Japan International Cooperation Agency
Thailand Greenhouse Gas Management Organization

The Project for Capacity Development and Institutional Strengthening for GHG Mitigation in the Kingdom of Thailand

Project Activity Completion Report

March 2012

Oriental Consultants Co., Ltd.

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Table of contents

Deliverables

1. Presentation materials for trainings
2. Training materials, Trainers guideline
3. PIN/PDD
4. Database structure

Abbreviation

Abbreviation	Description
A/R	Afforestation/ Reforestation
AFOLU	Agriculture, Forestry and Other Land Use
BMA	Bangkok Metropolitan Administration
C/P	Counterpart Personnel
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CPA	CDM Programme Activity
CTC	Climate Thailand Conference
DEDE	Department of Alternative Energy Development and Efficiency
DMCR	Department of Marine and Coastal Resources
DOE	Designated Operational Entity
EU-ETS	European Emission Trading Scheme
GHG	Greenhouse Gas
IC/R	Inception Report
IPCC	Intergovernmental Panel on Climate Change
IPPU	Industrial Process and Product Use
JCC	Joint Coordination Committee
JGSEE	Joint Graduate School of Energy and Environment
JICA	Japan International Cooperation Agency
J-VER	Japan Verified Emission Reduction
LCA	Life Cycle Assessment
LOI	Letter of Intent
M/M	Minutes of Meeting
MNRE	Ministry of Natural Resources and Environment
MRV	Measure, Report, Verify
NAMA	Nationally Appropriate Mitigation Action
ONEP	Office of Natural Resources and Environmental Policy and Planning
PDD	Project Design Document
PDM	Project Design Matrix
PIN	Project Idea Note
PoA	Programme of Activities
QA/QC	Quality Assurance/ Quality Control
R/D	Record of Discussions
REDD	Reducing Emissions from Deforestation and Forest Degradation
RFD	Royal Forestry Department
t-CO_{2e}	ton Carbon Dioxide equivalent
TGO	Thailand Greenhouse Gas Management Organization
UNFCCC	United Nations Framework Convention of Climate Change

Chapter 1 OVERVIEW

1.1 Background

Although the Kingdom of Thailand (hereinafter referred to as "Thailand") is not imposed of any obligation to reduce GHG emissions under the Kyoto Protocol, climate change-related authorities in Thailand, particularly Thailand Greenhouse Gas Management Organization (hereinafter referred to as "TGO"), other related ministries, and local governments had been highly motivated to tackle the implementation of mitigation measures for climate change. This has been also demonstrated by the fact that Bangkok Metropolitan Administration (BMA) had established an action plan for GHG emissions reduction. At national level, the Government of Thailand issued the "National Strategy on Climate Change 2008 - 2011" in January 2008 to enhance the cooperative policy among the ministries, in which six strategies were also stipulated to identify and react to important climate change issues.

TGO has the task to promote and support all activities related to climate change mitigation in Thailand, and is responsible for promoting the strategies together with the Office of Climate Change Coordination (OCCC) under the Office of Natural Resources and Environmental Policy and Planning (ONEP) of the Ministry of Natural Resources and Environment, which is responsible for establishing policies. Since TGO was a new organization, the organization had somewhat insufficient capacity and expertise in several fields that remained a room to be further improved.

In light of this situation, the government of Thailand requested Japan for technical cooperation that aims to further strengthen the capacity of TGO and stakeholders attached to climate change mitigation and CDM in Thailand and also in Southeast Asia, taking into account that TGO has a plan to play a key role of climate change mitigation center in Southeast Asia. Upon this request, Japan International Cooperation Agency (JICA) dispatched Japanese Preparatory Study Team to Thailand in May 2009 where both parties discussed the details of technical cooperation. As a result of the discussions, Record of Discussions (R/D) was agreed and signed by both parties on October 21, 2009, and the implementation of the said technical cooperation project was agreed (hereinafter referred to as the "Project").

1.2 Objective

Main objective of the Project is to enhance the capacity of TGO staff and organization so that TGO will be able to promote climate change mitigation in an even more efficient and effective manner.

Overall goal and purpose of the Project have been agreed through the preparatory study as the followings:

Overall Goal

GHG mitigation activities will be promoted in Thailand.

Project Purpose

Capacity development for human resources and institutional strengthening on GHG mitigation for TGO will be achieved.

Objectively Verifiable Indicators

a) TGO can provide technical instruction, and can promote awareness of climate change mitigation policy to the other stakeholders.

b) TGO staff level of knowledge and expertise are increased.

c) Number of training course provided by TGO is increased

Outputs

1. The level of knowledge and expertise of TGO staff on GHG mitigation will be enhanced.
2. Capacity of TGO to provide training will be enhanced.
3. Capacity of TGO to review and monitor GHG mitigation project will be enhanced.
4. Capacity of TGO to manage information on GHG mitigation will be enhanced.

1.3 Project Area

The Project covered the whole area of Thailand. The JICA Expert Team based in an office inside the TGO office in Bangkok.

1.4 Counterpart Agency

The counterpart agency of the Project is TGO, which was established under Ministry of Natural Resources and Environment (MNRE), and has the task to promote and support all activities related to climate change mitigation in Thailand. TGO is responsible for promoting the implementation of national climate change strategies together with ONEP.

Project Design Matrix

Name of Project Capacity Development and Institutional Strengthening for GHG Mitigation in the Kingdom of Thailand

Target Group: TGO personnel and stakeholders related to GHG mitigation in Thailand
Term of Project: Two years

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal GHG mitigation activities will be promoted in Thailand	TGO consults at least 12 training courses for stakeholders utilizing achievements of project by the end of 2014. At least one new GHG inventory report is produced by the end of 2014. Methodologies for TVER are proposed to TGO Board by the end of 2012.	TGO Annual Report Inventory report of Thailand	
Project Purpose Capacity development for human resources and institutional strengthening on GHG mitigation for TGO will be achieved.	TGO can provide technical instruction, and can promote awareness of climate change mitigation policy to the other stakeholders. TGO staff level of knowledge and expertise are increased. Number of training course provided by TGO is increased	Capacity assessment through survey and questionnaire to individual staff of TGO./Capacity assessment through survey and questionnaire to TGO and relevant stakeholders. TGO Annual Report/ Project Report.	CDM resume will remain
Output 1. The level of knowledge and expertise of TGO staff on GHG mitigation will be enhanced.	Score of the Capacity Development Progress Evaluation Check list is increased. More than 50 % of submitted post training test are evaluated as “good” or “fair”.	Capacity assessment through Capacity Development Progress Evaluation Check List	Duties and responsibilities of TGO will not be changed. Budget for TGO is secured by the Government of Thailand
2. Capacity of TGO to provide training will be enhanced.	Curriculum and training material will be produced. Series of training courses are designed	Curriculum and training material/Training courses plan	
3. Capacity of TGO to review and monitor GHG mitigation project will be enhanced.	PIN and/or PDD of pilot project(s) are developed.	PIN and/or PDD of pilot project(s) list /TGO report	
4. Capacity of TGO to manage information on GHG mitigation will be enhanced.	TGO website provides comprehensive information on GHG mitigation measures including CDM. Database of TGO is improved.	TGO website access data TGO database	
Activity 0 Conduct capacity assessment of TGO 1. Conduct training for TGO staff 1-1. CDM 1-2 Credit transfer 1-3 GHG mitigation 1-4 UNFCCC structure and negotiations 1-5 Carbon footprint 1-6 GHG Inventory 2 Develop training curriculum and materials 2-1. CDM 2-2 Credit transfer 2-3 GHG mitigation 2-4 UNFCCC structure and negotiations 2-5 Carbon footprint 2-6 GHG Inventory 3-1 Make a list of potential pilot project 3-2 Set the criteria for selection of pilot project(s) 3-3 Select the pilot project(s) 3-4 Prepare PIN and PDD of pilot project(s) 3-5 Conduct monitoring exercise based on registered CDM project(s) on a pilot basis in light of the SD criteria in Thailand and a monitoring plan as defined on PDD 3-6 Conduct a workshop or seminar to disseminate the experience of formation of PIN or PDD 4-1 Website 4-2 Database	Inputs 1 Japanese side 1) Experts 2) Training in Japan 3) Training in Thailand 4) Equipment 5) Project operation cost for Japanese experts 2 Thai side 1) Counterpart personnel 2) Office space and facilities 3) Local miscellaneous c		Preconditions Financial and human resources are allocated to TGO to implement the project during the project period

This PDM is proposed by JICA Expert Team based on PDM agreed between JICA and C/P in order to evaluate output appropriately.

1.5 Scope of Work

The Project was implemented in accordance with M/M signed on October 21, 2009. The Project was implemented in accordance with the specific instructions given by JICA.

1.6 Outline of the Project

Three major points improved in order to achieve the Project objectives include the followings:

a) Systematization and update of knowledge and expertise of TGO and technical training tool

It was considered TGO staff already had fundamental knowledge on climate change mitigation, especially they were able to have technical guidance stakeholders because they had been implemented many seminars on CDM, and capacity development and institutional strengthening.

However, in order to implement overall mitigation actions on climate change such as those depicted in national climate change strategy or BMA action plan and to promote technical assistance and dissemination, the knowledge of individual TGO staff needed to be even more systematized and updated to the level where each personnel has comprehensive understanding about, for example, applicable technologies for climate change mitigation, detailed CDM procedures and methodologies, carbon trading and international negotiations over post-Kyoto mechanism.

Furthermore, in order to provide technical assistance and dissemination to stakeholders even more efficiently and effectively, it was necessary to develop technical teaching tools based on well-systematized and most up-to-date information on overall theme on climate change.

b) TGO's capacity to evaluate and provide technical assistance and dissemination for all sectors including priority, because CDM sectors had been distorted to biogas biomass sectors

As of January 2010, among the 37 CDM projects from Thailand that had been registered to the United Nations/ currently under review/ corrections requested, more than 80% of the projects were from biomass and biogas sectors; 24 projects related to biogas using animal manure or wastewater, 7 from biomass use such as bagasse, palm waste, and rice husk, 3 from waste energy recovery at cement factory, and 2 from LFG recovery and energy use.

Similarly, among the 113 CDM projects including those under validation process, nearly 80% of them were from the same two sectors (67 from biogas and 22 from biomass). Although seven projects from the renewable energy sector (excluding biomass and biogas) were in the list, the proportion to all projects was very limited.

As shown in the above data, formulation of the CDM projects were relatively slow in two of the priority sectors mentioned in the Strategy 2 "promotion of reduction of GHG emission based on sustainable development" of the "National Strategy on Climate Change 2008-2011," which are 1) to "Promote greenhouse gas mitigation in the energy sector through improving energy efficiency, promoting renewable energy" including a) raise production efficiency and electricity utilization, b) increasing efficiency of energy utilization and saving in the mass transportation sector, c) supporting and developing utilization of renewable energy and 2) to "Increase carbon sinks." Same situation can be applied to priority sectors of BMA action plan, which include transportation sector, energy efficiency sector, and renewable energy sector.

And therefore, it is essential to enhance project formulation in sectors other than biomass and biogas sectors in order to broaden the country's climate change mitigation measures. In addition, it is important to enhance TGO's capacity to evaluate and promote such priority sectors as transportation, energy efficiency, renewable energy, and forestry, which were the sectors TGO had not had so much opportunity to be involved with. It was considered, on the other hand, TGO had sufficient project formulation and evaluation capacity and experience in other sectors such as biomass and biogas, and LFG recovery and energy use.

c) More efficient and effective information management and supply

TGO had been preparing the GHG emission inventory for energy, industry, agriculture, and forestry sectors, which was expected to be used to establish policies and action plans on climate change mitigation. TGO also had a plan to build a network system on GHG emission inventory using internet.

Although it was considered that TGO had sufficient function of information supply as well as information management, as observed in the monthly newsletter published on their website, it was still important to upgrade to even more efficient and effective system by improving website and database.

In order to improve the points mentioned above, following four capacity development

assistance activities for human resources and organization was provided under the technical cooperation project.

1) Enhancement of level of knowledge and expertise of TGO staff on GHG mitigation

TGO and JICA Expert Team jointly conducted trainings on 6 topics, i.e. CDM, carbon trading, GHG mitigation in relevant sectors, UNFCCC structure and negotiations, carbon footprint, and GHG inventory. Climate change-related ministries and local governments participated in the training courses.

2) Enhancement of capacity level of TGO staff on training provision

TGO and JICA Expert Team jointly developed technical training tools (training curriculum and materials) that will be used by TGO staff when training the stakeholders related on climate change mitigation in Thailand and abroad. The training tool covered six subjects, i.e. CDM, carbon trading, GHG mitigation in relevant sectors, UNFCCC structure and negotiations, carbon footprint, and GHG inventory. The training activity for trainers was also carried out for TGO staff.

3) Enhancement of review and monitoring capacity of TGO staff

TGO and JICA Expert Team as well as climate change related ministries in Thailand jointly developed a list of potential climate change mitigation projects from all sectors including priority sectors of Thailand. PINs and PDDs of the prospective CDM projects were developed and monitoring exercise was conducted.

4) Enhancement of capacity of TGO staff on information management on GHG mitigation

TGO and JICA Expert Team jointly updated TGO website. GHG inventory database was also established where TGO designed the interface, input the data, calculated inventory and developed reporting system with technical assistance from JICA Expert Team.

Through above-mentioned activities, four Project Outputs for corresponding activity were achieved, which designed to achieve the Project Purpose “Capacity development for human resources and institutional strengthening on GHG mitigation for TGO.”

1.7 Implementation Approach

JICA Expert Team took into full consideration the following project implementation approaches so that TGO and climate change related stakeholders will be able to continuously and self-reliantly formulate and promote climate change mitigation projects as a result of the Japanese technical cooperation project.

1) Principle of technical cooperation

JICA Expert Team provided technical advice and support to TGO so that TGO, as a main agency that is responsible for the promotion and assistance on all GHG emission reduction activities of Thailand, will be able to continuously and self-reliantly assist climate change related stakeholders even after the completion of the Project.

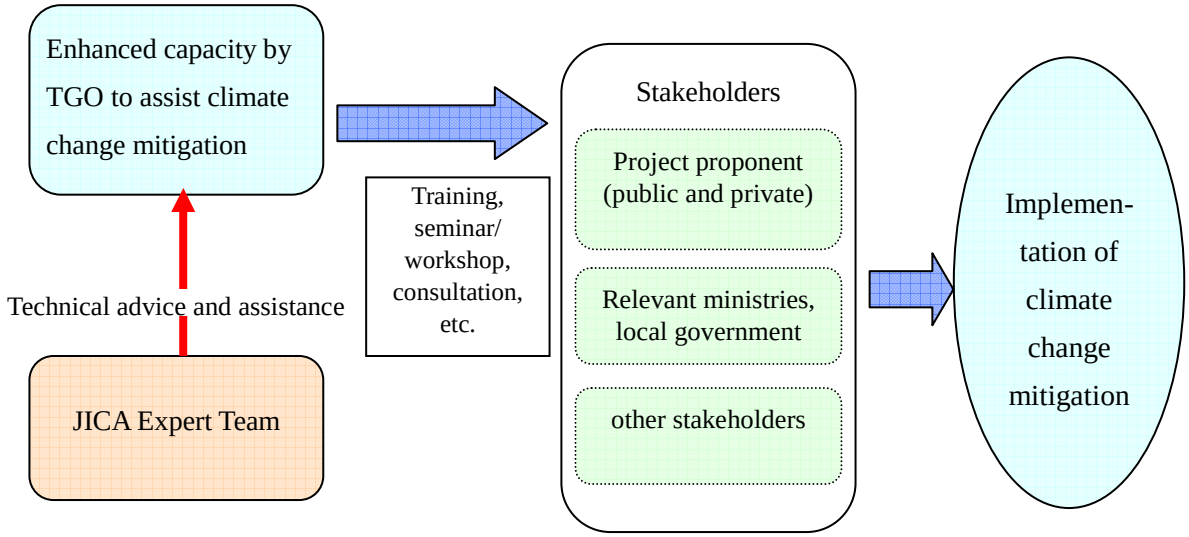


Figure 1-1 Concept of technical cooperation

2) Capacity assessment and regular capacity check

JICA Expert Team, through close discussions with TGO and capacity assessment at the beginning of the Project, identified the points of TGO and stakeholders' capacity where had room for improving, and established the capacity goal.

The capacity assessment of TGO was carried out using capacity development evaluation test (multiple-choice and written test). The level of achieved capacity development was checked by interim evaluation and final evaluation on February 2011 and January 2012, respectively.

3) Working Team

In implementing the Project, it was necessary to have a close relationship with various climate change-related actors in Thailand including not only TGO but also other climate change related ministries that have the authority to supervise and approve related projects and also may act as a project implementing body.

For this reason, a working team that consists of TGO, JICA Expert Team, staff from related institutions was established. The working team played a main role in the actual implementation of the Project.

More specifically, a project activity involving preparation of potential project list was jointly carried out with these institutions and information was shared extensively among working team members. Moreover, in selecting pilot projects for PIN and PDD development, several projects from a sector/ field which those institutions have high priority were selected. Developed PINs/ PDDs were shared with them and also technical know-how about PIN/ PDD writing and project formulation was transferred to them through study sessions.

The goal of this implementation approach is that staff from these institutions will be able to play a central role in their own institutions in promoting and formulating climate change mitigation projects after the completion of the technical cooperation Project.

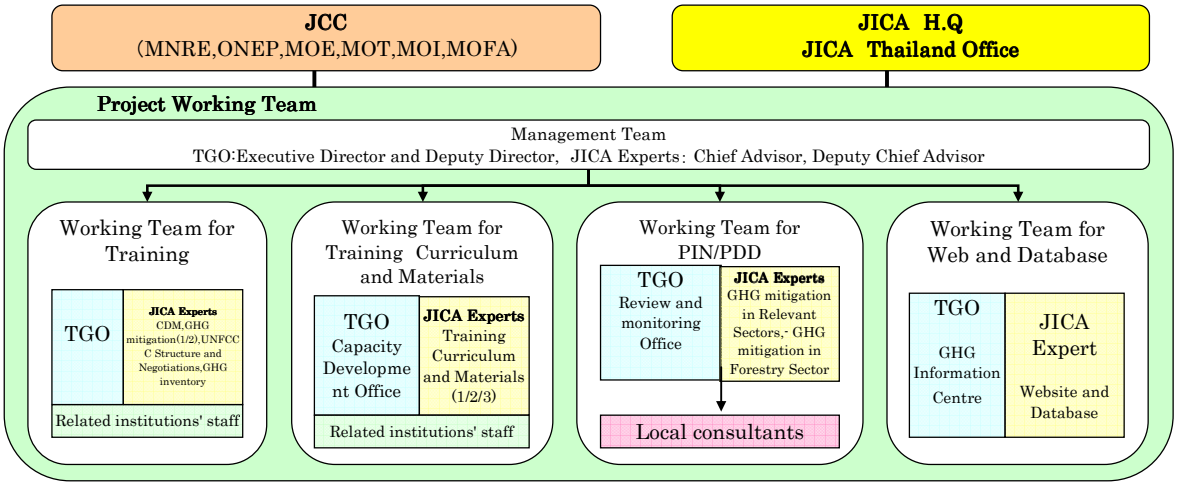


Figure 1-2 Scheme of Project Working Teams

4) Study sessions

Workshop-style study sessions for preparation of training tool (training curriculum and materials) and development of PIN/ PDD were held where TGO, JICA Expert Team joined.

In addition to the regular training sessions under Activity 1, internal study sessions on GHG inventory topics were conducted for TGO based on a request from TGO.

For training material preparation activity, sub-working teams for training material development were organized under the project working team. Study sessions were held regularly where assignment was given to each sub working team member.

Similarly, for PIN/ PDD development activity, sub-working teams for PIN/PDD development were organized and another set of study sessions was held. In a PIN/PDD session, assignment was given to each working team member who prepared the initial draft of PIN or PDD, and through various discussions among working team, members completed the assigned document. Through this process, participants was able to further understand the key issues in climate change mitigation especially CDM.

