
		To influence stakeholders' behavior						To change local governments' activities	
		Regional planning & Target setting	Cap & Trade	Subsidies	Levies	Standards & Labeling	Information provision & Education	Infrastructure construction	Public procurement
	Period – 3 yr (2010-2012) Organization – DEQP/local administrative org./private sector Budget – 5 billion baht								
	4. Global warming reduction by transformation of garbage into energy. - Support local administrative org. which have the large garbage collecting area to improve energy production. Period – 2 yr (2011-2012) Organization – PCD/ONEB/Academic institute/local administrative org. Budget – 20 billion baht	✓					✓	✓	
	5. Support and strengthen garbage management into local administrative org.	✓					✓		

Sector	Projects	Typology of policies and measures							
		To influence stakeholders' behavior						To change local governments' activities	
		Regional planning & Target setting	Cap & Trade	Subsidies	Levies	Standards & Labeling	Information provision & Education	Infrastructure construction	Public procurement
	- Giving instruction, Training program, and Knowledge transfer. Period – 10 yr (2010-2019) Organization – PCD Budget – 1 billion baht per year								

Appendix III

Workshop on

National-Sub-national Linkage to Enhance Low Carbon Development at the Sub-national Level in Thailand

Jointly organized by

Institute for Global Environmental Strategies (IGES)

Thailand Environment Institute (TEI)

20 November 2012, 9:00-12:00

Vanda 1 Room, TK. Palace Hotel, Chaengwattana Rd, Bangkok, Thailand.

Objective

Institute for Global Environmental Strategies (IGES) and Thailand Environmental Institute (TEI) have conducted a study on low carbon development polices and measures at the national and sub-national level in Thailand and the potential mechanisms to link national and sub-national policies to strengthen low carbon development policies at the sub-national level under the financial support of the Ministry of the Environment, Japan since June 2012.

The workshop aims to share the study results with relevant officials, practitioners and researchers to discuss the potential of such mechanisms and to articulate the effective ideas.

Time	Topic and Speaker
08:30–09:00	Registration
09:00–09:15	Opening Remark *By Dr. Qwanruedee Chotichanathawewong* President of Thailand Environment Institute (TEI)
09:15–09:30	Introduction & Framing *Presented by: Hidenori Nakamura* Researcher, Institute for Global Environment Strategies (IGES)
09:30–10:15	State of low carbon development policies at the national/sub-national level in Thailand & State of monitoring and evaluation of policy and GHG emissions in Thailand *Presented by: Dr. Namphung Vongvanich* Researcher, Thailand Environment Institute (TEI)
10:15-10:30	Tea/Coffee Break
10:30–11:00	Potential national-sub-national linkage to enhance low carbon development at the sub-national level *Presented by: Hidenori Nakamura* Researcher, Institute for Global Environment Strategies (IGES)
11:00–11.45	Discussion and Wrap-up (all) *Moderated by Dr. Qwanruedee Chotichanathawewong* President of Thailand Environment Institute (TEI)
11:45-12:00	Closing Remark *By Dr. Qwanruedee Chotichanathawewong* President of Thailand Environment Institute (TEI)
12.00 – 13.00	Launch

20 November 2012
Bangkok, Thailand
Workshop on National-Sub-national Linkage to Enhance Low Carbon Development at the Sub-national Level in the Philippines

Potential National-Sub-national Linkage to Enhance Low Carbon Development at the Sub-national Level

Hidenori Nakamura, Ph.D.
Institute for Global Environmental Strategies

Objective

"What kinds of institutional mechanisms of national mitigation actions would enhance low carbon development at the sub-national level?"

To answer the above question, the presentation aims

- to share the important aspects of the *national-level institutional mechanisms* to enhance *effective* low carbon development at the *sub-national level*
- to show the options of *potential national-sub-national linkage mechanisms* and to articulate the *effective* ideas

2

Division of Responsibilities between National and Sub-national Governments

Planning and implementation

Only implementation

Sector	# of Low Carbon Dev't Policies & Measures	National Government (# of P/M in charge)	Provincial Government (# of P/M in charge)	City/Municipal Government (# of P/M in
Energy	10	10	2	2
Transport	8	8	3	3
Building	1	1	0	0
Industry	3	3	0	0
Waste and Wastewater	11	11	5	5
Agriculture	4	4	1	1
Forestry	7	7	5	5

3

Source: TEI (2012)

Four Things to be Considered for National and Sub-national Linkage Mechanisms

4

1. Incentive Provision and Ownership Development

Example 1: The secretariat of international intercity network programmes to promote sustainable development (CITYNET and ICLEI Southeast Asia)

- Properly *understanding the particular needs* of participating cities
- Providing them with *useful opportunities*
- Nurturing ownership and commitment through
  - — *Calls for proposals*
  - — *Requests for action planning*
  - — *Requiring commitment of political leader*
  - — *Monitoring* during the network activities

6

Sources: Nakamura (2011)

1. Incentive Provision and Ownership Development

Example 2: Social lending for Education for All – Fast Tack Initiative (EFA-FTI) (World Bank)

- Results-based lending which disbursed *payment after predefined results* are attained and verified
- *Conditions to be met before the implementation*, such as appropriate action planning and submission, appropriate division of financial cost bearing, and transparent budget management and accounting

Example 3: Incentive grant mechanism for sub-national governments in climate change mitigation (UK)

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Sources: Honorati et al. (2011), DEFRA (2006)

Potential Risk of Incentive/Performance-based Mechanism

Incentive mechanism may deteriorate the *motivations* in the case where *good intention and efforts* did not result in *good performance*

Fail-safe and incentive adjustment approach

•*First* national government *lets local governments to set feasible initial GHG reduction target* by sector or programme, which will be monitored as performance later

•*Then* national government also distributes *mixed fail-safe (intention/trial-based) and performance-based funding* to local governments to innovate and implement GHG emissions reduction polices

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Sources: Aoki and Aoki (2010)

Funding Incentive Mechanisms

National governments could utilise *pooled fund* using international support or Nationally Appropriate Mitigation Actions (NAMAs) financing by donor

Sources: Chen (2010)

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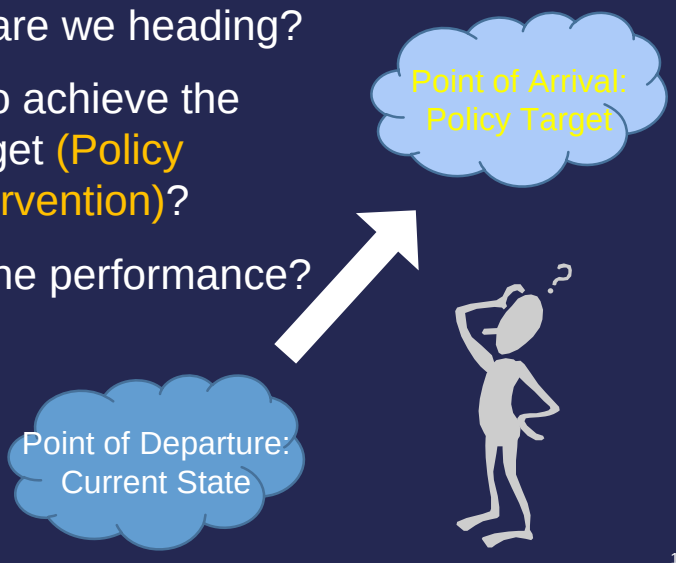
Where are we now?

Where are we heading?

How to achieve the target (Policy Intervention)?

How is the performance?



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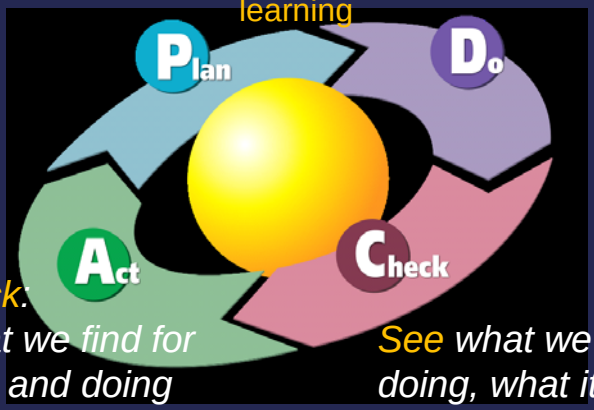
2. Effective Monitoring and Evaluation of Policies

Institutionalised M&E for discipline and learning



Feedback:
Use what we find for planning and doing

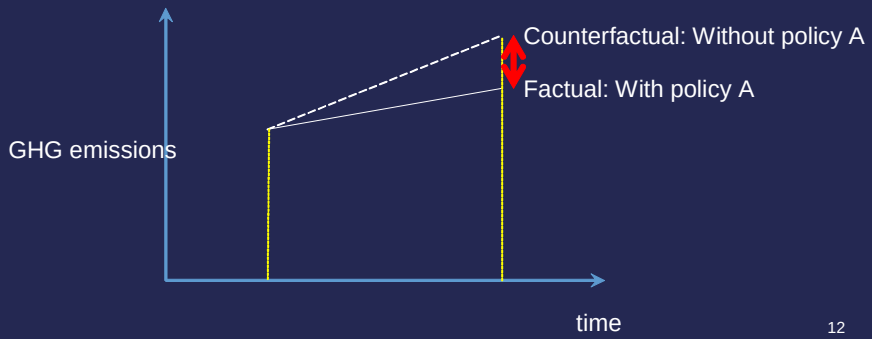
See what we are doing, what it causes

11

Comparison: Factual and Counterfactual

Context – *policy intervention*	Results
Factual: With Policy A	Observed
Counterfactual: Without Policy A	Unobserved