5) Joint Coordinating Committee (JCC)

The Project was implemented with close cooperation with the Joint Coordinating Committee (JCC), an advisory team, which consists of related institutions. JCC was utilized in sharing the outcomes and making a request to those ministries for project information.

6) Promotion and publication

Since TGO has been publishing a monthly newsletter, a column was allocated for the Project activities in this newsletter. In this column, such information as Project goal, activities, progress, schedule of training seminar/ workshop were informed to readers. It allowed various stakeholders in Thailand and abroad to understand the objective of the technical cooperation and also share outcomes.

7) Cooperation with local consultants

The Project employed local consultants in order to collect and compile data and information of potential projects to develop PINs/ PDDs.

8) Cooperation with other entities and donors

Project outputs were shared through close relationship, with other Japanese entities and other donors working in Thailand, with which project members exchanged information.

9) Cooperation with other departments in TGO

All technical offices and departments of TGO were requested to participate in the training seminars. JICA Expert Team provided technical advice for TGO technical offices and departments as much as possible regarding the activities that were not included in the implementation plan but were included in TGO's core activities, in order to develop the integrated capacity of TGO organization.

Chapter 2 OUTCOME OF THE PROJECT

2.1 Output 1：Enhancement of level of knowledge and expertise of TGO staff on GHG mitigation

2.1.1 Activities

2.1.1.1 Training for TGO staff

Trainings for TGO staff that aim to enhance the level of knowledge and expertise on GHG mitigation were conducted. Trainings covered the following 6 subjects:

- CDM
- Carbon Trading
- UNFCCC Structure and Negotiations
- GHG Mitigation in relevant sectors
- Carbon Footprint
- GHG Inventory

Training also aims to further develop the comprehensive capacity of TGO staff so that the TGO personnel are able to efficiently assist project proponents in Thailand and abroad. In order to achieve this goal, following points were considered in selecting the topics for the training courses:

- Integrate the most up-to-date information about international trends
- Beware of progress and key points of such trends
- Recognize Thailand's characteristics and situation in the international world, and identify ideal measures to be taken and issues to be solved in Thailand
- Organize courses in a small group and hands-on exercise training in order to enhance further understanding from each participant

Types of trainings were mainly lecture-style where participants "listen" to the lecturer, but workshop-style trainings where he/she tried to "think" and tried "hands-on exercise" were also be extensively incorporated. Detailed training program was determined based on discussions with TGO. Final program is provided in the table below.

Table 2-1 Training program

Items	Training Topics	Date	No.
CDM	1. Background and history of CDM/ current situation and issues	20/4/2010	CDM1
	2. Technical aspects of baseline determination	27/4/2010	CDM2
	3. Overview of large-scale/small-scale methodologies	25/5/2010	CDM3
	4. Technical aspects of additionality demonstration	6/7/2010	CDM4
	5. Measures to obtain CER of CDM project	7/9/2010	CDM5
	6. Validation and Verification including communication with DOE	7/9/2010	CDM6
	7. Overview of programmatic CDM (PoA)	21/9/2010	CDM7
	8. Exercise: Programmatic CDM (PoA)	21/9/2010	CDM8
	9. Development of CDM project activity	28/9/2010	CDM9
	10. AR-CDM/current situation and issues	23/11/2010	CDM10
Carbon Trading	1. Background, history and overview of carbon trading markets in the world	20/4/2010	CT1
	2. Overview of European Emission Trading System (EU-ETS) and Tokyo ETS (T-CAT)	27/4/2010	CT2
	3. Overview of emission trading systems in the United States, and future international trading system in post 2012	22/6/2010	CT3
	4. Overview of voluntary emission trading system in Japan - J-VER	29/6/2010	CT4
	5. Overview of national registry system	6/7/2010	CT5
	6. Japan's Voluntary Emissions Trading Scheme (JVETS)	10/5/2011	CT6
UNFCCC Structure and Negotiations	1. Overview of UNFCCC and international negotiations: from establishment to present	20/4/2010	UN1
	2. UNFCCC and key international negotiations after COP 3	4/27/2010	UN2
	3. Overview of international negotiations over post-2012 mechanisms	25/5/2010	UN3
	4. Overview of international negotiations by EU and the United States over post-2012 mechanisms	22/6/2010	UN4
	5. MRV/NAMA/ SCM	29/6/2010	UN5
	6. Exercise: MRV/NAMA/SCM	29/6/2010	UN6
	7. REDD/ carbon sink	6/7/2010	UN7
	8. Exercise: REDD/ carbon sink	6/7/2010	UN8
	9. UNFCCC Structure & Negotiations :Technology Transfer	1/11/2011	UN9
	10. Exercise: UNFCCC Structure & Negotiations :Technology Transfer	1/11/2011	UN10
GHG Mitigation in relevant sectors	1. International trend in GHG mitigation measures	28/9/2010	GHG1
	2. Monitoring of contribution to the sustainable development by mitigation measures, including co-benefit approach	19/10/2010	GHG2
	3. Importance of low carbon society/low carbon city	19/10/2010	GHG3
	4. Mitigation measures in commercial building and residential sectors	23/11/2010	GHG4
	5. Exercise: Quantification of GHG emission reduction with MRV (commercial building and residential sectors)	23/11/2010	GHG5
	6. Mitigation measures in waste management sector	23/11/2010	GHG6

Items	Training Topics	Date	No.
	7. Exercise: Quantification of GHG emission reduction with MRV (waste management sector)	23/11/2010	GHG7
	8.GHG Mitigation Measures in Energy and Industry Sectors	18/1/2011	GHG8
	9. Exercise: GHG Mitigation Measures in Energy and Industry Sectors	18/1/2011	GHG9
	10. GHG Mitigation Measures in Transportation Sector	15/2/2011	GHG10
	11. Exercise: GHG Mitigation Measures in Transportation Sector	15/2/2011	GHG11
Carbon Footprint	1. Overview of carbon footprint concept and current situation of the system in the world	12/10/2010	CFP1
	2. LCA related issues	12/10/2010	CFP2
	3. Calculation of carbon footprint	12/10/2010	CFP3
	4. Issues in implementation and dissemination of carbon footprint system	19/10/2010	CFP4
	5. Issues in carbon footprint (CFP) system for services - Example of printing services -	22/2/2011	CFP5
	6. Carbon Footprint for Organization	10/5/2011	CFP6
GHG Inventory	1. Overview of IPCC Guideline	7/9/2010	INV1
	2. Introduction of GHG inventory of Japan and Thailand	14/9/2010	INV2
	3. Overview of energy sector	14/9/2010	INV3
	4. Overview of industrial processes and product use sector (IPPU)	14/9/2010	INV4
	5. Overview of agriculture, forestry, and other land-use sector (AFOLU)	21/9/2010	INV5
	6. Overview of waste sector	28/9/2010	INV6
	7. Overview of QA/QC of IPCC Guideline and Example of QA/QC measures taken in Japan	11/1/2011	INV7
	8. Analysis of Key Categories and Assessment of Uncertainties, Example from Japanese Cases	15/2/2011	INV8
	9. Review and Practice of Greenhouse Gas Inventory	22/2/2011	INV9
	10. Exercise: Review and Practice of Greenhouse Gas Inventory	22/2/2011	INV10

As shown in the table above, 53 seminars were implemented. The participants for these seminars were the accumulative number of 450 (except JICA experts), which were 267 from TGO staff and 183 from related organizations.

The staff from the following organizations on GHG mitigation in Thailand participated in these seminars. Especially staff of BMA and organizations from the forestry sector participated positively.

- Office of Natural Resources and Environmental Policy and Planning : ONEP
- Office of Transport and Traffic Policy and Planning: OTP
- Department of Alternative Energy Development and Efficiency : DEDE
- Royal Forest Department: RDF

- Department of National Parks, Wildlife and Plant Conservation：DNP
- Forest Industry Organization：FIO
- Bangkok Metropolitan Administration: BMA
- Energy Conservation Center of Thailand
- Mahidol University
- Cheng Mai University
- PTT
- Metal and Materials Technology Center: MTEC

List of participants is shown in table below.

Table 2-2 (1) Seminar participants (TGO)

No.	Office	Name	Position
1	**Executives Office**	Mr. Sirithan Pairoj-Boriboon	Executive Director
2		Mrs. Prasertsuk Chamornmarn	Deputy Executive Director
3		Mr. Chaiwat Munchroen	Deputy Executive Director
4		Mrs. Supapak Tanasamrit	Internal Audit
5		Ms. Thitiporn Chunsano	Secretary
6		Ms. Tassana Rattanawadee	Secretary
7		Ms. Pornnapakanin Kaewpradittun	Secretary
8		Ms. Thippawan Sahatara	Secretary
9	**Administration Office**	Ms. Aimorn Saichumdee	Accounting
10		Ms. Supaporn Prakodchue	Administrative Officer
11		Mr. Visut Aeam-aram	Officer
12		Ms. Bussabongkot Deewaja	Budget Officer
13	**Policy and Strategy Office**	Ms. Natarika Wayuparb	Director
14		Ms. Tritib Suramaythangkoor	Senior Official
15		Mr. Noppayut Pichainarong	Officer
16		Mr. Thawatchai Somnam	Assistant Senior Official
17		Ms. Sinsom Sangkapong	Lawyer
18		Ms. Weerada Tivasuradej	Lawyer
19		Ms. Janyaporn Khaoklin	Project staff
20	**GHG Information Center**	Mr. Chessada Sakulku	Director
21		Ms. Wasinee Cheunban	Assistant Senior Official
22		Ms. Wararat Chaumkruea	Official
23		Ms. Mewadee Seresathiansub	Official
24		Mr. Rongphet Bunchuaidee	Assistant Senior Official
25		Ms. Thanaporn Wannasiri	Inventory Project
26	**Review and Monitoring**	Ms. Paweena Panichayapichet	Assistant Senior Official
27		Ms. Penporn Petchsri	Assistant Senior Official

No.	Office	Name	Position
28	**Office**	Ms. Puttipar Rotkittikhun	Assistant Senior Official
29		Ms. Anna Kiewchaum	Assistant Senior Official
30		Ms. Nhungruetai Chortip	Official
31		Ms. Neeracha Tridech	Official
32		Mr. Thanachart Sarnmetha	Staff
33		Mr. Pahol Savetjinda	BRESL Project
34		Mr. Sarawut Thepanondh	Staff
35	**Carbon Business Office**	Ms. Pongvipa Lohsomboon	Director
36		Ms. Nattanan Kitvorawat	Staff
37		Ms. Phakamon Supappunt	Assistant Senior Official
38		Ms. Sumon Sumetchoengprachya	Assistant Senior Official
39		Ms. Natalie Ward	Staff
40		Ms. Anothai Sangthong	Assistant Senior Official
41		Mr. Thada Varoonchotikul	Assistant Senior Official
42		Ms. Leyla Arpac	Officer
43		Mr. Nathasith Chiarawatchai	Staff
44	**Capacity Building and Outreach Office**	Mr. Jakkanit Kananurak	Director
45		Ms. Nareerat Thanakasem	Assistant Senior Official
46		Mr. Thitipong Piboolgulsamlit	Official
47		Ms. Natteera Kanjawatkul	Official
48		Ms. Natchanan Wathanachinda	Official
49		Mr. Danupat Putwatana	Staff
50		Mr. Darmp Phadungsri	Staff
51		Ms. Wiriya Puntub	BRESL Project
52		Mr. Saroj Srisai	Assistant Senior Official
53		Mr. Chinnawat Choochuen	Staff
54	**Others**	Mr. Martin Brechter	GTZ Advisor
55		Ms. Jestina Zvirblytis	-
56		Ms. Kulnara Laemthongmonkkol	-
57		Ms. Thanapom Wannasiri	-

* Office & position is as of December 2011. The list contains those who resigned TGO.

Name of 2 offices was changed during the Project period as follows:

Old) Review and Approval Office/ Monitoring and Evaluation Office
New) **Review and Monitoring Office**
Old) Marketing Office
New) **Carbon Business Office**

Table2-2 (2) Seminar participants (related organizations)

No.	Organization	Name
1	Office of Natural Resources and Environmental Policy and Planning	Mrs. Nattanich Assawaphoositkul
2		Mrs. Angkhana Chaloemphong
3	Office of Transport and Traffic Policy and Planning	Ms. Chamroon Tungpaisankij
4		Ms. Nopporn Jaroongkiat
5		Ms. Chutinathorn Praditthapong
6	Royal Forest Department	Ms. Chaiyasit Leangsiri
7		Ms. Suthad Kongyaeam
8	Department of National Parks, Wildlife and Plant Conservation	Ms. Phanumard Ladpala
9		Ms. Siri Akhaakkara
10		Ms. Chingchai Viriyabuncha
11	BMA	Ms. Suwanna Jungrungrueng
12		Ms. Woranuch Suaykakaow
13		Ms. Wantana Wuttiyingyong
14		Ms. Sawitree Srihikhet
15		Ms. Nuntiya Muangmar
16		Ms. Panyaluk
17		Ms. Siwat Sripetpun
18	Forest Industry Organization	Ms. Kieatipat Intarakasem
19		Ms. Chonlada Siripap
20		Ms. Prasert Netprachit
21		Ms. Sureepom Niyomdlam
22		Ms. Supakit Enme
23		Mr. Chiranu Wanapornboonjan
24		Mr.Supakit Enme
25		Mr.Chiranu Wanapornboonjan
26		Ms. Orasa Taesumrith
27	Department of Alternative Energy Development and Efficiency	Mr. Chaiwat
28	PTT	Ms. Aenvin
29	Energy Conservation Center of Thailand	Mr. Jirasak Boonrod
30	Mahidol University	Prof.Dr. Kitikorn Jamorndusit
31		Mr.Phanuwat Prasertpong
32		Dr. Panjaporn Werchayanwiwat
33		Mr. Suwin Apichartpattanasiri
34		Mr. Poonperm Wanta
35	Chiang Mai University	Ms. Natanee Vorayos
36	Delta Electronics	Ms. Khanittha Tupchai
37		Mr. Saroj Rueangsakulrat
38	MTEC	Mr. Athiwat Jirajariyawet
39		Ms. Pornpimol Boonkum
40		Ms. Ruethairat Wisalsuwankorn
41		Ms. Janthima Uthaka
42		Ms. Kamalaporn Poompradab
43		Ms. Ruethai Trungkawachirakul
44		Ms. Tatsaneewan Chom-in

In many training sessions, JICA expert provided lecture in English and then TGO staff summarized the lecture in Thai in order to help training participants to understand even more

profoundly.

Some sessions include both "lecture-style" and "workshop-style" course. In these sessions, after the lecture was provided by JICA expert, participants discussed about the subjects related to the session topic in a small group, and a representative from each group presented their conclusion. Through the discussion, participants were able to deepen their knowledge obtained in the lecture. Those who participated in the seminars positively asked questions to the lecturers and joined the discussions.

Some of the main points discussed during each training session are summarized in Table 2-3 below.

Table 2-3 Overview of training sessions

Session 1		**20/04/2010, 9: 00-16: 30**
Participant		Total: 69 (TGO: 30 , Climate change-related ministries and organization: 25, JICA and Other: 14)
Theme/Topic		CDM1: Background and history of CDM/ current situation and issues CT1: Background, history and overview of carbon trading markets in the world UN1: Overview of UNFCCC and international negotiations: from establishment to present
Points of discussion	CDM1	• Discussed the context of "Positive List" and why it was not approved. • Discussed the use of Official Development Assistant for CDM project. • Discussed dominancy by Non-CO2 project and its limited number of projects. • Discussed additionality demonstration of the project for energy efficiency improvement. • Discussed uneven distribution of CDM projects.
	CT1	• Discussed viewpoint of carbon trading buyer. • Discussed punishment system in The Regional Greenhouse Gas Initiative (RGGI).
	UN1	• Discussed negotiation of USA in establishment of Kyoto protocol. • Discussed outcome of Copenhagen Accord, especially target of each country.
Session 2		**27/04/2010, 10: 00 -16: 30**
Participant		Total: 46 (TGO: 25, Climate change-related ministries and organization: 14, JICA and Other: 7)
Theme/Topic		CDM2: Technical aspects of baseline determination (includes exercise) CT2: Overview of European Emission Trading System (EU-ETS) and Tokyo ETS UN2: UNFCCC and key international negotiations after COP 3
Points of discussion	CDM2	• Discussed determination of baseline scenario. - Participants conducted exercise in order to understand how to determine the baseline scenario using actual biogas project in Thailand. -Discussed about each step stipulated in applied methodology, including analysis on compliance with laws and barriers.
	CT2	• Discussed main exchange markets in EU-ETS. • Discussed current and future value of EUA and CER. • Discussed fluctuation of the trading price of EUA. • Discussed a character of T-CAP as a voluntary market.
	UN2	• Discussed shortcoming of Kyoto mechanism such as "Low hanging fruits". • Discussed the role of NGO in negotiation of climate change.

Session 3		**25 /05/ 2010, 13: 00-16: 30**
Participant		Total: 34 (TGO: 18 , Climate change-related ministries and organization: 10 , JICA and Other : 6)
Theme/Topic		CDM3: Overview of large-scale/small-scale methodologies UN3: Overview of international negotiations over post-2012 mechanisms
Points of discussion	CDM3	• Discussed methodologies that are not applied to any registered projects. • Discussed methodologies that have been combined from other methodologies (e.g. AM0002, AM0013). • Discussed the methodologies which will be suitable in Thailand present and future as exercise (Group discussion). - AMS-I.D, AMS-III.H and ACM0014 are useful in Thailand at present, because there is a big potential in biogas, biomass and electricity generation from waste water. - ACM0016, AMS-II.C and AMS-II.J will be useful in Thailand for the future, because it is very important for sustainable development to promote transportation project, energy efficiency improvement project and electricity generation from waste materials. It is also suitable in Thailand to promote program of activity for CDM implementation. • Other discussion and question - Definition of Renewable biomass, - Registered project using AMS-III-E
	UN3	• Discussed determination of target of post Kyoto protocol, baseline of each country.
Session 4		**22/06/2010, 10: 00-16: 30**
Participant		Total: 41 (TGO: 23, Climate change-related ministries and organization: 14, JICA and Other : 4)
Theme/Topic		CDM4: Technical aspects of additionality demonstration CT3: Overview of emission trading systems in the United States, and future international trading system in post 2012 UN4: Overview of international negotiations by EU and the United States over post-2012 mechanisms
Points of discussion	CDM4	• Discussed additionality demonstration using actual CDM project in Thailand which are under review by the CDM Executive Board (CDM-EB) (Group discussion). • Suggested to TGO that it is more credible to demonstrate additionality by using numerical grounds. Although project proponent tries to demonstrate additionality by using barrier analysis, CDM EB requires using investment analysis to show additionality in many cases.
	CT3 UN4	• Discussed following items; -What kind of GHG emission reduction projects (forest, electricity, renewable energy, waste, etc…) should be developed in Thailand? -Who are main partners (Japan, USA, EU, Canada etc…) to develop the projects and to sell carbon credits? • Suggested to participants that it is important to consider NAMA, instead of focusing only on CDM, as a means to buy and sell a carbon credit in the near future, considering the current situation of UN negotiations. It is very important for the Non-Annex1 country to select trade partner country and select trade sector and method. For Thailand, it will be taken consider the matching between own potential and demands in partner country.

Session 5		**29/06/2010, 10: 00-16: 30**
Participant		Total: 29 (TGO: 16, Climate change-related ministries and organization: 9, JICA and Other : 4)
Theme/Topic		CT4: Overview of voluntary emission trading system in Japan - J-VER UN5 and UN6: MRV/NAMA/SCM (Lecture and exercise)
Points of discussion	CT4	• Discussed following items on J-VER - Is validation by DOE is necessary to get credit? - How much time does it take to get credit? - Who is project proponent? Private or public? - Who buys J-VER credit? Why do they buy it although price of J-VER credit is higher than that of CER? Do they have any incentive? - Is there check system in J-VER scheme to confirm the system work correctly?
	UN5 UN6	• Discussed which of the two example project (1) Reforestation projects in rural areas, and 2) Municipal solid waste management projects in urban areas) is suitable among NAMA, SCM, T-VER (voluntary carbon trading system in Thailand) according to current discussion on MRV, SCM, T-VER. (Group discussion) • Suggested to TGO and related ministries and organization about the prediction of future trading of NAMA/SCM credit.
Session 6		**06/07/2010, 10: 00-16: 30**
Participant		Total: 23 persons (TGO: 11 persons, Climate change-related ministries and organization: 8 persons, JICA and Other : 4 persons)
Theme/Topic		CT5: Overview of national registry system UN7 and 8: REDD/ carbon sink(lecture and exercise)
Points of discussion	CT5	• Discussed the current situation and the future of national registry system - National registry system of EU countries can resister with International Transaction Log (ITL) and EU registry system both. Asian countries will be able to establish the system as well as EU in the future.
	UN7 UN8	• Discussed the current situation of forestry in Thailand in order to help participants understand REDD/ carbon sink in detail. (Presentation was provided by DNP) • Discussed REDD potential projects in Thailand and expected project participants. • Suggested to TGO and related ministries and organization that it is important to consider local community and its socio-economy, when REDD project is promoted in Thailand, because the illegal occupation (by residence/ farming activity/ finish farming activity) is currently in place in protected forest area in Thailand. In order to promote REDD project, it is important to consider life of local people including illegally occupying residents.
Session 7		**7/9/2010, 10:00-16:30**
Participant		Total: 36 (TGO: 14, Climate change-related organizations: 11, JICA and Other: 11)
Theme/Topic		CDM5: Measures to obtain CER of CDM project CDM6: Validation and Verification including communication with DOE INV1: Overview of IPCC Guideline
Points of discussion	CDM 5	• Discussed major technical issues that CDM project proponents often find pitfalls in obtaining CERs. • Suggested to TGO that it is important in order to avoid such problems, to inspect of several cases carefully.
	CDM 6	• Discussed several key points in selecting DOE, including • Relevant experience from same sector, or knowledge about CDM.
	INV1	• Discussed importance of developing the GHG inventory in Thailand, difficulty of obtaining reliable statistic data, and importance of developing incentive by related institutions. • Suggested to TGO that it is important to utilize the GHG inventory to set the target and strategy for GHG emission reduction, and to conduct monitoring.

Session 8		**14/9/2010, 10:00-16:30**
Participant		Total: 19 (TGO: 3, Climate change-related organizations: 7, JICA and Other: 9)
Theme/Topic		INV2: Introduction of GHG inventory of Japan and Thailand INV3: Overview of energy sector INV4: Overview of industrial processes and product use sector (IPPU)
Points of discussion	INV2	• Discussed current situation of the data collection for GHG inventory in Japan and Thailand. • Noted that there are some issues in obtaining statistical data especially in agriculture and forest sector inventory of Thailand.
	INV3	• Discussed how to decide and/or use Tier of IPCC guideline for GHG inventory. • Discussed how to develop the GHG inventory of energy sector through an exercise session using energy statistic data)
	INV4	• Discussed current situation of the data collection of industrial process for GHG inventory of Japan and Thailand. • Suggested to TGO that it is necessary to have a seminar for stakeholders of industrial sector.
Session 9		**21/9/2010, 10:00-16:30**
Participant		Total: 36 (TGO: 18, Climate change-related organizations: 10, JICA and Other: 8)
Theme/Topic		CDM7: Overview of programmatic CDM (PoA) CDM8: Exercise: Programmatic CDM (PoA) INV5: Overview of agriculture, forestry, and other land-use sector (AFOLU)
Points of discussion	CDM 7	• Discussed current situation of programmatic CDM (PoA) from several cases such as in Mexico, Brazil etc. • Discussed the procedure and structure of PoA by using some figures. • Discussed some points that PPs have to consider when they submit the documents to DOE.
	CDM 8	• Discussed the procedure of PoA by using a case of biogas project using waste food in Thailand. • Suggested to TGO that it is important who manage the project. In case of the above biogas project, DEDE may be a suitable agency for management of the project.
	INV5	• Discussed the procedure of classification of land use by using a case in Japan.
Session 10		**28/9/2010, 10:00-16:30**
Participant		Total: 25 (TGO: 12, Climate change-related organizations: 7, JICA and Other: 6)
Theme/Topic		CDM9: Development of CDM project activity GHG1: International trend in GHG mitigation measures INV6: Overview of waste sector
Points of discussion	CDM 9	• Discussed the steps of feasibility study of CDM project including technical evaluation, financial evaluation of the project through using a case of hydro power generation project in a group exercise.
	GHG 1	• Discussed international trend in GHG mitigation measures by introducing some measures in Japan.
	INV6	• Discussed current situation of GHG inventory of waste sector from several cases such as Japan, Thailand and ASEAN countries. • Suggested to TGO that it may underestimate GHG emissions from waste sector if the data is lacking.

Session 11		**12/10/2010, 10:00-16:30**
Participant		Total: 21 (TGO: 10, Climate change-related organizations: 6, JICA and Other: 5)
Theme/Topic		FP1: Overview of carbon footprint concept and current situation of the system in the world FP2: LCA related issues FP3: Calculation of carbon footprint
Points of discussion	FP1-2	• Discussed advantage of introducing carbon footprint system for private enterprise. • Discussed member composition of the committee for Product Category Rules (PCR). • Discussed problems occurred in case that several countries developed their own carbon footprint system. (To avoid this inconvenience, ISO rules may be applied.)
	FP3	• Discussed GHG emissions from disposal/ recycle stage of life cycle of products that may be double-counted.
Session 12		**20/10/2010, 10:00-16:30**
Participant		Total: 18 (TGO: 7 , Climate change-related organizations: 6, JICA and Other: 5)
Theme/Topic		FP4: Issues in implementation and dissemination of carbon footprint system GHG2: Monitoring of contribution to the sustainable development by mitigation measures, including co-benefit approach GHG3: Importance of low carbon society/low carbon city
Points of discussion	FP4	• Discussed contribution of carbon footprint system to GHG emission reduction, and its difference from other GHG mitigation activities.
	GHG2	• Discussed mitigation measures including co-benefits for Thailand.
	GHG3	• Discussed mitigation measures for low-carbon society in Japan with various examples from eco-model cities, and about possibility of its application to Thailand.
Session 13		**23/11/2010, 10:00-16:30**
Participant		Total: 28 (TGO: 15 , Climate change-related organizations: 8, JICA and Other: 5)
Theme/Topic		CDM10: AR-CDM/current situation and issues GHG4: Mitigation measures in commercial building and residential sectors GHG5: Exercise: Quantification of GHG emission reduction with MRV (commercial building and residential sectors) GHG6: Mitigation measures in waste management sector GHG7: Exercise: Quantification of GHG emission reduction with MRV (waste management sector)
Points of discussion	CDM10	• Discussed leakage sources in A/R-CDM project. (It is GHG emission from out of boundary of the project by human activities such as movement of residence or agriculture production.) • Discussed five types of carbon pools that project proponents have to consider in A/R-CDM project.
	GHG4 &5	• Discussed how to implement the mitigation measures in waste sector in Thailand through group discussion. - What is the possible waste as a resource? - Who are implementers? municipalities/government/private companies? - How to implement the mitigation measures? - What is the role of TGO?
	GHG6 &7	• Discussed how to implement the mitigation measures in commercial building (hotels/ shopping building) in Thailand through group discussion. - Who are implementers? - How to implement the mitigation measures? - What is the role of TGO?

Session 14		**2011/1/11, 10:00-16:30**
Participants		Total：33 (TGO: 19 Climate change relevant agencies：7 JICA Expert Team：7)
Topic		UN9,UN10：Technical Transfer and Exercise INV7：QA/QA outline of IPCC Guideline and QA/QC in Japan
Points of discussion	UN9 UN10	• It was supplementary explained that the opinions gap, which is continuously discussed, about the challenges of technical transfer between developed country and developing country. • Exercise for needs assessment using matrix and technical transfer program development were conducted in order to help deeper understanding. Mass transportation system has been chosen as an example. JICA Expert Team supported group discussion.
	INV7	• QA/QC activities for an inventory development flow were explained. QA/QC activities of inventory relevant organizations were supplementary explained using Japan's experience as an example.
Session 15		**2011/1/18, 13:30-15:30**
Participants		Total：23(TGO: 8 Climate Change relevant agencies：8 JICA Expert Team：7)
Topic		GHG8：Mitigation measures in Energy and Industry sector GHG9：Exercise Calculation of GHG reduction and MRV(Mitigation measures in Energy and Industry sector)
Point of discussion	GHG8 GHG9	• Mitigation measure in Energy and Industrial sector was explained using the Thai Energy Plan and Statistics. (Gas turbine combined-cycle, Renewable energy, Re-use generated thermal energy of cement and metal factory)was picked up as example measures.
Session 16		**2011/2/15, 10:00-16:30**
Participants		Total：18(TGO:5 Climate change relevant agencies:6 JICA Expert Team:7)
Topic		GHG10：Mitigation measures in Transportation sector GHG11：Exercise Calculation of GHG reduction and MRV(Mitigation measures in Transportation sector) INV8：Key category analysis and uncertainty evaluation
Points of discussion	GHG 10	• Mitigation measures in Japan and other countries including high technology, alternative fuel and modal shift were explained as example. • GHG reduction of MRT Blue line project was calculated as an exercise for better understanding of participants.
	GHG 11	• Mitigation measures and their effect in transportation sector was discussed within the groups. JICA Expert Team supported the discussion. • Comprehensive mitigation measures combining transportation amount reduction and intensity improvement were supplementary explained. • Factors increasing GHG emission when a mitigation measures was implemented were also explained.
	INV8	• Key check points of emission factor and activity data uncertainty evaluation methods for TGO, as an inventory compiler, were explained following category classification.

Session 17		**2011/2/22, 10:00-16:30**
Participants		Total：22(TGO: 12 Climate change relevant agencies:5 JICA Expert Team:5)
Topic		CFP5：Carbon Footprint for organizations INV9：Exercise GHG emission calculation of energy sector in Thailand INV10：Exercise GHG emission calculation and uncertainty evaluation of Key categories in Thailand
Points of discussion	CFP5	• Respond to requests from TGO, Carbon Footprint for organization was supplementary explained. Printing industry was chosen as an example and GHG emission from the industry was explained following the process in service activity.
	INV9	• Exercise on GHG emission estimation in different sectors was conducted. Through the calculation process, contents of past lectures were reviewed and supplementary explained details for participant's deeper understanding.
	INV 10	• Key category analysis and uncertainty evaluation were explained and participants calculated them step by step by following the JICA expert's guidance. • Answering the question on the importance of key category analysis and uncertainty evaluation, JICA expert explained the merit to know the sectors which commit the large emission and the emission source with large uncertainty. • Calculation of trend assessment and level assessment were supplementary explained.
Session 18		**2011/5/10, 13:00-16:00**
Participants		Total：44(TGO:14 Climate change relevant agencies:22 JICA Expert Team:8)
Topic		CT7：Voluntary emission trading market in Japan(JVETS) CFP6：Carbon footprint for organization
Points of discussion	CT7	• ・JVETS which is voluntary emission trading market in Japan were introduced. The structure, difference and conducting systems were explained.
	CFP6	• ・Latest trends on Carbon footprint in Japan and other countries were explained. In addition, GHG protocol which is estimation and reporting standards for implementers were explained. • ・Participants discussed conditions which need to be prepared for introduction of Carbon footprint in Thailand.

Photo 2-1 Opening Address

Photo 2-2 Seminar by JICA Expert

Photo 2-3 Group Discussion (1)

Photo 2-4 Group Discussion (2)

In addition to the training sessions above, internal study sessions on GHG inventory topics were conducted for TGO's inventory related staff based on a request from TGO. Topics covered in the sessions are technically very specific and are not suitable for a general training session, which targeted all TGO staff and climate change related organizations. Therefore, TGO and JICA Expert Team decided to have closed study sessions with specific TGO staff members.

Main points of discussion during the inventory study sessions are shown below.

Table 2-4 Inventory study sessions

Session 1	**2011/5/11**
Participants	Total: 4 (TGO: 3, JICA Expert Team: 1)
Topics	Evaluation of uncertainty -Exercise-
Points of discussion	・ Conducted an exercise on uncertainty evaluation in energy sector. ・ Discussed the importance for data compilers to know about uncertainty calculation method and adequate order.
Session 2	**2011/5/18**
Participants	Total: 4 (TGO :3 JICA Expert Team:1)
Topic	Evaluation of uncertainty -Exercise-
Points of discussion	・ Conducted an exercise on uncertainty calculation in cement industry, lime industry, chemical industry and metal industry. Uncertainty solid waste disposal which is subcategory of waste sector was also analyzed. ・ IPCC default value was referred when TGO staff does not have necessary data for uncertainty evaluation.
Session 3	**2011/5/19**
Participants	Total: 2 (TGO :1 JICA Expert Team:1)
Topic	Evaluation of uncertainty -Exercise-
Points of discussion	・ Conducted an exercise on uncertainty analysis of sub categories other than solid waste disposal. ・ Discussed the calculation method in the case where range of emission factor is not available for calculation.
Session 4	**2011/5/23**
Participants	Total: 2 (TGO :1 JICA Expert Team:1)
Topic	Evaluation of uncertainty -Exercise-
Points of discussion	・ Uncertainty of Solid Waste Disposal sector was evaluated using Tier 2.

Session 5	**2011/5/24**
Participants	Total: 2 (TGO:1 JICA Expert Team:1)
Topic	Evaluation of uncertainty -Exercise-
Points of discussion	・ Uncertainty of Solid Waste Disposal sector was evaluated using Tier 2 n referring the Japan's example.
Session 6	**2011/5/25**
Participants	Total: 2 (TGO :1 JICA Expert Team:1)
Topic	Evaluation of uncertainty -Exercise-
Points of discussion	・ Q & A session for Solid Waste Disposal Tier 2 was held. ・ Composite equation was discussed through Step by Step approach.
Session 7	**2011/5/25**
Participants	Total: 4 (TGO:3 JICA Expert Team:1)
Topic	Evaluation of uncertainty -Exercise-
Points of discussion	・ Discussed on the uncertainty evaluation in Thai regarding waste sector.
Session 8	**2011/5/25**
Participants	Total: 2 (TGO:1 JICA Expert Team:1)
Topic	Evaluation of uncertainty -Exercise-
Points of discussion	・ Process of uncertainty evaluation of AFOLU sector was further discussed. ・ Discussed the key category analysis and uncertainty calculation.
Session 9	**2011/5/30**
Participants	Total: 2 (TGO:1 JICA Expert Team:1)
Topic	Evaluation of uncertainty -Exercise-
Points of discussion	・ Based on the uncertainty evaluation result on sub categories, Uncertainty evaluation process on waste sector was explained.
Session 10	**2011/5/31**
Participants	Total: 2 (TGO :1 JICA Expert Team:1)
Topic	Evaluation of uncertainty -Exercise-
Points of discussion	・ Conducted an exercise on uncertainty evaluation on AFOLU sector.
Session 11	**2011/8/11**
Participants	Total: 4 (TGO :3 JICA Expert Team:1)
Topic	Emission calculation method for waste sector and AFOLU sector
Points of Discussion	・ FOD model was explained which is calculation method for CH4 emission from waste site. ・ Status of data collection in Thailand and applicability of the model were discussed. ・ Scope of AFOLU sector for GHG inventory was explained using specific examples.
Session 12	**2011/8/15**
Participants	Total: 5 (TGO:4 JICA Expert Team:1)
Topic	Review: Procedure of inventory development
Points of Discussion	・ Participants discussed necessary tasks in each process of an inventory development cycle and deepen their understanding. ・ Issues on developing GHG inventory in Thailand were discussed. ・ JICA expert confirmed their level of understanding on GHG calculation method and uncertainty estimation method.

2.1.1.2 Capacity assessment

Capacity assessment of TGO staff was conducted in order to check the level of understanding about the topics related to climate change mitigation that were covered in the training course.

Capacity assessment was also effective in stimulating motivation and willingness of participants toward the training courses.

Two different capacity assessments were conducted as follows;

1. To check how much knowledge TGO staff has obtained on climate change mitigation in a comprehensive manner (multiple-choice test)
2. To check how much TGO staff understands the contents of training courses provided (written test)

Comprehensive knowledge assessment was held 3 times; at the beginning for the Project implementation, at the end of Phase I, and at the end of the project. While understanding check of training course was held at the end of each quarter.

(1) Capacity assessment

A multiple-choice test for "capacity assessment test" was provided to TGO staff. The result of the test, which covers all 6 sectors, was categorized into 5 ranks.

S: he/she has a profound understanding on many subjects (score: 71-100%)
A: he/she has a general understanding on many subjects (score: 60-70%)
B: he/she has a general understanding on some subjects (score: 50-59%)
C: he/she has only a partial understanding on some subjects (score: 25-49%)
D: he/she does not have clear understanding on many subjects (score: 0-24%)

A. Initial capacity assessment (January 2010)

30 answers were collected. 26 persons (87 % of all) were evaluated as Rank C or D in all 6 sectors, and 11 persons (37 % of all) were evaluated as Rank D in all 6 sectors.

There were 4 persons (13 % of all) evaluated as Rank S or A. It was considered that they have high capacity only in their own specialty fields or sectors, and many of them still had a room to further improve their capacity in other sectors.

Taking this result into account, training topics of the first several sessions were selected to mainly focus on enhancing understanding of basic knowledge and information.

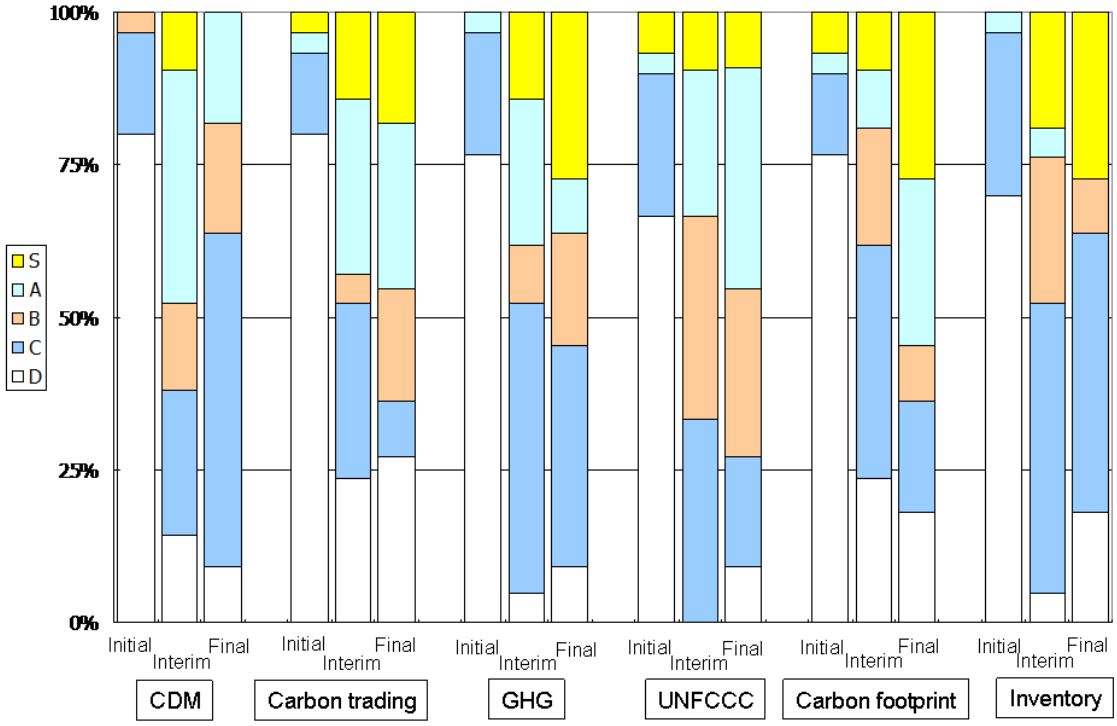
B. Interim capacity assessment (March 2011)

The assessment showed significant improvement of TGO staff's knowledge as a result of the

trainings. Only 1 person was evaluated as rank C in all sectors and no one was evaluated as rank D. In addition, the number of highly evaluated staff increased mainly in their specialty field. The person who was evaluated rank A or S in any sector increased from 10% to 70%. It was indicated that many staff comprehensively understood many topics from various sectors as shown in their high scores from the sectors other than their field.