Difference: Effects of policy



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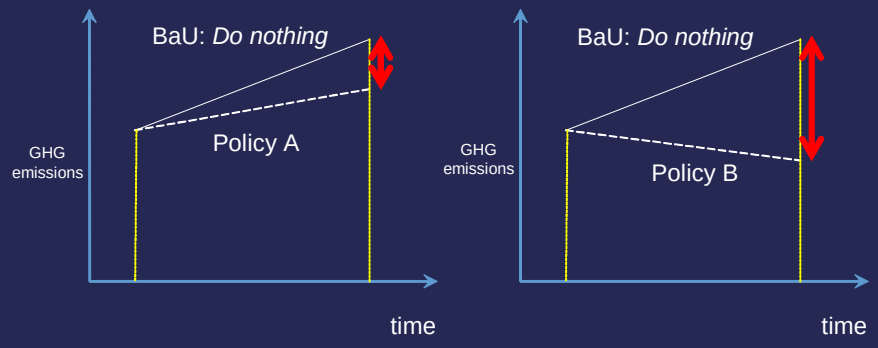
Comparison: Policy Alternatives

Expected Effects of Policies A & B



Cf. Other factors: Costs, Capacity, Political Difficulties, etc.

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3. Diverse Local Conditions

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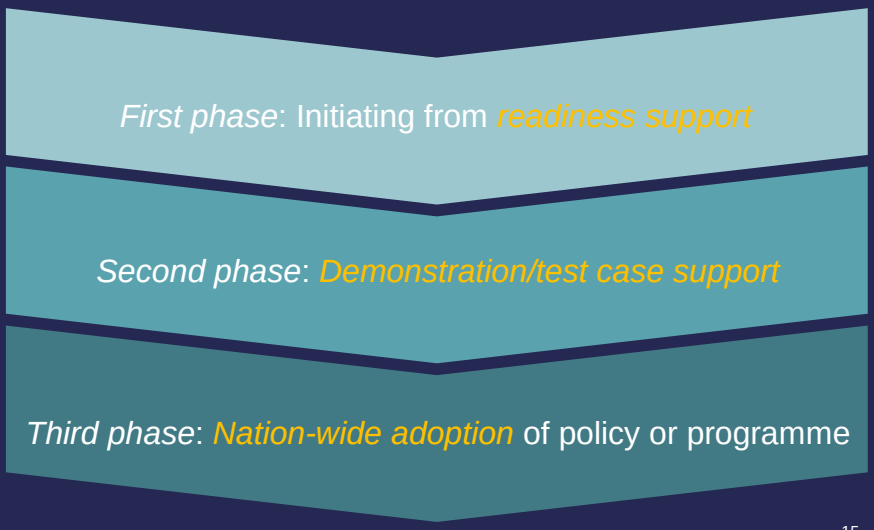
Example 1: Phased approach taken for Reducing Emission from Deforestation and Forest Degradation (*REDD+*)



Source: Yamanoshita (2012)

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Example 2: EU Regional and Urban Policy Support Mechanism

- *Programme-based* (not project-based) *funding* for particular objectives, *bottom-up* vision development and policy competition
- *Different grant ratio* for different regions with *different economic/financial level*
- "Sense of pride" by even small amount of subsidies
- Focus on "*policy-integration orientation*"
  - *Public investment & Economic development*
  - *Building reform & Social policy* (unemployment)
  - *Infrastructure reconstruction & Residents participation*

  → Integration of low carbon (GHG emissions reduction) *&* development for the case of climate (*co-benefits approach*)

Source: Okabe (2003)

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Example 3: Case Study of a Japanese Advanced City - Hiroshima