C. Final capacity assessment (January 2012)

Compared to the result of the initial capacity assessment where 80% of all respondents were evaluated as Rank C and D in all topics, in the final capacity assessment the proportion of S and A has been significantly increased in 5 sectors. Especially in the UNFCCC and Carbon footprint, nearly half of the respondents were evaluated as Rank S or A. It can be considered that most TGO staff have significantly increased their knowledge on climate change mitigation.



Rank	Score (%)	Evaluation: In certain topics, the personnel;
S	71-100	Has a profound understanding on many subjects
A	60-70	Has a general understanding on many subjects
B	50-59	Has a general understanding on some subjects
C	25-49	Has only a partial understanding on some subjects
D	0-24	Does not have clear understanding on many subjects

Figure 2-1 Result of Interim Capacity Assessment

(2) Post training exam

During the project, post training exams were conducted 3 times as shown below.

Table 2-5 Outline of post training exams

No.	Date	Topics (number of question)	Number of submission
1st	July 2010	CDM (4) Carbon Trading (3) UNFCCC Negotiations (3)	15
2nd	December 2010	CDM (3) GHG Mitigation (3) UNFCCC Negotiations (1) Carbon Footprint (2) GHG Inventory (2)	18
3rd	December 2011	Carbon Trading (1) UNFCCC Negotiation (1) GHG Mitigation (2) Carbon Footprint (1) GHG Inventory (2)	9

All exams include 7 to 10 questions from all topics covered by the JICA trainings. Each covered topic contains 1 to 3 questions depending on the number of trainings conducted during the period and relevance to tasks of TGO respondents. All questions in the written test were based on the lectures by JICA Expert Team and discussions during the training sessions. The test also contained open questions in which a person can describe her/his opinion on the question such as the situation in Thailand or applicability in Thailand. Such types of questions were included in the exam so that the capacity can be assessed in a more comprehensive manner.

The submitted tests were evaluated into 3 categories, which are “good” (more than 80 points), “fair” (60-79 points), and “poor” (less than 59 points).

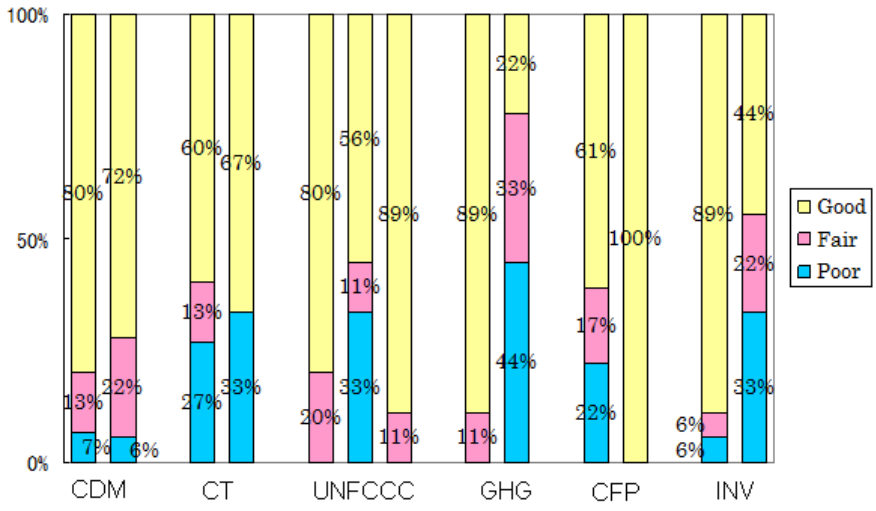


Figure 2-2 Result of post training exam

More than 60% of participants who submitted answers scored “good” or “fair” in all topics. In several topics such as CDM, carbon trading, carbon footprint, the proportion of answers scored “good” reached more than 60%. It can be considered that TGO staff who had limited knowledge about individual topics gained comprehensive understandings on the mitigation measures.

TGO staff who actively attended the JICA training sessions submitted answers well and the test results were also good; it was considered that such TGO staff understood the contents of the training sessions well in not only their own specialty fields or sectors but also other sectors. It was also observed such staff members have shown greater motivation and willingness to improve their knowledge than those who failed to submit the exam.

2.1.2 Target and achievement

The target of Activity 1 is set in PDM as follows:

Target
The level of knowledge and expertise of TGO staff on GHG mitigation will be enhanced.

The following indicators are provided in the proposed PDM to measure results of Activity 1.

Objectively Verifiable Indicators
Score of the Capacity Development Progress Evaluation Check list is increased.

Referring to the above indicators, the results of achievement on Activity 1 are as follows:

TGO staff attended training sessions on climate change mitigation including carbon trading, UNFCCC negotiations, GHG mitigation, carbon footprint and GHG inventory. The training on 53 topics was conducted in 18 day.

Total number of participants from TGO reached 267. The participants acquired comprehensive and deep knowledge on the climate change mitigation through the training. It also helped TGO staff who had limited knowledge about individual topics to gain comprehensive understandings on the mitigation measures.

TGO staff, especially who was assigned for the development of a training material, was extensively participated and tried to understand details of the contents in order to prepare for their own presentation for the upcoming seminar.

The TGO participants to the training were actively involved in the training by asking questions to lecturers and made discussions in the exercises during the sessions. In addition, many of them made individual discussions after the training in order to gain further understanding on the topics. There was a tendency that some staff selectively attended training sessions for certain topics related to the responsible field at TGO Most of them were not able to allocate much time for all sessions that took place for over 18 days since they were busy with their duties at TGO.

The training sessions had diverse participants, those who were from government institutions and other organizations, all related to the mitigation of climate change and the total number of such participants reached to 183 people. It is considered that the training sessions had contributed to the knowledge enhancement for these stakeholders as well.

The systematic knowledge on climate change mitigation, which include inter alia information on a wide variety of applicable technologies for climate change mitigation, knowledge on procedures and methodologies for CDM, various options for carbon trading, appropriate judgment of carbon footprint applicability and new mechanisms, was developed among TGO staff through the training sessions, which is expected to allow TGO to promote and carry out the climate change mitigation more efficiently and effectively. It was also proven in the result of interim and final capacity assessment, where almost all TGO staff significantly improved their score compared to the initial capacity assessment.

Overall, the target of Activity 1, which is the enhancement of the level of knowledge and expertise of TGO staff, has been achieved.

2.2 Output 2 : Enhancement of capacity level of TGO staff on training provision

2.2.1 Activities

2.2.1.1 Development of Training Curriculum

TGO and JICA Expert Team jointly developed training curriculum that will be used in external seminar/ workshop TGO will hold on GHG mitigation in Thailand and abroad on the following 5 topics.

- CDM
- Carbon trading
- UNFCCC structure and negotiations
- Carbon footprint
- GHG inventory

Referring to the curriculum of JICA training courses, training materials were developed. In developing training materials, special attention was paid to the target audience in terms of their;

- Type and affiliation: general audience, project proponent, policy making government institution, consultant, stakeholders in another country, etc
- Points of interest: technical knowledge or policy-oriented knowledge, etc
- Level of technical knowledge and understanding: basic information or advanced comprehensive knowledge

After a series of discussions between assigned persons from TGO and JICA Expert Team, training curriculum was developed as shown below.

Table 2-6 Training curriculum and training materials

Theme	Title of training material	JICA Training topics covered in the training material
CDM	**"Basic Knowledge about CDM"** (For beginner audience) & **"Key Issues for CDM Project Implementation"** (For advanced audience)	1. Background and history of CDM/ current situation and issues
		2. Technical aspects of baseline determination
		3. Overview of large-scale/ small-scale methodologies
		4. Technical aspects of additionality demonstration
		5. Measures to obtain CER of CDM project
		6. Validation and Verification including communication with DOE
		7. Overview of programmatic CDM (PoA)

Theme	Title of training material	JICA Training topics covered in the training material
		8. Exercise: Programmatic CDM
		9. Development of CDM project activity
	"Afforestation and Reforestation CDM – A/R CDM"	10. A/R-CDM/ current situation and issues
Carbon trading	**"Background and Overview of Carbon Markets in the World"**	1. Background, history and overview of carbon trading markets in the world
		2. Current situation of Kyoto credits (CDM, JI, and GIS) and overview of European Emission Trading System (EU-ETS)
		3. Overview of emission trading systems in the United States , and future international trading system in post 2012
		4. Overview of voluntary emission trading system in Japan - J-VER
		5. Overview of national registry system
UNFCCC structure and negotiations	**"Climate Change Law and Policy"**	1. Overview of UNFCCC and international negotiations: establishment to present
	"UNFCCC: Negotiations"	2. UNFCCC and key international negotiations after COP 3
		3. Overview of international negotiations over post-2012 mechanisms
		4. Overview of international negotiations by EU and the United States over post-2012 mechanisms by EU and the United States over post-2012 mechanisms
		5. MRV/NAMA/ SCM
		6. Exercise: MRV/NAMA/SCM
		9. Technical transfer
		10. Exercise: technical transfer
	"Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (REDD)"	7. Exercise: REDD/ carbon sink
		8. Exercise: REDD/ carbon sink
Carbon footprint	**"Carbon Footprint - Concept and Current Situation in the World"**	1. Overview of carbon footprint concept and current situation of the system in the world
		4. Issues in implementation and dissemination of carbon footprint system
	"LCA Related Issues & Calculation of Carbon Footprint"	2. LCA related issues
		3. Calculation of carbon footprint
GHG inventory	**"Overview of Thailand National Inventory"**	1. Overview of IPCC Guideline
		2. Introduction of GHG inventory of Japan/ Review of GHG inventory of Thailand
		7. Overview of QA/QC of IPCC Guidelines and example of QA/QC measures taken in Japan

Theme	Title of training material	JICA Training topics covered in the training material
		8. Analysis of key categories and assessment of uncertainties, example from Japanese cases
		9. General overview
		10. exercise: GHG inventory
	"Energy Sector"	3. Overview of energy sector, examples of Thailand and Japan
	"Industrial Process Sector"	4. Overview of Industrial processes and product use sector (IPCC)
	"AFOLU Sector"	5. Overview of agriculture, land-use change sectors, examples of Thailand and Japan
	"Waste Sector"	6. Overview of waste management sector, examples of Thailand and Japan

The outline of training materials is as follows:

- CDM: a wide variety of items is systematically integrated into a single training material, which covers CDM background, key concept (baseline, additionality, and methodology), project cycle, and outline of project type (large- and small-scale CDM, PoA etc.)
  Some topics that are contained in the 1st CDM training curriculum are covered again in the 2nd CDM training curriculum. This is because the 2nd training curriculum/ material targets more advanced audiences such as prospective CDM project proponents and CDM consultants and cover such advanced information as detailed method to assess and demonstrate additionality and identification of baseline, or key points to avoid monitoring failure or CER issuance rejection.
- Carbon trading: background information was combined with topics about some of the present major carbon markets in the world, including EU-ETS, carbon trading markets in the US, and J-VER, a voluntary carbon market in Japan.
- UNFCCC structure and negotiations: basic information and overview of UNFCCC and international negotiations was compiled into "Climate Change Law and Policy". The training material was updated by including the latest information on UNFCCC negotiation especially such emerging important topics as NAMA and MRV. On the other hand, topic on sector crediting mechanism was not included in the training material because Thailand has no plan to introduce the mechanism at the time of training material preparation.
- Carbon footprint: Overview of carbon footprint concept and current situation in Thailand was compiled into "Carbon Footprint - Concept and Current Situation in the World", while technical points, especially Life Cycle Assessment (LCA), and calculation methods into

"LCA Related Issues & Calculation of Carbon Footprint".

- GHG Inventory: training curriculum are divided into 2 categories; first category is an introduction part, and it covers a basic information useful for policy-maker in GHG inventory-related organizations; second category is more technical and detailed parts, which consist of four separate training curriculum containing more advanced and practical knowledge for those who are involved in the actual preparation of raw GHG inventory data.

As for the 6th topic, GHG mitigation on relevant sectors, TGO and JICA Expert Team decided not to develop training materials. Main reason is the theme covers a very wide variety of topics such as energy, industry, building/ houses, transport, and waste management, and cross-sectoral concepts such as low carbon society and co-benefit are also included. In addition, it was difficult to identify the key target group for this theme, which includes virtually all stakeholders in Thailand from government institutions and private sector, as well as general public.

However, presentation material on this theme was developed for a seminar in CTC 2011. The material covers some of the key mitigation policies as well as measures applicable in Thailand.

- Development of training curriculum for CTC 2011

A training curriculum was developed for an international climate change seminar titled "CTC 2011" (Climate Thailand Conference), where the training materials developed under the Project were utilized. The curriculum for the seminar was jointly developed by TGO and JICA Expert Team (see Chapter 2.5 for more details).

Capacity Building and Outreach Office of TGO, which is in charge of developing and implementing training programs, played a principle role in developing the curriculum for CTC 2011 while JICA Expert Team provided technical advice.

The curriculum was developed for an international seminar, which targeted various types of participants who have different background, expertise, nationality, affiliation and objective. Although such curriculum may be different from a curriculum for target audiences in Thailand, TGO was able learn the general process and important points in developing a training curriculum, which is highly useful in developing new training curriculum in the future.

2.2.1.2 Development of Training Materials

(1) Working team

Technical staff members, who will make a presentation at external TGO seminars by using the developed training material, have been assigned as the working team member for training material

development. The assigned staff members were selected from technical staff rather than from executives or directors who have plenty of experience in presentation at external seminars.

In developing training materials, assigned TGO personnel first developed the draft version and then had a series of discussions with JICA Expert Team and finalized the training material.

The following 10 staff were assigned and prepared 14 training materials (4 staff prepared 2 materials).

Table 2-7 Working Team for Training Material Development

Theme	Training Material	Assigned TGO staff	Office/Department
CDM	"Basic Knowledge about CDM"	Dr. Paweena Panichayapichet	Review and Approval Office
	"Key Issues for CDM Project Implementation"		
	"Afforestation and Reforestation CDM – A/R CDM"	Ms. Anna Kiewchaum	
Carbon trading	"Background and Overview of Carbon Markets in the World"	Ms. Sumon Sumetchoengprachya	Marketing Office
UNFCCC Structure and Negotiations	"Climate Change Law and Policy"	Ms. Weerada Tivasuradej	Policy and Strategy Office
	"UNFCCC: Negotiations"		
	"Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (REDD)"	Ms. Anna Kiewchaum	Review and Approval Office
Carbon Footprint	"Carbon Footprint - Concept and Current Situation in the World"	Ms. Phakamon Supappunt	Marketing Office
	"LCA Related Issues & Calculation of Carbon Footprint"	Mr. Thada Varoonchotikul	
GHG Inventory	"Overview of Thailand National Inventory"	Mr. Chessada Sakulku	GHG Information Center
	"Energy Sector"		
	"Industrial Process Sector"	Ms. Wasinee Cheunban	
	"AFOLU Sector"	Ms. Wararat Chaumkruea	
	"Waste Sector"	Ms. Mewadee Seresathiansub	

(2) Development of training materials

The first thing the working teams did was to identify the target audience of the prospective seminars/ workshops and identify the needs of this target audience. Also analyzed was the level of technical knowledge and understanding of such audience, and how to reflect such needs into training materials.

Depending on the themes and topics, expected seminar audience may include wide variety of stakeholders such as project proponents (from beginners to advanced level), ministries and local government/ municipalities (policy-makers or prospective project proponents), consultants, climate change-related stakeholders in neighboring countries, and these audience as different level of technical knowledge and also different points of interest.

In order to effectively and efficiently meet demands from such wide variety of target groups, training materials have been developed and arranged in a way that contains information from basics to advanced information in a comprehensive manner. A presenter will be able to meet a different kind of demand by selecting appropriate contents (i.e. PowerPoint slides) during the presentation depending on the audience group.

Working teams have developed training materials by arranging and improving some of the data and information used in the existing presentation materials from TGO and also handout materials used in the JICA training courses.

The training materials include not only the PowerPoint presentation developed by TGO and JICA Expert Team, but also additional information of each slide such as background and key issues as well as important points to remember in presenting the slide. The training materials can be used as a textbook-style reference by TGO personnel.

Training Materials were translated into Thai after developing in English in consideration of main target audience who were expected mainly Thai people in some topics. For instance in case of topic on carbon footprint calculation, expected audiences are those from private company who plan to introduce goods of carbon footprint and related governmental organizations in Thai. In accordance with discussion with TGO, translation into Thai was ordered to translator, and TGO staff had a confirmation and proofreading.

Study session on training curriculum and materials were held 67 times totally. Discussion and technical transfer on key points to develop materials and to improve presentation was implemented.

Following table summarizes the points of discussion between TGO staff and JICA Expert Team.

Table 2-8 Study session for training material development

General Meeting 1	21/04/2010
Participants	Total: 8
Points of discussion	• Discussed and confirmed the objective and principles of training material development activity. • Discussed methodology to develop training materials. • Discussed items to be identified before training material preparation, i.e. target audience, objective and theme, expected outcome, etc.) • Discussed assignment of TGO personnel for each theme and topic • Discussed schedule of material preparation.
General Meeting 2	29/04/2010
Participants	Total: 16
Points of discussion	• Discussed assignment of TGO personnel and their expertise and current duty in TGO • Discussed detailed methodology and outputs with all assigned personnel
General Meeting 3	06/05/2010
Participants	Total: 7
Points of discussion	• Further discussed and confirmed assigned TGO personnel
CDM 1	11/05/2010
Participants	Total: 4
Points of discussion	• Discussed training curriculum and material for CDM theme. • Discussed target audiences (project proponent, consultants, government agencies, local government/ municipalities, DNA in southeast Asia, etc.), objective of presenting the topics, and expected outputs • Discussed topics to be covered in the training materials, which will include materials from JICA training courses and existing TGO seminar materials
Carbon Trading 1	12/05/2010
Participants	Total: 4
Points of discussion	• Discussed training curriculum and material for carbon trading theme. • Discussed target audiences (project proponent, government agencies, etc.), objective of presenting the topics, and expected outputs • Discussed topics to be covered in the training materials, which will include materials from JICA training courses and existing TGO seminar materials
UNFCCC Structure & Negotiations 1	13/05/2010
Participants	Total: 3
Points of discussion	• Discussed training curriculum and material for UNFCCC structure and international negotiations theme. • Discussed target audiences (project proponent, government agencies, local government/ municipalities, etc.), objective of presenting the topics, and expected outputs • Discussed topics to be covered in the training materials, which will include materials from JICA training courses and existing TGO seminar materials • Suggested TGO to assign personnel from technical staff level in order to enhance capacity development
UNFCCC Structure & Negotiations (2)	26/05/2010
Participants	Total: 5
Points of discussion	• Discussed training curriculum and material for UNFCCC structure and international negotiations theme. • Discussed based on the training material developed by TGO assigned personnel.

CDM (2)	27/05/2010
Participants	Total: 6
Points of discussion	• Discussed training material for CDM theme. • Discussed based on the training material developed by TGO assigned personnel. • Discussed the order and contents of presentation slides, addition and deletion of some slides
UNFCCC Structure 3	08/06/2010
Participants	Total: 3
Points of discussion	• Discussed training material for UNFCCC structure theme. - Discussed contents of presentation (e.g. deletion of Marrakesh Accord and inclusion of CDM topic) - Discussed how to describe UNFCCC decisions and legal terms in presentation and how to convey key points correctly to general audience by using legal languages - Discussed institutional structure of UNFCCC and functions of main bodies
Carbon Trading 2	10/06/2010
Participants	Total: 4
Points of discussion	• Discussed training material for carbon trading theme. • Discussed based on the training materials developed by TGO assigned personnel. • Discussed contents of presentation (e.g. EU-ETS and T-CAT information source)
CDM 3	11/06/2010
Participants	Total: 3
Points of discussion	• Discussed training material for CDM theme. • Discussed technical aspects of presentation. - Description of anthropogenic GHG emissions in the background slide - Order of presentation slides of crediting period, CDM project cycle, baseline, additionality, and methodology. - Types of CDM project types, i.e. large-scale, small-scale, bundling, and PoA - Current issues of CDM - Information sources and copyright issues
CDM 4	24/06/2010
Participants	Total: 5
Points of discussion	• Discussed training material for CDM theme. • Discussed technical aspects of presentation - Source of data and information especially charts and diagrams used in the presentation - CDM project cycle of Thailand - CDM project registration statistics - Status of ratification by Parties for UNFCCC and Kyoto Protocol - How to present baseline and additionality for general audience as well as for advanced target groups - Recent trend of CDM and significant changes for Thai stakeholders (e.g. new or revised guidelines and guidance, revised approved methodologies, etc.)

UNFCCC Structure 4	24/06/2010
Participants	Total: 4
Points of discussion	• Discussed training material for UNFCCC structure theme. • Discussed technical aspects of presentation - Discussed functions UNFCCC bodies, such as GEF, World Bank, UNDP, and UNEP - Discussed UNFCCC principles - Discussed involvement and functions of Thailand in UNFCCC and international negotiations and how to include such information in training materials
UNFCCC Negotiations 5	28/06/2010
Participants	Total: 4
Points of discussion	• Discussed training material for UNFCCC/ international negotiations theme. • Discussed based on the training materials developed by TGO assigned personnel.
Carbon Trading 3	28/06/2010
Participants	Total: 4
Points of discussion	• Discussed training material for carbon trading theme. • Discussed technical aspects of presentation - Discussed how to and to what extent include detailed information on EU-ETS Phase 3 - Discussed detailed institutional design of Tokyo T-CAP, such as how to determine allocation of allowance for a facility
CDM 5	05/07/2010
Participants	Total: 5
Points of discussion	• Discussed training material for CDM theme. • Discussed technical aspects of presentation - Methods to demonstrate additionality - Monitoring plan and monitoring activity • Discussed recent decisions by CDM-Executive Board - Update of VVM, investment analysis guideline, approval of uniform monitoring report format, revision of small scale methodology guideline, guidelines of demonstrating additionality of less than 5MW renewable energy project - Update of frequently-used approved methodologies in Thailand (AMS-I.D, AMS-III.H, AMS-I.C, ACM0002, ACM0006) - OE: suspended DOE, and newly accredited OEs
Carbon Trading 4	07/07/2010
Participants	Total: 3
Points of discussion	• Discussed the train the trainers seminar - Discussed the result of questionnaires collected from participants to the seminar - Discussed the positive and negative comments from the participants about presentation quality and training materials - Discussed how to improve presentation and training materials

CDM 6	12/07/2010
Participants	Total: 3
Points of discussion	• Discussed the train the trainers seminar - Discussed the result of questionnaires collected from participants to the seminar - Discussed the positive and negative comments from the participants about presentation quality and training materials - Discussed how to improve presentation and training materials
UNFCCC Structure 6	14/07/2010
Participants	Total: 2
Points of discussion	• Discussed the train the trainers seminar - Discussed the result of questionnaires collected from participants to the seminar - Discussed the positive and negative comments from the participants about presentation quality and training materials - Discussed how to improve presentation and training materials
GHG Inventory 1	8/9/2010
Participants	Total: 6
Points of discussion	• Discussed how to develop training material in study session. • Discussed contents of the training material and confirmed target audiences for training.
CDM 7	13/9/2010
Participants	Total: 2
Points of discussion	• Discussed points to be updated in the training material developed in the 1st phase. • Discussed concept and target audiences of the training material of 2nd phase. • Confirmed the topics of training material. Suggested to refer to the latest decision by CDM Executive.
GHG Inventory 2	15/9/2010
Participants	Total: 7
Points of discussion	• Discussed and confirmed contents of the training material and target audiences. • Confirmed the structure of national GHG inventory in Thailand and discussed how to decide target audiences. • Confirmed target audience categories, i.e. inventory related ministries and government agencies, and relevant organizations that collect and compile raw data for inventory.
CDM 8	22/9/2010
Participants	Total: 2
Points of discussion	• Discussed order and volume of each slides. • Discussed the case which has different volume of CERs in PDD and monitoring reports. • Discussed the cases that were rejected for issuance of CERs, and how to advise project proponents and consultants in order to avoid such cases. • Overviewed Validation and Verification Manual (VVM).
GHG Inventory 3	22/9/2010
Participants	Total: 7
Points of discussion	• Discussed component of the training material based on discussion of last meeting. • Suggested to TGO that it is easy to understand for target audience, if the training material is divided into two parts, such as “overview of GHG inventory” and “GHG inventory of each sector”. • Confirmed assign person for development of the above training material. • Suggested to TGO that it is easy to understand the concept of inventory calculation for target audience, if the training material is focused on basic information and is included the exercise if necessary.

GHG Inventory 4	29/9/2010
Participants	Total: 7
Points of discussion	• Discussed contents of the training material and order of the slides. • Suggested to TGO that it is better that overview of each sector would be explained first, and then the detail information would be explained.
CDM 9	30/9/2010
Participants	Total: 2
Points of discussion	• Discussed the registered projects for: - Small-scale CDM projects and bundling. - Programme of activities (PoA) • Discussed how to effectively present information on baseline determination and additionality demonstration
UNFCCC Structure & Negotiations 7	1/10/2010
Participants	Total: 3
Points of discussion	• Discussed contents of the training material for REDD • Discussed and confirmed the target audiences • Discussed and confirmed the topics, contents and volume • Discussed the relation between A/R CDM and REDD • discussion for REDD in UNFCCC
GHG Inventory 5	5/10/2010
Participants	Total: 7
Points of discussion	• Discussed contents of the draft and order and volume of each slide • Discussed how to effectively present the benefit of GHG inventory development • Discussed the issues which are occurred in data collection for GHG inventory development.
GHG Inventory 6	6/10/2010
Participants	Total: 7
Points of discussion	• Discussed contents of the training material (second-third draft) and order and volume of each slides • Discussed and confirmed the contents of additional information. •
UNFCCC Structure & Negotiations 8	13/10/2010
Participants	Total: 2
Points of discussion	• Discussed baseline of REDD project and A/R CDM. • Discussed the point of PES (payment of ecological services) • Discussed the REDD program of UN and World Bank. • Discussed and confirmed the component of the training material.
Carbon Footprint 1	18/10/2010
Participants	Total: 4
Points of discussion	• Discussed contents of the training material • Discussed and confirmed the target audiences • Discussed and confirmed the topics, and their contents and volume • Supported to develop the presentation outline
CDM 10	20/10/2010
Participants	Total: 2
Points of discussion	• Discussed the following technical information: - CDM Programme of activities (PoA), and registered projects - The role of CEM - The contents of PoA-DD and CPA-DD - The relationship between prior consideration and additionality • Confirmed the target audiences for training and the component of the training material.

UNFCCC Structure & Negotiations 9	15/11/2010
Participants	Total: 2
Points of discussion	• Discussed the contents of the training material for UNFCCC and international negotiation (draft) and confirmed the topics. • Confirmed the target audiences for the topic of NAMA/MRV and discussed the information to be included. • Requested TGO to decide the trainer for this topic.
CDM 11	16/11/2010
Participants	Total: 2
Points of discussion	• Discussed the process for CDM application in Thailand and SD criteria. • Discussed detailed procedure from monitoring to CER issuance. • Discussed importance of monitoring and key points in monitoring. • Discussed the new guideline for additionality demonstration of very small scale CDM project approved by CDM Executive Board.
Carbon Footprint 2	19/11/2010
Participants	Total: 2
Points of discussion	• Discussed the component of the draft training material • Discussed range of Information to be presented to target audience such as importance and advantage of carbon footprint system • Discussed current situation of corporate carbon footprint • Discussed each step of LCA of products and information to be presented to target audience • Discussed Thailand's LCI database
CDM 12	26/11/2010
Participants	Total: 2
Points of discussion	• Discussed contents and volume of the presentation material for additionality demonstration in large-scale, small-scale and very small-scale CDM project. • Discussed contents and volume of the presentation material for VVM
Carbon Footprint 3	26/11/2010
Participants	Total: 2
Points of discussion	• Discussed contents and volume of the training material for LCA • Discussed technical aspects of presentation - Discussed contents and volume of training material for CFP calculation method - Discussed B to B, and B to C in detail. - Discussed how to present example cases effectively.
CDM 13	12/2/2010
Participants	Total: 2
Points of discussion	• Discussed the result of train the trainers seminar - Discussed the result of questionnaires collected from participants to the trainers seminar - Discussed the positive and negative comments from the participants about presentation quality and training materials - Discussed how to improve presentation and training materials
Carbon Footprint 4	12/2/2010
Participants	Total: 3
Points of discussion	• Discussed the result of train the trainers seminar - Discussed the result of questionnaires collected from participants to the trainers seminar - Discussed the positive and negative comments from the participants about presentation quality and training materials - Discussed how to improve presentation and training materials

UNFCCC Structure & Negotiations 10	12/2/2010
Participants	Total: 2
Points of discussion	• Discussed the result of train the trainers seminar - Discussed the result of questionnaires collected from participants to the trainers seminar - Discussed the positive and negative comments from the participants about presentation quality and training materials - Discussed how to improve presentation and training materials
GHG Inventory 7	19/1/2011
Participants	Total: 7
Points of discussion	• Review training material developed during 2nd quarter • Discussed structure and order of slides • Discussed supplementary explanation on presentation • Discussed importance of a slide on benefits of GHG inventory • Discussed how to explain calculation on IPCC sectors
Carbon Footprint 5	20/1/2011
Participants	Total: 3
Points of discussion	• Review training material developed during 2nd quarter • Discussed importance of a slide on benefits of CFP • Discussed expected questions from audience and reflect on presentation • Discussed order of slides and title • Discussed technical aspect on CFP for private sectors • Discussed how to explain about LCA • Discussed appropriate example for CFP calculation
GHG Inventory 8	27/1/2011
Participants	Total: 7
Points of discussion	• Discussed structure and order of slides • Discussed supplementary explanation on presentation • Discussed issues on inventory development and its solution • Discussed how to explain calculation on waste sector
GHG Inventory 9	10/2/2011
Participants	Total: 2
Points of discussion	• Discussed structure and order of slides for AFOLU sector • Discussed supplementary explanation on presentation • Discussed how to explain calculation on waste sector • Discussed how to explain issues on inventory development and its solution
GHG Inventory 10	11/2/2011
Participants	Total: 3
Points of discussion	• Discussed structure and order of slides for IPPU sector and Waste sector • Discussed supplementary explanation on presentation • Discussed how to explain calculation for GHG inventory • Discussed issues on inventory development and its solution
UNFCCC Structure & Negotiations 11	11/2/2011
Participants	Total: 3
Points of discussion	• Discussed draft presentation material on UNFCCC Structure & Negotiations • Discussed on Bali road map and NAMA • Discussed difference between domestic NAMA and supported NAMA, and MRV for each NAMA • Discussed MRV guideline developed by UN • Discussed target audience for the material

GHG Inventory 11	17/2/2011
Participants	Total: 3
Points of discussion	• Finalized training materials of IPPU sector and waste sector • Discussed importance of providing reference
GHG Inventory 12	23/2/2011
Participants	Total: 2
Points of discussion	• Discussed structure and order of slides for energy sector and introduction • Discussed supplementary explanation on presentation • Discussed how to explain calculation for GHG inventory • Discussed issues on inventory development and its solution
GHG Inventory 13	23/2/2011
Participants	Total: 2
Points of discussion	• Finalized training materials of AFOLU sector and waste sector • Discussed importance of providing reference
CDM 14	24/2/2011
Participants	Total: 2
Points of discussion	• Discussed training curriculum and training material on A/R CDM • Discussed target audience and contents • Discussed definition of reforestation and afforestation • Discussed difference between small scale and large scale project • Discussed how to prove additionality • Discussed project initiation date • Discussed EIA in Thailand • Discussed A/R projects registered
UNFCCC Negotiations 12	24/2/2011
Participants	Total: 2
Points of discussion	• Finalized training materials • Discussed amount of reduction to stabilize GHG concentration • Discussed Cancun agreement • Discussed GHG emission from major countries • Discussed AWG-KP documents
GHG Inventory 14	28/2/2011
Participants	Total: 2
Points of discussion	• Finalized training materials of energy sector and introduction • Discussed importance of providing reference
CDM 15	28/2/2011
Participants	Total: 2
Points of discussion	• Finalized training materials of A/R-CDM • Discussed how to prove additionality of large scale projects • Discussed importance of providing reference • Discussed order of slides
UNFCCC Negotiations 13	4/3/2011
Participants	Total: 2
Points of discussion	• Feedback of trainer's training • Discussed amount points to be improved on training curriculum and training materials
GHG Inventory 15	4/3/2011
Participants	Total: 6
Points of discussion	• Feedback of trainer's training

CDM16	6/5/2011
Participants	Total: 2
Points of discussion	• Feedback of trainer's training • Discussed amount points to be improved on training curriculum and training materials
CDM17	6/5/2011
Participants	Total: 2
Points of discussion	• Discussion on contents of presentation at CTC • Identify target audience • Review existing training materials • identification of appropriate slides from existing training material • Confirm updated data and information • Feedback from Trainers training • Check the translation
GHG Inventory 16	6/5/2011
Participants	Total: 4
Points of discussion	• Discussion on contents of presentation at CTC • Identify target audience • Review existing training materials • identification of appropriate slides from existing training material • Confirm updated data and information • Feedback from Trainers training • Check the translation
UNFCCC Structure and Negotiations 14	9/5/2011
Participants	Total: 2
Points of discussion	• Discussion on contents of presentation at CTC • Identify target audience • Review existing training materials • identification of appropriate slides from existing training material • Confirm updated data and information • Check the translation
Carbon Footprint 6	11/5/2011
Participants	Total: 3
Points of discussion	• Discussion on contents of presentation at CTC • Identify target audience • Review existing training material • identification of appropriate slides from existing training material • Confirm updated data and information • Feedback from Trainers training • Check the translation into Thai
Carbon Trading 5	12/5/2011
Participants	Total: 3
Points of discussion	• Discussion on contents of presentation at CTC • Identify target audience • Review existing training material • identification of appropriate slides from existing training material • Confirm updated data and information • Feedback from Trainers training • Check the translation into Thai

CDM 18/ UNFCCC Structure & Negotiations 15	14/7/2011
Participants	Total : 3
Points of discussion	• Discussion on contents of presentation at CTC • Discussion on A/R-CDM and REDD in Thailand • PPT improvement • Discussion on points of presentation
GHG Mitigation 1	14/7/2011
Participants	Total: 2
Points of discussion	• Discussion on contents of presentation at CTC • Identify target audience • Discussion on outline of mitigation and relevant policies in Thailand • Discussion on effect of co-benefit • PPT improvement
Carbon Footprint 7	21/7/2011
Participants	Total : 3
Points of discussion	• PPT improvement • Discussion on carbon footprint for organization • Discussion on effective way to explain LCA calculation process • PPT improvement • Discussion on points of presentation
CDM 18/ GHG Mitigation 2	21/7/2011
Participants	Total : 3
Points of discussion	• Improvement of presentation on CDM and GHG • Discussion on latest agreement made by the CDM Executive Board meetings • Discussion on additionality of PoA
Carbon Trading 6	3/8/2011
Participants	Total : 3
Points of discussion	• PPT improvement • Discussion on JVETS, T-CAT and EU-ETS
GHG Inventory 16	8/8/2011
Participants	Total: 4
Points of discussion	• PPT improvement • Discussion on lack of data in different sectors

Photo 2-5 Study session for training material development (1)

Photo 2-6 Study session for training material development (2)

2.2.1.3 Conduct "Train the trainers" seminars

Seminars were conducted that aim to develop the training provision capacity of TGO staff (titled "training of trainers") by using the developed training materials.

The trainers who made a presentation at the trainers' seminar were assigned TGO staff from the responsible department related to the training theme and topic. Those personnel also developed the training curriculum and training materials. Since TGO had a plan to provide training to other countries, all presentations were conducted in English.

Staff from other departments in TGO was encouraged to participate into the trainers' seminars since personnel from such offices should be able to make a presentation of their responsible sectors and topics and answer to questions from the audience appropriately. JICA experts participated to the seminar as an audience and raised questions that general audience may raise in an actual seminar. 3 trainer's trainings were conducted where 10 trainers made presentation covered 14 topics.

Table 2-9 Training of Trainers

Seminar	No.	Sector	Topic	Time (min)	Presenter
1st session	1	Carbon Traiding	Overview and Background Overview of EU-ETS and Tokyo Cap-and-Trade	30	Ms. Sumon Sumetchoengprachya
	2	CDM	Basic Knowledge about CDM	40	Dr. Paweena Panichayapichet
	3	UNFCCC structure and negotiations	Climate Change Law and Policy	20	Ms. Weerada Tivasuradej
2nd session	4	Carbon Footprint	Concept and Current Situation in the World	40	Ms. Phakamon Supappunt
	5		LCA Related Issues & Calculation of Carbon Footprint	40	Mr. Thada Varoonchotikul
	6	CDM	Key Issues for CDM Project Implementation	60	Dr. Paweena Panichayapichet
	7	UNFCCC	REDD	30	Ms. Anna Kiewchaum
3rd session	8	UNFCCC structure	UNFCCC	20	Ms. Weerada Tivasuradej
	9	CDM	Afforestation/ Reforestation Clean Development Mechanism: A/R CDM	20	Ms. Anna Kiewchaum
	10	GHG Inventory	Overview of Thailand National Inventory	20	Mr. Chessada Sakulku
	11		Industrial Processes Sector	20	Ms. Wararat Chaumkruea

Seminar	No.	Sector	Topic	Time (min)	Presenter
	12		Energy Sector	20	Mr. Chessada Sakulku
	13		AFOLU Sector	20	Ms. Wasinee Cheunban
	14		Waste Sector	20	Ms. Mewadee Seresathiansub

Photo 2-7 Trainer's training (1)

Photo 2-8 Trainer's training (2)

2.2.1.4 Evaluation of training material and curriculum

Participants to the trainers' seminars evaluated presentation materials and presentation skills by using evaluation sheet. Each question was scored in scale of five (5 being the highest evaluation). Evaluation sheets were distributed before trainers' seminars and were collected after the seminar.

(1) Evaluation of presentation material and curriculum

Items of evaluation for presentation materials were as blow.

Table 2-10 Items of evaluation for presentation materials

No.	Questions
1	Information is sufficiently covered for the topic and the latest information is included?
2	Information provided is clear and easy to understand?
3	Presentation contains appropriate graphic (picture, table) that will help audience to understand?
4	Length of presentation is appropriate?
5	Information source is appropriately presented and presentation uses only reliable source?
6	Letters and figures in presentation are clearly and readable?

Results of the evaluation on each material are shown in the table below. Both training curriculum and training materials were highly evaluated.

Table 2-11 Evaluation result on training material (1)

Topic / Evaluation Item	CDM1	CT	UN1	CFP1	CFP2	CDM2	REDD
1	4.30	4.47	4.08	4.67	4.06	4.75	4.57
2	3.90	4.37	4.67	4.47	3.41	4.00	4.43
3	3.80	3.95	4.50	4.53	4.00	4.08	4.86
4	4.00	4.32	4.25	4.33	4.06	3.87	4.29
5	4.10	4.47	4.50	4.60	4.24	4.33	4.64
6	4.20	4.37	4.58	4.27	4.24	4.42	4.64
Average	4.05	4.32	4.43	4.48	4.00	4.24	4.57

Table 2-11 Evaluation result on training material (2)

Topic / Evaluation Item	UNFCCC	A/R CDM	INV Intro	INV IPPU	INV Energy	INV AFOLU	INV Waste
1	4.33	4.69	4.47	4.33	4.57	4.50	4.59
2	4.42	4.31	4.40	4.13	4.43	4.47	4.59
3	4.17	4.69	4.27	4.53	4.14	4.59	4.59
4	4.42	4.67	4.53	4.36	4.57	4.29	4.59
5	4.33	4.54	4.53	4.20	4.57	4.41	4.53
6	4.42	4.15	4.53	4.27	4.36	4.06	4.47
Average	4.35	4.51	4.46	4.30	4.44	4.39	4.17

Suggestions from participants to the presenters include following points;

- A presenter should summarize the important points by her/his own word and provide tables and figures effectively.
- A presenter should prepare a training material in light of level of understanding of audience.
- A presenter should not put too much information in a slide and should use simple figures and tables.
- A presenter should prepare the printed handouts which are matching the slides shown at the screen to avoid confusion.
- A presenter should avoid using too much animation effect.
- A presenter should choose appropriate font size and color.
- It is good practice to prepare handouts to give additional information that cannot be covered in the presentation

Based on the result, each trainer was able to learn about which points he/she can improve, and then revised their training materials with the support from JICA Expert Team.