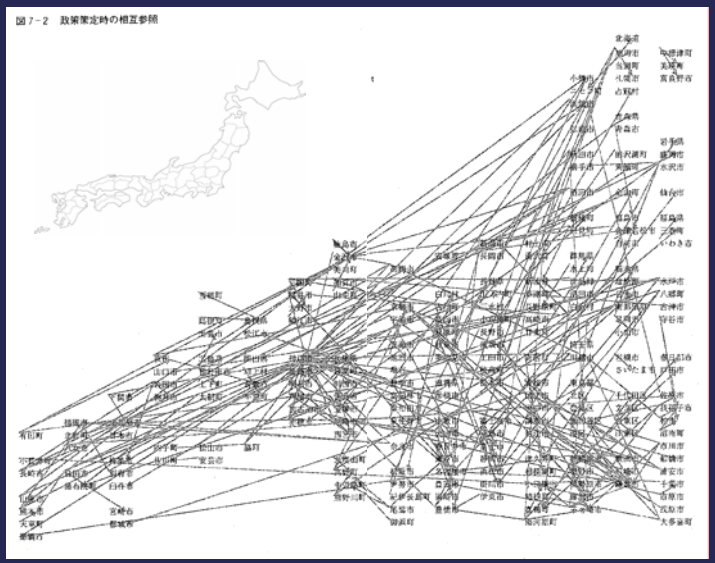
- Significance of *coherence* between *low carbon development policies* and *local issues* to be solved and initiatives taken in the past (*co-benefits approach*)
- *Political leadership* shown by Mayor promotes justification and relevance of *new* low carbon development policy by *drawing different reasons in various contexts in the city*
  - Coherence with City Basic Plan and Future Vision
  - Coherence with initiatives taken in the past
  - Coherence with promoting local residents' welfare

"Provide *three* reasons to justify new policy/project when requesting budget" – a Japanese government official

Source: Hosei University (2012)

17

Mutual Reference among Japanese Sub-national Governments



Source: Itoh (2006)

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4. Support of Policy Diffusion and Mutual Learning

Mutual Reference among Sub-national Governments in Japan

- Copying
- Emulation
- Mixtures
- Inspiration

Local Policies Studied
Environmental Impact Assessment
Environmental Basic Ordinance
Information Disclosure Ordinance
Welfare Development Ordinance
Landscape Conservation Ordinance

Policy Diffusion ✖ Policy Evolution with Diversification and Selection

Source: Itoh (2006)

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Key Factors for Sub-national Policy Diffusion in Japan

- Sub-national governments are
  - Proactive in *information and experience disclosure* and *searching on the internet*
  - Proactive in *organisational and individual networking* activities
- Existence of *promoting agency that supports knowledge production and dissemination* (← National government can play a role)

Source: Itoh (2006)

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Ideas for National and Sub-national Linkage Mechanisms

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Possible Options of National and Sub-national Linkage Mechanisms

Phased approach

- *First phase*: National government could assist the efforts of limited number of advanced provinces/cities by providing support of low carbon development planning and inventory development (Low Carbon City project)
  - Still difficult let all sub-national governments to prepare low carbon development polices
  - Selected advanced provincial/city governments (Bangkok, Muangklang) have developed and implemented their own low carbon development policies
- *Second phase*: National government would extend *fail-safe and performance-based grant* mechanism to support sector-specific projects
  - Such as those in *solid waste management* (sanitary landfill and composting), *building energy efficiency* improvement, and *renewable* power generation
  - Soliciting the commitment of wilful provinces/cities/municipalities

Effective M&E mechanisms as a common basis

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Appendix V

List of workshop participants

No. Name Organization

1. Sirinthon Vongsoasup

Department of Alternative Energy Development and Efficiency (DEDE), Ministry of Energy

2. Wiriya Puntub

Thailand Greenhouse Gas Management Organization (TGO)

3. Wisanu pholpho

Thailand Greenhouse Gas Management Organization (TGO)

4. Mewadee sareesateansup

Thailand Greenhouse Gas Management Organization (TGO)

5. Assoc. Prof. Dr. Sirintornthep Towprayoon

The Joint Graduate School of Energy and Environment (JGSEE), King Mongkut's Univeristy of Technology Thonburi (KMUTT)

6. Laddawan Kumpa

Office of the National Economic and Social Development Board (NESDB)

7. Somchai Chariyacharoen (Delegate)

Muang Klang Municipality

8. Siwat Sripetpun

Bangkok Metropolitan Administration

9. Thanaporn Kemdang

Bangkok Metropolitan Administration

10. Vorapoch Aungkasit

King Mongkut's University of Technology Thonburi

11. Teeranunta Ritmanee

King Mongkut's University of Technology Thonburi

12. Waraporn Kunawanakit

Electricity Generating Authority of Thailand

13. Panit Thedsuttironnaphom

Electricity Generating Authority of Thailand

14. Apinya Wisuttiwat

Electricity Generating Authority of Thailand