(2) Evaluation on presentation

Evaluation items on trainer's presentation skill are shown in Table 2-12. Each item was evaluated in scale of five (5 being the highest evaluation).

Table 2-12 Items of evaluation for presentation skills

No.	Questions
1	Voice is loud enough?
2	Talking speed is appropriate?
3	Presenter's voice clearly audible?
4	Laser pointer or whiteboard is appropriately used?
5	Presenter answers to questions appropriately?
6	Presenter is talking in her/his own words, not simply reading slides?
7	Presenter interacts with audience effectively during presentation?

Results of the evaluation of each presenter are shown in Table 2-13.

Table 2-13 Evaluation result on presentation (1)

Topic / Evaluation Item	CDM1	CT	UN1	CFP1	CFP2	CDM2	REDD
1	4.20	4.18	4.60	4.27	4.35	4.55	4.85
2	3.60	4.12	4.70	4.20	4.06	4.09	4.62
3	3.70	4.06	4.70	4.13	3.76	4.09	4.62
4	3.50	3.57	3.80	4.14	3.53	3.60	4.38
5	3.78	4.25	4.00	4.27	3.69	4.27	4.31
6	3.70	3.53	4.50	3.87	3.53	4.45	4.69
7	3.50	3.35	4.40	3.80	3.35	3.91	4.46
Average	3.71	3.87	4.39	4.10	3.75	4.14	4.56

Table 2-13 Evaluation results on presentation (2)

Topic / Evaluation item	UNFCCC	A/R CDM	INV Intro	INV IPPU	INV Energy	INV AFOLU	INV Waste
1	4.58	4.62	4.73	3.73	4.93	4.71	4.53
2	4.50	4.54	4.27	4.13	4.64	4.47	4.35
3	4.50	4.54	4.47	4.00	4.43	4.41	4.41
4	3.82	4.25	3.47	3.33	3.29	3.65	4.29
5	4.33	4.38	4.60	3.67	4.46	4.31	3.33
6	4.67	4.62	4.20	3.71	4.43	4.18	4.29
7	4.50	4.23	4.20	3.69	4.29	4.24	3.94
Average	4.41	4.45	4.28	3.75	4.35	4.28	4.17

Suggestions from participants to the presenters include the following points;

- A presenter should explain by using their own words.
- A presenter should emphasize important points using voice tone and pointer.
- A presenter should consider allocation of presentation time of each slide.
- A presenter should focus on important points and explain carefully.
- Providing some specific examples facilitate easier understanding of audience.
- It is good practice to ask comments from audience in order to keep their attention to the presentation.
- A presenter should use eye contact to the audience in order to receive their response to presentation. If their attention drops, making a question to them is one of the effective ways to capture attention.
- A presenter should take a brief stop before moving to the next slide so that the audience can follow the presentation.

TGO and JICA Expert Team reviewed the result of evaluation and comments, and discussed how to improve their presentation. Such comments received at the trainers seminars were compiled in the guideline for trainers which can be referred in developing training materials and training presentation skill continuously. The guideline consists of 3 topics such as presentation contents, slide design and presentation delivery in order to provide ideas and tips for the trainers.

2.2.2 Target and achievement

The target of Activity 2 is set in PDM as follows:

Target
Capacity of TGO to provide training will be enhanced.

The following indicators are provided in the proposed PDM to measure results of Activity 2

Objectively Verifiable Indicators
Curriculum and training material will be produced. Series of training courses are designed.

Referring to the above indicators, the results of achievement on Activity 1 are as follows:

14 training materials from 5 key themes in climate change mitigation as well as training curriculum were developed by TGO. The training materials covered 5 key topics related to climate change mitigation in Thailand, including CDM, carbon trading, UNFCCC structure and international negotiations, carbon footprint, and GHG inventory.

Technical staff of TGO who had a very limited experience to make a presentation at external seminars developed their own training materials and carried out presentations at several occasions. 10 TGO staff who were assigned for the activity have significantly improved their capacity through the Project activities such as training material development and making a presentation at trainer's training seminar and international climate change seminar. By developing capacity of 10 new trainers in all technical departments of TGO, it will be adequate to conclude that TGO, as an organization, has been strengthened.

It is also important to mention that these 10 assigned staff not only improved their training provision capacity, but also their overall comprehensive understanding on the subject has been dramatically improved through 67 study sessions and discussion with JICA Expert Team.
Workshop at Climate Thailand Conference (CTC) was held in August 2011 as a summary seminar of the Project and trainers made a presentation by using training materials developed through the Project. Capacity Building and Outreach Office of TGO, which is responsible for developing and implementing training programs, played a principal role in developing the curriculum for CTC 2011. It was the first presentation experience on external seminar for most of trainers and contributed to further capacity enhancement.

The training materials and experience of curriculum development are utilized in their external training planned in the Greenhouse Gas Management Programme (GMaP) 2012, where 7 seminars and 2 training courses (Basic/Advance) are described as an annual training plan of 2012. Therefore, the target of Activity 2 has been achieved in light of the Objectively Verifiable Indicators.

2.3 Output 3：Enhancement of review and monitoring capacity of TGO staff on GHG mitigation

2.3.1 Activities

2.3.1.1 Development of a potential list

JICA Expert Team and TGO prepared a potential project list to select pilot projects for PIN and PDD development. A working team consisted of TGO staff and JICA Expert Team has collected data and information of potential projects.

(1) Implementation method for list development

Potential project list was prepared based on the information from existing CDM project pipeline of TGO, and call for new potential pilot projects through TGO website and seminars/ workshops. It also was prepared based on the information from existing literatures/ studies on potential/ existing projects by climate change-related institutions such as Ministry of Energy, Ministry of Transport, and Bangkok Metropolitan Administration (BMA).

Survey on the existing literatures/ studies was carried out by local consultants in commission.

(2) Outline of data collection

The basic data including the existing potential survey results and potential project lists etc. was collected from relevant agencies as Table 2-14.

JICA Expert Team had a series of meeting and discussions with TGO and other stakeholders through this data collection activity, and various kinds of technical knowledge was transferred to the Thai side, such as conditions and applicability of CDM projects and method to calculate GHG emission reduction or absorption, etc. The outline of data collection and the technology transfer to TGO and other agencies, which will be project implementing body such as BMA was shown in Table 2-15.

Table 2-14 Relevant Agencies Contacted for Data Collection

Relevant Agency	Outline of Consultation
Bangkok Metropolitan Administration (BMA)	・ Consultation on various potential CDM projects project (5 times)
Department of Marine & Coastal Resources (DMCR), Royal Forest Department (RFD), Chantaburi Province, Kasesaht University	・ Consultation on mangrove plantation project (3 times)
JGSEE/ King Mongkut's University	・ Consultation on the potential of solid waste management projects
Mass Rapid Transit Authority of Thailand (MRTA)	・ Consultation on MRTA Purple Line project

Table 2-15 Data Collection and Technology Transfer to Relevant Authority

Session 1	**01/02/2010, 9: 30-10: 15**
Relevant Authority	Bangkok Metropolitan Administration (BMA)
participants	Total: 6 (TGO: 1, BMA: 2, JICA Expert Team: 3)
Discussion Topic	CDM project candidates under BMA
Outline of Discussion/ Items of Technology transfer	Information about the technical cooperation project was presented, and the project formation of CDM was discussed. Main points of discussion and technology transfer was as follows: • On-going and potential BMA projects were introduced. －Biogas project for wastewater treatment －Biogas project at final disposal site of solid waste management －Energy saving project for buildings by installation of insulation materials • JICA Expert Team transferred technical knowledge including necessary condition to be CDM project (establishment of institutional arrangement, technical analysis, selection of methodology, financial analysis, F/S). The investment analysis and IRR was explained. The necessity of project profile (materials to be explained to relevant agencies or investors) was commented.

Session 2	**08/02/2010, 11: 00-12: 00**
Relevant Authority	Kasesaht University
participants	Total: 6 (TGO: 1, Kasesaht Univ.: 3, JICA Expert Team: 2)
Discussion Topic	Mangrove Plantation Project in Chantaburi Province
Outline of Discussion/ Items of Technology transfer	• Information about the technical cooperation project was presented by JICA Expert Team, and the mangrove plantation project by Kasesaht Univ. • The followings are main discussion and technology transfer items. －The meeting for mangrove plantation project in Chantaburi Province was held by TGO, Royal Forest Department, Chantaburi Province, Department of Marine & Coastal Resources (DMCR), and WB in 2009. The F/S has been implementing. It seems that WB has an interest on this project. －JICA Expert Team advised the importance of responsibility sharing to be CDM project, and clarification of roles among relevant authorities such as project implementation, technical supporting, planting, rearing/ maintenance. －F/S was commissioned to consultant by Province (It is described that TGO commissioned consultant by TGO in the F/S report). F/S was prepared by Equitech Thailand Ltd., local subsidy of Canadian consultant －JICA Expert Team explained that not only financial analysis but also the calculation of growth volume based on growth curve of species to be planted is very important. It was advised that the grown volume should be calculated by measuring results at site. －The reforestation has been implemented little by little. The Mangrove Station 2&3 of DMCR has been managing these forests, and implementing the Biodiversity Assessment. • The method of seed gathering, nursery construction, rearing at nursery, planting/ rearing at site for mangrove plantation was advised by JICA Expert Team.
Session 3	**15/02/2010, 14: 00-15: 00**
Relevant Authority	Bangkok Metropolitan Administration (BMA)
participants	Total: 8 (TGO: 3, BMA: 2, JICA Expert Team: 1, JICA Thai Office: 2)
Discussion Topic	CDM project candidates under BMA
Outline of Discussion/ Items of Technology transfer	• The following CDM candidates were explained by BMA. －Human waste treatment －Sludge treatment －BRT －Collection route improvement and energy conversion of solid waste collection vehicles －improvement of flood control pumps －mangrove plantation －Energy saving of buildings • JICA Expert Team transferred technical knowledge including necessary condition to be CDM project. Response by BMA was not sufficient, so the meeting with staffs in charge of the projects will be held.

Session 4	**18/02/2010, 14: 00-15: 00**
Relevant Authority	Bangkok Metropolitan Administration (BMA)
participants	Total: 15 (BMA: 14, JICA Expert Team: 1)
Discussion Topic	CDM project candidates under BMA
Outline of Discussion/ Items of Technology transfer	• The following CDM candidates were explained by persons in charge of each project in BMA. ・BRT ・Electricity saving ・Improvement of road side lighting ・Introduction of NGV ・Improvement of solid waste collection vehicles・improvement of water pumps ・Improvement of human waste and wastewater treatment・Coastal erosion control • JICA Expert Team had questions on detailed project contents and CO2 emission factors, and advised further data collection items and methods.
Session 5	**29/04/2010 14: 00-16: 00**
Relevant Authority	Bangkok Metropolitan Administration (BMA)
participants	Total: 11 (TGO: 1, BMA: 3, JICA Expert Team: 7)
Discussion Topic	Biogas generation using waste food from schools in Bangkok (BMA project)
Outline of Discussion/ Items of Technology transfer	• JICA Expert Team visited project site of "Biogas generation using waste food from schools in Bangkok" and discussed about current condition and problem of project operation with BMA staffs and project operator (school teacher). - Discussed about project content, technology, project cost, etc. - Discussed about transportation and collection system of biomass (waste food) which are fuels of biodigester. - Suggested to TGO, BMA and project operator about project monitoring. - Suggested to TGO, BMA and project operator about project monitoring, overview of baseline of GHG emission, project emission and leakage emission, and predicted GHG emission sources. - Suggested to TGO, BMA and project operator about GHG calculation method. - Discussed about the kinds of food waste, the rate of methane generation, and impacts on the plant. • JICA Expert Team transferred technical knowledge to TGO and BMA on necessary condition and future consideration to be CDM project. Discussion points are shown below. -Confirmation of sources of GHG emissions and collection of date for calculation of baseline emission and project emission - Concept of additionality and significance of financial analysis - Technical barrier and actual technology introduced to the project - Significance of project start date - Expected monitoring activities and cost - Outline and benefits of bundling and program of activity, and applicability

Photo 2-9 Discussion with BMA

Photo 2-10 Project site visit

Session 6	**07/05/2010, 10: 00-11: 00**
Relevant Authority	Mass Rapid Transportation Authority (MRTA)
participants	Total: 11 (TGO: 3, MRTA: 3, JICA Thailand office: 2, JICA Expert Team: 3)
Discussion Topic	CDM project candidates under MRTA (purple line)
Outline of Discussion/ Items of Technology transfer	• MRT blue line and its extension have been considered to be CDM and PDD of these projects have been developed. MRTA has an interest to make the purple line project as CDM as well as blue line, and they asked TGO to support them. TGO, MRTA and JICA, which has been invested, had a meeting on this matter. • JICA Expert Team suggested to TGO and MRTA that they should confirm the date that MRTA had first considered that they would make this project as CDM.
Session 7	**09/ 05/2010, 10: 00-11: 00**
Relevant Authority	Joint Graduate School of Energy and Environment (JGSEE)
participants	Total: 8 (TGO: 1, JGSEE: 2, JICA Expert Team: 5)
Discussion Topic	Waste Management in Thailand CDM projects potential in Thailand (waste)
Outline of Discussion/ Items of Technology transfer	• JICA Expert Team interviewed JGSEE in King Mongkut's University on potential CDM projects in waste management sector. -JGSEE suggested that small scale landfill methane recovery project has a big potential in Thailand. In promoting such waste management projects, projects usually encounter problems such as a strong opposition from local community. Dismantling speed of organic matter is high because of high temperature. Current methodology may not be suitable for projects in Thailand. - Points at issue are rank odor at processing and increase of BOD and COD of wastewater because of high temperature.
Session 8	**04/06/2010, 10: 00-15: 00**
Relevant Authority	Bangkok Metropolitan Administration (BMA)
participants	Total: 20 (TGO: 1, BMA: 10, JICA Expert Team: 4, Local consultants: 5)
Discussion Topic	CDM project candidates under BMA
Outline of Discussion/ Items of Technology transfer	• Before the meeting, JICA Expert Team sent questionnaires about details of existing BMA project and current condition and problem of its operation, data for GHG calculation. In this meeting, BMA staffs explained the answers to JICA team's questioners. • JICA Expert Team transferred technical knowledge to TGO and BMA on necessary condition to be CDM project. Discussion points are shown below. - Overview of CDM project and project cycle - Outline of baseline emission and the concept of additionality, demonstration method of additionality, and the types of barriers in the additionality tool. - Key points and issues of CDM project development - Definition of project start date and its relation with additionality - Outline and benefit of bundling and CDM program of activity

Photo 2-11 Discussion with BMA (1)

Photo 2-12 Discussion with BMA (2)

Session 9	**09/ 07/2010, 15: 00-17: 00**
Relevant Authority	TGO
participants	Total: 3 (TGO: 2, JICA Expert Team: 1)
Discussion Topic	PDD for Mangrove Plantation Project in Chantaburi Province
Outline of Discussion/ Items of Technology transfer	• The existing PDD sample of small-scale AR-CDM was provided to TGO, and the followings on PDD preparation were explained by JICA Expert Team. －Project implementing body －Selection of project boundary －Species to be planted, planting method and its technical transfer method －Land tenure and land use －Necessary condition for year 1989 －Credit for CO2 emission －Calculation method of GHG absorption －methodology and items of monitoring －Environmental and social impacts • The points to be noted in preparation of PDD for mangrove plantation project in Chantaburi Province
Session 10	**16/07/ 2010, 15: 00-17: 00**
Relevant Authority	TGO, DMCR, Kasesaht University
participants	Total: 5 (TGO: 2, DMCR: 1, Kasesaht Univ.1, JICA Expert Team: 1)
Discussion Topic	PDD preparation for Mangrove Plantation Project in Chantaburi Province
Outline of Discussion/ Items of Technology transfer	• The followings on PDD preparation of mangrove plantation project in Chantaburi Province was advised by JICA Expert Team. －Clarification of role sharing among relevant authorities －Condition to be Small Scale A/R-CDM (16,000 tCO2/year) －Selection of species to be planted －Calculation of growth volume based on growth curve of species to be planted －Calculation of project area • The calculation of growth curve, growth volume, and project area as a small-scale A/R-CDM was provided by JICA Expert Team by using sample project in Indonesia.

(3) Call for new potential pilot projects through TGO website

New potential pilot projects were invited through TGO website from June to July 2010. Projects were invited from project developers who are interested in preparation and development of PIN in all types of projects.

Figure 2-3 Project application at TGO website

(4) Provision of Potential List

Developed potential list based on data collection activities form project implementers and call through website is shown in the Table 2-16.

The 3 projects collected through website were No6: Namfon Dairy Farm Bio-gas Development project, No.7: Bangkok Solar Farm at Bangpa-In, and No. 15: Smart Logistics: reducing fuel usage of commercial.

The amount of emission reduction/ absorption was preliminarily estimated by using the available data and simplified equations, and it is not entirely based on the calculation formula stipulated in the approved methodologies.

Table 2-16 List of Potential Project

Sector	No.	Project name (tentative)	Project Description
Fuel Conversion	1	Natural Gas Vehicles	BMA will install equipment (DDF) to diesel or gasoline vehicles that will allow the use of natural gas. GHG Emission/ Absorption Amount: 140 t-CO_{2e}/y Investment Cost: 15.6 Million Baht
	2	Improvement of waste collection system	The project will improve the current waste collection system in BMA and thus reducing fossil consumption by waste collection trucks. The project will also involve switching fuel from diesel to CNG. GHG Emission/ Absorption Amount: 13,780 t-CO_{2e}/y Investment Cost: N/A
Energy efficiency improvement	3	Natural Gas for Water Distribution Pumps	The water distribution pumps in Bangkok were installed more than 10 years ago. 240 – 360 MWh of electricity generated by a diesel power unit is currently used by each water pump. The project will involve conversion of fuel to natural gas for 150 pumps. GHG Emission/ Absorption Amount: 54 t-CO_{2e}/y Investment Cost: 3.5 Million Baht (as cost for equipment)
Waste management	4	Sewage sludge treatment	The current sewage treatment faculties install bio digester to treat sludge. There are 2 existing wastewater treatment facilities in Bangkok. 1 of them is operating and the other one has been stopped in operation to meet the current sludge volume. The operating one will expand to treat sludge when amount of sludge increase. GHG Emission/ Absorption Amount: 251 t-CO_{2e}/y Investment Cost: N/A
Waste management	5	Biogas generation from food waste at schools	Schools in Bangkok collect food waste from local schools, market, and restaurants and use as an input to bio-digester. Biogas generated will substitute the use of LPG currently used for cooking fuel for school. About 20 kg of waste is collected and used per day. Byproduct sludge will be used as a fertilizer and provided to nearby communities and factories with no charge. Pilot projects cover 80 schools and now BMA is trying to expand to 84 schools. BMA plans to install the new biogas system in 2011. DEDE plans new plant with capacity of 20 kg/day. GHG Emission/ Absorption Amount: N/A (depend on scale) Investment Cost: N/A (depend on scale)
	6	Namfon Dairy Farm Bio-gas Development project	Namfon Farm LP has started to implement with 2,000 cows and 3,000 m2 digester 3 years ago. It has been more than 5,000 dairy cows in Sep. 2010, and it will be expand 7,000 cows, so treatment of raw sewage is issue. New 20,000 m3 digester and 20,000 m3 reservoirs to treat raw sewage will introduce, produce electricity from generated biogas, and covert electricity which had purchased from grid. GHG Emission/ Absorption Amount: 19,258 t-CO_{2e}/y Investment Cost: approximately 120 Million Baht
Renewable energy	7	Bangchak Solar Farm at Bangpa-In	The solar panels of 38MW will be installed. It will generate 65GWh/year of electricity, all of which will be supplied to the national grid. GHG Emission/ Absorption Amount: 32,500 t-CO_{2e}/y Investment Cost: 4,715 Million Baht
Energy saving	8	Roadside LED lighting	Switch the current inefficient street lighting to more energy-efficient roadside Light Emitting Diode (LED) lighting system. GHG Emission/ Absorption Amount: 173 t-CO_{2e}/y Investment Cost: N/A
	9	Energy saving at buildings	The project will reduce energy consumption at all BMA buildings. Total of 600 buildings include 2 of the main BMA Offices, 9 hospitals, 50 district offices, schools, etc. GHG Emission/ Absorption Amount: 22,580 t-CO_{2e}/y Investment Cost: N/A

Sector	No.	Project name (tentative)	Project Description
Energy saving	10	Repair of air-conditioning and refrigerator	The project will involve repair and exchange the existing energy-inefficient air conditioning machines and refrigerators. (out of BMA control) GHG Emission/ Absorption Amount: 579 t-CO_{2e}/y Investment Cost: N/A
Transportation	11	Biodiesel from cooking oil – for BMA forklift	Forklifts in BMA use diesel. Introduction of cooking oil-based biodiesel into forklift machines of BMA. Biodiesel plant with 100 l/day was already installed, but cooking oil from Wachiraboriban and Taksin Hospital is insufficient. 2 forklifts were supplied by biodiesel every year. Amount of collected cooking oil plan to increase, so diesel for 14 folk lifts will change to biodiesel. GHG Emission/ Absorption Amount: 32 t-CO_{2e}/y
	12	Biodiesel from cooking oil –for gas station	Introduction of cooking oil-based biodiesel into petroleum market (gas stations) in Thailand. GHG Emission/ Absorption Amount: 322 t-CO_{2e}/y Investment Cost: 3.2 Million Baht
	13	BRT	The project will involve construction of second Bus Rapid Transit (BRT) system project, which will cover 14 routes, with total extension of 249.6 km. GHG Emission/ Absorption Amount: 38,050 t-CO_{2e}/y
	14	MRT project (purple line)	The purpose of the project activity is the establishment and operation of a railway system, named Purple Line, Bang Yai – Rat Burana (40 km), as an effective mass transit system. Expected number of passenger is 195,505 in 2012 between Bang Su and Bang Ya (23km), and 493,717 in 2022 between Bang Su and Ratburana (20 km). GHG Emission/ Absorption Amount: 9,732 t-CO_{2e}/y (2014) ~ 23,559 t-CO_{2e}/y (2042) Investment Cost: 60,072 Million Baht
	15	Smart Logistics: reducing fuel usage of commercial vehicles in Thailand	The fuel consumption on Thailand logistics will be reduced by optimization on usage of commercial vehicles (tracks) using advanced travel monitoring technology. The digital tachograph system is able to vehicle management and optimization on usage of resources. GHG Emission/ Absorption Amount: N/A (under planning for introduction of vehicle) Investment Cost: 10.2 Million Baht
Forestation	16	Mangrove plantation project in BMA Bangkunthien District	Plant mangrove trees along 4.8 km coast of Thailand Gulf in Bangkunthien District. Currently the project site is used as fish and shrimp pond. Mangrove area covers 2,735 rai in year 1961. The areas are decreased continuously. There are 1,999 rai in year 2000. Information indicated that the mangrove area is 1,237 rai (1.98 km2). GHG Emission/ Absorption Amount: 4,349 t-CO_{2e}/y Investment Cost: N/A
	17	Mangrove A/R project in Chantaburi Province	Welu wetland is located at Ban Thasorn, Amphur Khlung, Chantaburi province, covered the area 19,000 ha. The area is classified as “reserved forest” heavily encroached by rural people. The natural mangrove forest was cut down and changed to shrimp and fish ponds. The RFD, DMCR and Chantaburi Province have been reforesting over several years. The 1,600 ha were proposed for A/R CDM. GHG Emission/ Absorption Amount: 5,829 t-CO_{2e}/y Investment Cost: 87 Million Baht (except O/M cost)

2.3.1.2 Develop criteria for pilot project selection

TGO and JICA expert jointly developed criteria to select pilot projects. The “Guidebook on CDM Project Screening” currently developed by TGO were referred to in this activity. The developed

criteria are shown in Table 2-17 and 2-18.

Table 2-17 Selection criteria to screen pilot projects for PIN

Category	Screening	Criteria
Category 1:	Check if it is significant to promote a project as a CDM project in Thailand	a. Contribute to environmental conservation (improvement of air and pollution and solid waste treatment, etc.) b. Contribute to sustainable development in Thailand (job aeration in local community, etc.) c. Be consistent with national policy of Thailand or belongs to at least one of the relevant CDM sectors d. Contribute to GHG emission reductions/removals by sink e. Project concept/plan is clearly defined f. Project has NOT been yet implemented without CDM
Category 2:	Check if a project can be formulated and implemented as a CDM project	a. Project proponent has willingness to implement the proposed project as a CDM project activity b. Project cost is appropriate (not unreasonably large) c. Project installation period is appropriate (Project starting date as well as planned CER issuance date will be within a few years) d. Proven and reliable technology is applied e. Applicable approved methodology(ies) exists f. Necessary data to calculate project's financial performance is readily available g. Necessary data to calculate project's GHG emission reductions/removals by sink is readily available h. Project proponent has completed at least a pre-F/S of the project
Category 3:	Check if a project is appropriate to promote	a. Project has high promotional/newsy impact b. Project concept has high potential market and needs in Thailand and can be diffused c. Contribute to capacity development of stakeholders to adopt new technology/ measure in Thailand

Table 2-18 Selection criteria to screen pilot projects for PDD

Category	Screening	Criteria
Category 4:	Check if a project is likely to be formulated and implemented as a CDM project	a. Project can be started in the short term b. Financial analysis has already been performed c. Financial source is already identified or secured d. Project's technology has been evaluated e. GHG emission reductions/removals by sink have been preliminarily estimated

2.3.1.3 Selection of pilot projects

Each of the criteria listed above was applied to all potential projects in the list and positively evaluated projects were selected as pilot projects.

In addition to the above criteria, interest and intention of prospective project implementation

entities such as BMA were also considered for the selection.

6 projects for PIN and 2 projects for PDD (1 sink project and 1 emission reduction project) were selected. Results of selection of pilot projects are shown in Table 2-19 and 2-20.

Table 2-19 Results of selection of pilot projects

Sector	No.	Project name (tentative)	Project implementer	Result of selection	Reason of selection
Fuel Conversion	1	Natural gas vehicles	BMA	**PIN**	200 diesel vehicle and 47 gasoline-fueled cars were already introduced, and approximately 100 cars (50 diesel vehicles and 53 gasoline-fueled cars will be introduced by the end of 2011.The project implementer will be CDM project.
	2	Improvement of waste collection system	BMA	Reject	The department in charge has intention to be a project. Because of financial conditions of BMA, agreement from decision maker will not be obtained.
Energy efficiency improvement	3	Natural gas for water distribution pumps	BMA	**PIN**	Conversion to natural gas agrees energy policy in Thailand; therefore it is beneficial as GHG mitigation measures.
Waste management	4	Sewage sludge treatment	BMA	Reject	Introduction of biodigester and investment is already finished. It is no problem to introduce 2nd tank, so implementation as CDM project does not apply.
	5	Biogas generation from food waste at schools	BMA	**PDD**	It is possible to spread to all primary schools using PoA programme. Major ripple effect is expected by PoA project through policy programme of local government unit. In addition, spread to whole country including DEDE.
	6	Namfon Farm Dairy Farm Bio-Gas Development Project	Namfon Farm LP	**PIN**	Digester with new technology, which is not same as 1 phase, will introduce. It will have technical and financial barriers, so it has possibility to be CDM project.
Renewable energy	7	Bangchak Solar Farm at Bangpa-In	Private entrepreneur	Reject	FS completed. Project implementer will offer information, if PDD will be prepared. PIN will be prepared by the Project, so it was rejected.
Energy saving	8	Roadside LED lighting	BMA	Reject	It is still discussing that project implementer will be BMA or Metropolitan Energy Authority (public government). And the project is on the stage of idea.
	9	Energy saving at buildings	BMA	Reject	WB will support to develop PDD, so it is unsuitable for the JICA project.

Sector	No.	Project name (tentative)	Project implementer	Result of selection	Reason of selection
	10	Repair of air-conditioning and refrigerator	Electricity business association	Reject	TGO proposed CDM project at the seminar for electricity business association. The project is still on the stage of idea, and concert plan is not existed.
Transportation	11	Biodiesel from cooking oil for BMA's forklifts	BMA	**PIN**	Increase of collection amount of materials, extension of biodiesel production, and conversion from diesel of folk lift will make CO2 reduction. There are some methodologies on biodiesel production from cooking oil, so these methodologies will be selected, and possibility of CDM will be checked.
	12	Biodiesel from cooking oil –for gas station	Private entrepreneur	Reject	The project was already started in 2006, and new factory was constructed. New construction or expansion is not planned.
	13	BRT	BMA	Reject	WB will support to develop PDD, so it is unsuitable for the JICA project.
	14	Urban mass transit project (Purple line)	MRTA	**PIN**	It is selected as PIN by request from MRTA and TGO.
	15	Smart Logistics: Reducing fuel usage of commercial vehicles in Thailand	Fujitsu System Business	**PIN**	Pre-FS is required on the planning stage。 Logistics project has possibility of CDM or NAMA.
Forestation	16	Mangrove plantation project in BMA Bangkunthien District	BMA	Reject	Implementation is difficult, because of problem of land acquisition.
	17	Mangrove A/R project in Chantaburi Province	Chantaburi Province, RFD, DMCR	**PDD**	It is possible to be CDM, because Chantaburi province, DMCR, and RFD as implementing body are tackling.

Table 2-20 Result of selection of pilot projects

		Criteria / Project name	Category 1: Check if it is significant to promote a project as a CDM project in Thailand						Category 2: Check if a project can be formulated and implemented as a CDM project								Category 3: Check if a project is appropriate to promote			Category 4: Check if a project is likely to be formulated and implemented as a CDM project					PIN/PDD
			a	b	c	d	e	f	a	b	c	d	e	f	g	h	a	b	c	a	b	c	d	e	
Fuel conversion	1	**Natural gas vehicles**	●	●	●	●		●	●	●	●	●	●					●	●	●		●			**PIN**
	2	Improvement of waste collection system	●	●	●	●		●				●	●				●	●							
Enegy efficiency management	3	**Natural gas for water distribution pumps**	●	●	●	●		●	●	●		●	●				●		●						**PIN**
Waste management	4	Sewage sludge treatment	●				●					●													
	5	**Biogas generation from food waste at schools**	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●	●	●		●	●	●	**PDD**
	6	**Namfon Dairy Farm Bio-Gas Development Project**	●	●	●	●	●		●	●	●	●	●	●	●		●	●	●	●	●		●	●	**PIN**
Renewable energy	7	Bangchak Solar Farm at Bangpa-In	●	●	●	●	●	●	●		●	●	●	●	●	●		●		●	●		●	●	*1
Energy saving	8	Roadside LED lighting	●	●	●	●						●	●				●	●							
	9	Energy saving at buildings	●	●	●	●	●	●				●	●												
	10	Repair of air-conditioning and refrigerator	●	●	●	●																			
Transportation	11	**Biodiesel from cooking oil- for BMA forklift**	●	●	●	●		●	●	●		●	●		●		●					●			**PIN**
	12	Biodiesel from cooking oil - for gas station	●	●	●		●		●	●	●	●	●		●										
	13	BRT project	●	●	●	●	●	●	●			●	●				●	●	●						*2
	14	**Urban mass transit project (Purple line)**	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●	●	●	**PIN**
	15	**Smart Logistics: Reducing fuel usage of commercial vehicles in Thailand**	●	●	●	●		●		●		●					●	●							**PIN**
Forestration	16	Mangrove plantation project in BMA Bangkunthien District	●	●	●	●	●	●		●		●					●	●							
	17	**Mangrove A/R project in Chantaburi Province**	●	●	●	●	●	●	●		●	●			●		●	●	●	●		●	●	●	**PDD**

Although these projects meet most of the selection criteria and scored higher than those selected as PIN target, they were not selected because:
*1 Project proponents have already conducted F/S and they have intention to develop only PDD instead of PIN.
*2 It was agreed that the PIN of the proposed project will be developed by assistance from World Bank.

2.3.1.4 Develop PINs and PDDs of pilot projects

(1) Project working team

A working team consisted of TGO staff and JICA Expert Team was established, and the team developed 6 PINs and 2 PDDs.

Necessary information for PIN development, such as project content, project cost, financial performance, technology, etc., was collected from project proponents by aforementioned local consultants. A working team developed PINs by analyzing collected data and results of interview with technical assistance from JICA Expert Team. The member of the working team is shown in Table 2-21. Working team for biogas PDD preparation originally consisted of 3 staff members belonging to Review and Approval Office; however, the members were replaced due to the availability of original members.

Table 2-21 PIN/PDD preparation working team

No.	Office	Name	PINs and PDDs
1	Review and Monitoring Office	Dr. Paweena Panichayapichet	PIN 1: Natural gas vehicles
2	Carbon Business Office	Mr.Thada Varoonchotikul	PIN 2: Natural gas for water distribution pumps
3	GHG Information Center	Ms.Wararat Chaumkruea	PIN 3: Biodiesel from cooking oil- for BMA forklift
4		Ms.Mewadee Seresathiansub	
5	Capacity Building and Outreach Office	Ms. Wiriya Puntub	PIN 4: Urban mass transit project (Purple line)
6	Policy and Strategy Office	Mr.Thawatchai Somnam	PIN 5: Namfon Dairy Farm Bio-Gas Development Project
7	JICA Expert Team	JICA experts	PIN 6: Smart Logistics: Reducing fuel usage of commercial vehicles in
8	Review and Monitoring Office	Ms. Wiriya Puntub	PDD 1: Biogas generation from food waste at schools
9		Ms. Anna Kiewchaum	PDD 2: Mangrove A/R Project in Chantaburi Province

(2) Preparation of PIN

A. PIN working session

A series of PIN development working sessions was held where the above-mentioned working team members participated. Each of the participants developed their assigned PIN through discussions with other members and JICA Expert Team, and enhanced their capacity on evaluation and monitoring.

Necessary information for PIN development, such as project content, project cost, financial performance, technology, etc., will be collected from project proponents by aforementioned local consultants. A working team analyzed and collected data and results of interview, and developed PINs by himself based on JICA support. The outline of the study session is shown in Table 2-22.

Table 2-22 PIN working session

Session-1	**27/05/2010**
Participants	Total: 8 (TGO: 4, JICA Expert Team : 4)
Theme/Topic	Introduction to CDM Project Idea Note (PIN)
Points of discussion	• Overview of the PIN PIN development is not indispensable for CDM register in Thailand. To deepen knowledge of TGO staff on meaning of PIN and status in the CDM project, technical transfer on objectives of PIN, merits for project proponents and investees, and description items was implemented. • Development of PIN The process to develop PIN was transferred using the sample project registered in Thailand. Especially description volume and quality of information was transferred.
Session-2	**31/08/2010**
Participants	Total: 14 (TGO: 10, JICA Expert Team : 4)
Theme/Topic	Guidance of preparation of PIN
Points of discussion	• Assigned TGO personnel for PIN working session Members for PIN/PDD preparation in TGO were confirmed, and outline of pilot projects was explained. • Way to prepare PIN JICA Expert Team transferred technical knowledge about the process of PIN preparation especially information to be covered in PIN preparation.

Photo 2-13 PIN working session (1)

Session-3	**17/09/2010**
Participants	Total: 13 (TGO: 8, JICA Expert Team : 5)
Theme/Topic	Report on progress
Points of discussion	Participants reported on progress and discussed about issues about their PIN preparation (lack of information, additionality, applicable methodology) JICA Expert Team reviewed draft PINs and transferred technical knowledge about how to develop PIN and additional information to be covered.
Session-4	**21/09/2010**
Participants	Total: 13 (TGO: 8, JICA Expert Team : 5)
Theme/Topic	Baseline and additionality
Points of discussion	JICA Expert Team transferred technical knowledge about how to describe baseline and additionality in a PIN. Also discussed about natural gas vehicle projects and considered the investment barrier and additionality. Participants learned general method to analyze investment barrier of the project by comparing revenue and cost without CER revenue.
Session-5	**29/09/2010**
Participants	Total: 13 (TGO: 8, JICA Expert Team : 5)
Theme/Topic	Discussion about estimation of GHG emission reduction
Points of discussion	JICA Expert Team transferred technical knowledge about estimation of GHG emission reduction and how to develop the PIN in Biodiesel from cooking oil project. Participants also discussed about additionality and investment barrier of the project taking into account the operation cost (raw materials and chemical reagent), diesel fuel cost and calorific value of biodiesel.
Session-6	**13/11/2010**
Participants	Total: 6 (TGO: 1, JICA Expert Team : 4, local consultant: 1)
Theme/Topic	Project site visit and interview with project developer
Points of discussion	• Project site visit Assigned TGO staff and JICA Expert Team visited the site and checked manure management system and related facilities installed in the past. • Interview with project developer TGO staff and JICA Expert Team interviewed with project developer about the outline of the project and discussed with project developer about the barriers of the project. Topics and current barriers are; -Project developer can not obtain subsidy because firm has expanded its business activities. -Although government is planning to develop similar projects in Thailand, project developer was not able to secure financial loan from the bank because there is no suitable category for the loan system the project can apply to. -Project developer considered to install larger power generator than the first one already installed, but they found there may not be sufficient electricity demand even if the generator is connected with the grid and excess electricity is sold.

Photo 2-14 Project site visit

Session-7	**7/11/2010**
Participants	Total: 7 (TGO: 4, JICA Expert Team : 3)
Theme/Topic	Report on PIN preparation
Points of discussion	• Report on PIN preparation Assigned TGO personnel reported and share the results of each PIN development. TGO staffs and JICA Expert Team discussed about the feasibility and CDM applicability of the following projects.
Session-8	**25/11/2010**
Participants	Total: 12 (BMA: 5, TGO: 4, JICA Expert Team: 3)
Theme/Topic	Report on PIN preparation to BMA
Points of discussion	Report on PIN preparation to BMA Assigned TGO personnel reported to BMA about the results of CDM analysis on 3 BMA projects and explained about the expected effects and issues on the process of CDM. JICA experts complemented barriers and issues to resister as CDM projects. BMA staffs, TGO staffs and JICA Expert Team discussed about the feasibility and CDM applicability of the following projects. PIN 1: It will be good model for GHG mitigation, but it is already implemented by their budget, and confirmation of additionality is difficult, therefore it is difficult to be CDM. PIN2: The development to be CDM was stopped, because BMA abandoned. PIN3: It will be good model for GHG mitigation, but it is already implemented by their budget, and confirmation of additionality is difficult, therefore it is difficult to be CDM.
Session-9	**26/11/2010**
Participants	Total: 5 (TGO: 1, JICA Expert Team: 2, Project proponent: 2)
Theme/Topic	Interview of project developer
Points of discussion	• Outline and concept of CDM TGO and JICA Expert Team explained about CDM scheme to project developer, and requested to offer necessary data. • Outline and concept of CDM TGO and JICA Expert Team conducted interview to project developer about the outline of proposed technology, implementation sample, and new development plan.

B. Results of PIN Development

The overview of PINs is shown in Table 2-23.

Table 2-23 Outline of developed PINs

No.	Project title	GHG Emission/ Absorption Amount	CDM applicability*	Comments
PIN1	Natural gas vehicles	140t-CO_2e/y	B	Financial benefit through fuel switch to natural gas may be quite large compared with initial equipment cost of fuel conversion kit. Therefore, demonstration of additionality using the investment analysis may be difficult.
PIN2	Natural gas for water distribution pumps	54t-CO_2e/y	N/A	Project proponent withdrew the project for undisclosed reason.
PIN3	Namfon Farm Dairy Farm Bio-Gas Development Project	19,258t-CO_2e/y	A	Financial analysis on the project yielded IRR of about 10%, which can be used to prove the project is facing significant investment barrier. Furthermore, the equipment to be installed at the site is new to the project proponent, which may impose technological barrier, or prevent proper operation and maintenance of the equipment. Therefore it is applicable for CDM project. However the project proponent is facing significant problem in finding financial source.
PIN4	Biodiesel from cooking oil for BMA forklift	32t-CO_2e/y	B	Considering the low financial return and limited CER revenue, the project may face significant investment barrier. the possibility to realize is low.
PIN5	Urban mass transit project (Purple line)	9,732t-CO_2e/y (2014) ～ 23,559t-CO_2e/y (2042)	A	The construction was already started in Jan. 2010. Prior consideration issue needs to be confirmed although some evidence shows CDM application was seriously considered in Oct 2007. After that, the loan contract with JBIC in March 2008. It might be impossible to explain prior consideration. The project IRR is showing negative value, and CER revenue will not significantly increase the feasibility, which can be a good factor to argue investment barrier of the project.
PIN6	Smart logistics: Reducing fuel usage of commercial vehicles in Thailand	N/A (under planning for introduction of vehicle)	B	Since the target vehicles/ users of the equipment have not been identified yet, project scenario cannot be set and thus baseline and project case to calculate reduction amount of fuel cannot be performed. Furthermore, there is no applicable approved methodology. (new methodology has been discussed in the SSC-NM)

*The CDM applicability is graded on a 2-grade (A and B) scale.

A: a project has a high possibility to be a CDM project activity

B: a project has a possibility to be CDM but it may need to meet certain conditions

(3) Development of PDD

A. PDD working session

A series of PDD development working sessions were held for 2 PDD projects, where TGO staff, JICA Expert Team and prospective project proponents attended. Working team members collected and analyzed various kinds of data and information necessary for PDD development, and prepared PDDs.

PDD 1: Biogas from food waste at schools

TGO and JICA Expert Team have analyzed the characteristics and potential of the project and agreed to develop the project as a programmatic CDM (PoA).

Working group had a series of study sessions for PDD development as outlined in Table 2-24.

Table 2-24 PDD working session for biogas generation project

Session-1	**31/8/2010**
Participants	Total: 13 (TGO: 10, JICA Expert Team : 3)
Theme/Topic	Assignment of TGO personnel for PIN/PDD Guidance of preparation of PDD
Points of discussion	• Assignment of TGO personnel for /PDD working session Discussed about assignment of TGO personnel for PIN/ PDD, explained outline of model project. • Guidance of preparation of PDD JICA Expert Team transferred technical knowledge about the process of PDD preparation especially information to be covered. The division of roles was discussed.
Session-2	**8/9/2010**
Participants	Total: 15 (BMA: 6, DEDE: 1, TGO: 2, JICA Expert Team: 6)
Theme/Topic	Project outline of biogas generation project from food waste at schools
Points of discussion	• Understanding of project outline Collected data was arranged, and discussion with BMA on project title, implementing body, project scope, and technology used, etc. Expected estimation of reduction amount of CO2 emission and project financial analysis was transferred. **Photo 2-15 PDD working session (1)**

Session-3	**20/11/2010**
Participants	Total: 6 (TGO: 3, JICA Expert Team: 3)
Theme/Topic	Process of the preparation of PDD
Points of discussion	• Diversion of roles Technical transfer on process of the preparation of PDD was implemented. The division of roles was discussed.
Session-4	**25/11/2010**
Participants	Total: 15 (BMA: 5, TGO: 4, JICA Expert Team: 3)
Theme/Topic	Progress of PDD preparation and plant design update
Points of discussion	• Progress of the project Technical transfer for necessary information was implemented. TGO discussed with BMA staffs about the progress of PDD development such as feasibility study by DEDE, selection of the target schools, and barriers to resister as CDM projects.

PDD 2: Mangrove A/R-CDM project in Chantaburi province

TGO and JICA Expert Team attended meetings with related organizations such as DMCR and RFD, and implemented study sessions. Outline of the study sessions is shown in Table 2-25.

Table 2-25 PDD working sessions for Mangrove A/R-CDM

Session-1	**15-16/8/2010**
Participants	Total: 24(TGO: 3, Chantaburi province: 2, Walu office in DMCR: 2, Kasetsart Univ.: 3, ONEP: 1, RFD: 1, JICA Expert Team: 3, Local resident: 9)
Theme/Topic	Briefing of the project for local residents and project site visit
Points of discussion	• Attendance of the meeting with related organizations The meeting on existing condition of the project and further schedule was discussed with persons involved. • Project site visit JICA Expert Team and TGO staffs visited project site, plantation area and nursery bed of mangrove plants. JICA Expert Team transferred technical knowledge about A/R-CDM target area and project proponent and management system.
Session-2	**26/8/2010**
Participants	Total: 7 (TGO: 2, Kasetsart Univ.: 1,TGO: 2, JICA Expert Team : 2)
Theme/Topic	Existing condition of reforestation project in Chantaburi, and examination to be AR-CDM project
Points of discussion	• Outline of CDM scheme and concept JICA Expert Team lectured the concept of AR-CDM and kinds of CER. Necessary data and its collection method that mangrove forestation project in Chantaburi will be AR-CDM project was transferred technically. • Outline of mangrove forestation project Based on the progress of the project, Project scope to be AR-CDM was transferred technically.

Photo 2-16 PDD working session (1)

Session-3	**2/9/2010**
Participants	Total: 8 (DNP:1, DMCR:1, Kasetsart Univ.: 1, TGO:1, JICA Expert Team : 4)
Theme/Topic	Existing condition of reforestation project in Chantaburi, and examination to be AR-CDM project
Points of discussion	• Calculation of CO2 removal of A/R-CDM project JICA Expert Team transferred technical knowledge about calculation method of CO2 removal for small scale A/R-CDM. • Data collection JICA Expert Team transferred technical knowledge about required information for PDD preparation especially growth curve of mangrove in Thailand and outline of former plantation including information of the budget and collection method. • Project Proponent JICA Expert Team transferred technical knowledge about required condition for the A/R-CDM project proponent. Discussed about suitable project proponent of this project
Session-4	**9/9/2010**
Participants	Total: 9 (DNP: 1, Kasetsart Univ.: 1, TGO: 2, JICA Expert Team: 5)
Theme/Topic	Existing condition of reforestation project in Chantaburi, and examination to be AR-CDM project
Points of discussion	Outline of Chantaburi forestation project JICA Expert Team transferred technical knowledge about how to describe background of the project, project proponent, scope of the project, planted species financial feasibility, applied methodology, and expected amount of CO2 absorption. Following the last meeting, necessary information, especially data for financial evaluation, was transferred technically. • Project Proponent JICA Expert Team transferred technical knowledge about required condition for the A/R-CDM project proponent. Discussed about suitable project proponent of this project
Session-5	**14-15/9/2010**
Participants	Total: 16(Walu office in DMCR: 1, Kasetsart Univ.: 1 TGO: 1,, JICA Expert Team: 5, Local resident: 8)
Theme/Topic	Briefing of the project for local residents and project site visit
Points of discussion	• Existing condition of mangrove forestation project Participants discussed progress of the project and schedule. Interview to representatives of residents was implemented. • Project site visit JICA Expert Team and TGO staffs visited project site, plantation area and nursery bed of mangrove plants. JICA Expert Team transferred technical knowledge to inspection of the environmental condition and impacts to local residents.
Session -6	**16/9/2010**
Participants	Total: 8 (TGO: 1, JICA Expert Team: 7)
Theme/Topic	Issues to be AR-CDM project for mangrove project
Points of discussion	• Issues to be AR-CDM project for mangrove project Issues to be AR-CDM project for mangrove project was arranged. - Plating activity in Phase 2 was already started in Aug. 2010, and it will be finished until the end of Dec. 2010. Project proponent should be decided, and LOI should be submitted to CDM office in UNFCCC as soon as possible. - It should be divided former planting activities and existing planting. The project scope to be corresponded to small-scale AR-CDM. On these points were transferred technically.

Session -7	**22/9/2010**
Participants	Total: 7 (Walu office in DMCR: 1, TGO: 1, JICA Expert Team: 5)
Theme/Topic	Issues to be AR-CDM project for mangrove project
Points of discussion	• Issues to be AR-CDM project for mangrove project JICA experts had technical transfer to DMCR and TGO on the following points. - Confirmation of project investors, data collection on contract between investor and Chantaburi province should be implemented. It should be clear that former planting activities were unsuitable management, and planted area was ruined. Investment will be on prerequisite of long term management should be shown. - Project scope for AR-CDM should be only Phase 2, which planting was already started in Aug. 2010. - Prior consideration, which is required for started project, should be submitted. - Budget for Validation fee for PDD should be provided by project implement body. - To be examined DOE for Validation in Thailand, which has Thai office. To start to prepare PDD.
Session -8	**28/9/2010**
Participants	Total: 2 (TGO: 1, JICA Expert Team: 1)
Theme/Topic	Issues and correspondence to be AR-CDM project for mangrove project
Points of discussion	JICA experts had technical transfer to TGO on the following points. - Preparation of scenario that only phase 2 in whole planting activities will be AR-CDM project. - Credit will be obtained only for Phase 2. - USD 10,000 should be secured as Validation fee.
Session -9	**29/9/2010**
Participants	Total: 5 (TGO: 3, JICA Expert Team: 2)
Theme/Topic	Issues and correspondence to be AR-CDM project for mangrove project
Points of discussion	JICA experts had confirmed and technical transfer to TGO on the following points. - Investors is required maintenance activities, which was not implemented on former planting. Investment body knows this fact, and concluded MOU with Chantaburi province. - Investment body is organization related Ministry, but NGO. - Director levels in Chantaburi province, DMCR and RFD agreed as project proponents. - Rights for CERs revert to investment body, but province has interest for it. Discussion among related organizations is implementing. Joining to implementing body by investment body is under consideration. - A part of donation is able to provide for Validation fee. Growth of mangrove in shrimp pond depends on the spoil condition. Growth curve should be recalculated to consider with the fact. In case that actual growth amount is larger than estimated amount, and exceed the limited value of small-scale condition, implement body does not care.

B. Outline of PDDs

PDD1: Biogas generation using waste food from schools in Bangkok

Schools in Bangkok collect food waste from local schools, market, and restaurants and use as an input to bio-digester. Biogas generated will substitute the use of LPG currently used for cooking fuel for school. About 20 kg of waste was planed to be collected and used per day. Byproduct sludge will be used as a fertilizer and provided to nearby communities and factories with no charge.

Pilot project of biodigester with capacity of 40 kg/day is operating at 79 schools. As the results, it became clear that capacity of 40 kg/day is larger than capacity can be operated by teachers and pupils. In case that the new type plant is effective, BMA is planning to expand to 435 schools controlled and other facilities. Moreover, Department of Alternative Energy Development and Efficiency (DEDE) will expand biogas programme with new type plant to whole country, when BMA pilot project will be successful. Therefore, project should be implemented as a programmatic CDM, in which it is possible to add more schools to the program even after UNFCCC registration.

However there has been no case of program CDM by subsidy program by local government unit such as BMA. Therefore this project is a good opportunity for Thai government as well BMA. Moreover, when information of the proposed programmatic CDM is disseminated to the public, education and enlightenment on solid waste recycling activity by BMA and Thai government can be achieved.

Working team calculated GHG emission reduction based on the new technical specification and cost estimates of a biogas boiler designed by DEDE.

The result of financial analysis shows the NPV of the project in 10 years is negative. The fact that the installment of biogas generation plant is not financially attractive without CDM credit sales revenue to demonstrate additionality of the project. However, financial analysis has also revealed the NPV is negative even CDM sales credit is taken into consideration.

The GHG emission in the baseline scenario is estimated to be 342.7t-CO2e/year, which is the sum of baseline methane emissions from a municipal waste disposal site (317.7 tCO2e/year) and CO2 emissions from LPG combustion at the school kitchen (25.6 tCO2e/year). The emission from the project is estimated to be 11.1 t-CO2e/year, which is estimated from total of CO2 emitted from fuel amount used on site (2.4 tCO2e/year) and leakages (8.7 tCO2e/year). The amount of GHG emission reductions was calculated as the difference between the baseline emissions and the emissions from project scenario, which yielded 331.6 t-CO2e/year.

PDD2: Mangrove Plantation Project in Chanthaburi Province

The proposed project site is located at the Welu wetland, Chanthaburi province, and is designated as Forest Reserve. The indigenous mangrove species will be planted for rehabilitation of present shrimp ponds spotted in the mangrove forest. The total area of the project sites is 3,284 rai (about 525 ha) and seedlings will be provided from a nursery. In this area, similar projects had been implemented and never succeeded due to a lack of budget and inefficient system for maintenance. Since long-term maintenance of plantation sites is important in this project, it is decided to

implement as an A/R-CDM project activity.

AR-AMS0003/Version01 “The simplified baseline and monitoring methodology for small-scale CDM afforestatioon and reforestation project activities implemented on wetlands” was applied to the project. According to the methodology, the baseline emission and leakage can be considered as zero. The proposed A/R CDM project was estimated to remove 195,856 t-CO2e/year using the growth curve of the similar project.

The planting activities have been implemented on 21 -25 February and 25-28 April 2011, and the planted area size were 2,000 rai and 1,284 rai (total 3,284 rai), respectively. There is an agreement letter (MoU) about implementation of the project among Chanthaburi province, Department of Marines & Coastal resources (DMCR) and Royal Forest Department (RFD) signed on 25 April 2011.

Chanthaburi province, the implementation body, aims to develop and submit the PDD to register the proposed project as A/R-CDM. Prior consideration was submitted to UNFCCC on 19 August 2011.

After that, project participants planed to proceed to the validation process after PDD will be finalized. However, it became clear as of February, 2012, the most of the project area is in the area, where has already been a Forest area, So that project implementers decided to abandon to be CDM project, and they will continue to find other suitable area for planting and to be CDM project.

However, the PDD prepared through technical cooperation can be extensively referred to for new projects.

2.3.1.5 Enhancement of monitoring capacity of TGO staff on GHG mitigation

(1) TGO’s CDM projects monitoring procedure

TGO’s current CDM monitoring scheme is shown in Figure 2-3. The on-site monitoring is implemented after a request for registration and a request for CER issuance. The Evaluation Reports are prepared based on the monitoring, and results are registered in the database.

During the on-site monitoring, a check-list for monitoring items is prepared, and an Evaluation Report is prepared referring to the PDD and the latest monitoring report. The Evaluation report form is currently under revision for the purpose of data registration to the database system. The database system has been developed, and it is expected to start operation in April 2012.

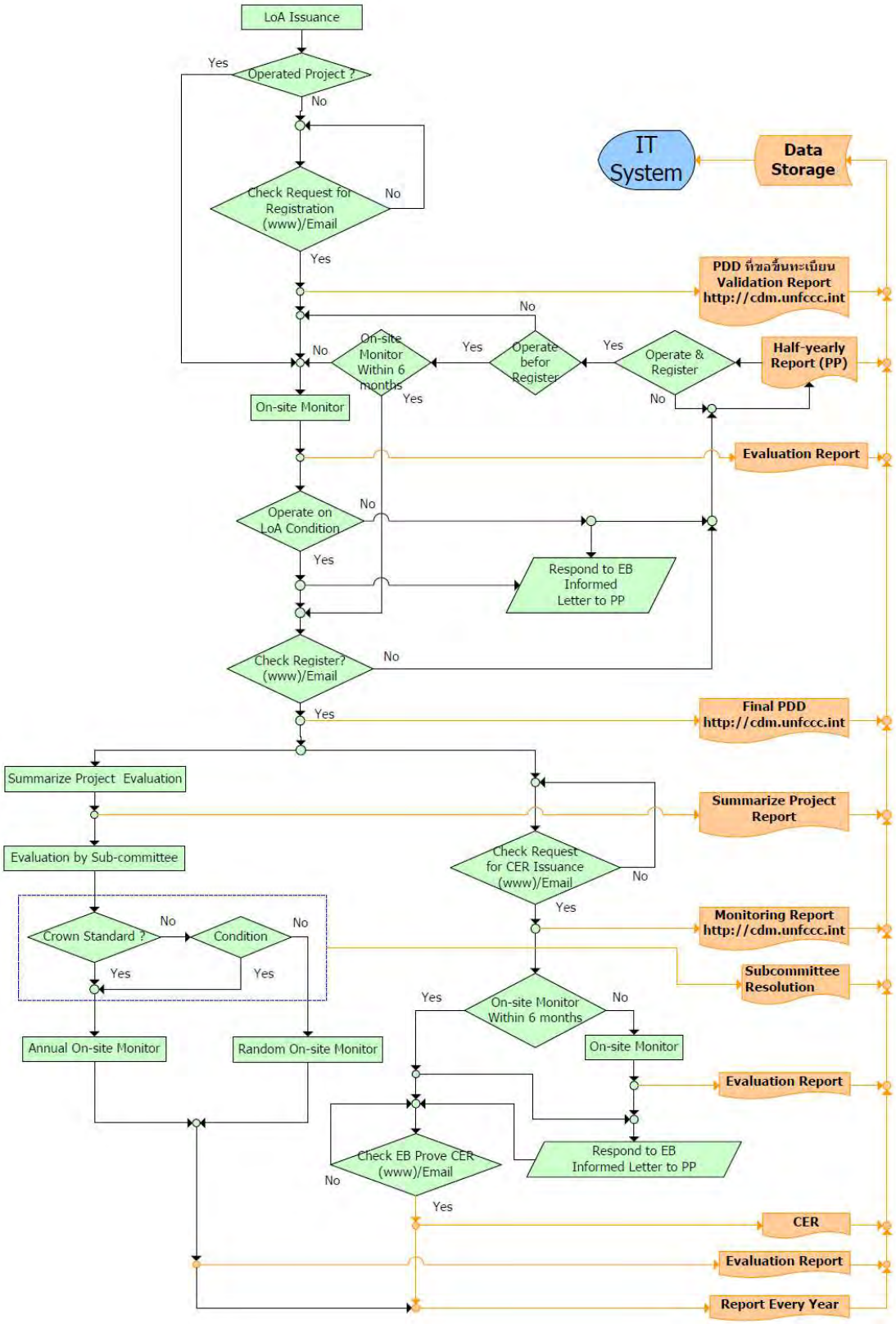


Figure 2-4 TGO's Monitoring Scheme

(2) Analysis on monitoring activities of actual projects

JICA Expert Team checked and analyzed the completed Evaluation Report of a sample registered CDM project ("Waste water treatment with Biogas System in Palm Oil Mill at Bangsawan, Surat, Thai, Thailand (Ref. No.4589)"). Reviewed mainly were which parameters and how monitoring was conducted and recorded. JICA Expert Team discussed with TGO staff members regarding the result of analysis, which contains several unclear and insufficient points. Main points of discussion include:

- Consistency with PDD description: Evaluation Report of the sample project describes that 2 (or 3) sets of new gas-engine and generator were additionally installed as "alternatives during maintenance," while the PDD states the total power generation capacity of them is 1MW. It is appropriate to record the monitoring results of such value as the amount of power generated or the amount of electricity sales on a Monitoring Report. And therefore, it is important to check whether such additional power generation and sales revenue is reflected in the CER issuance request report. TGO and JICA Expert Team discussed these issues.

- Consistency of Sustainable Development Criteria: Although the sample project is a wastewater treatment project in Palm oil plant, "odor" was not listed in sustainable development (SD) criteria. Through the discussions with TGO it was found that they had considered that odor will not be a problem because the pond, the source of odor, was located in the opposite side of a residential area. JICA Expert Team pointed out that the possibility to flow to a residential area depends on the direction of wind can be considered. And it was asked to TGO staff that wastewater from palm oil plant will overflow from the pond especially wet season. they replied that it is no problem because in general pond is on multistage, so water overflowed will flow into lower stage. They can not inspect condition at lowest pond at wet season, because they can not reach to the pond by flood. And water from lowest stage overflows to surrounding area owned by factory owner not river, so it is no problem. JICA expert pointed out that some measurement should be considered, because overflow leads poor environment.

- Description in monitoring report: JICA Expert Team pointed out that the issues of odor and wastewater overflow should be mentioned in the recommendation part of the evaluation report of the sample project.

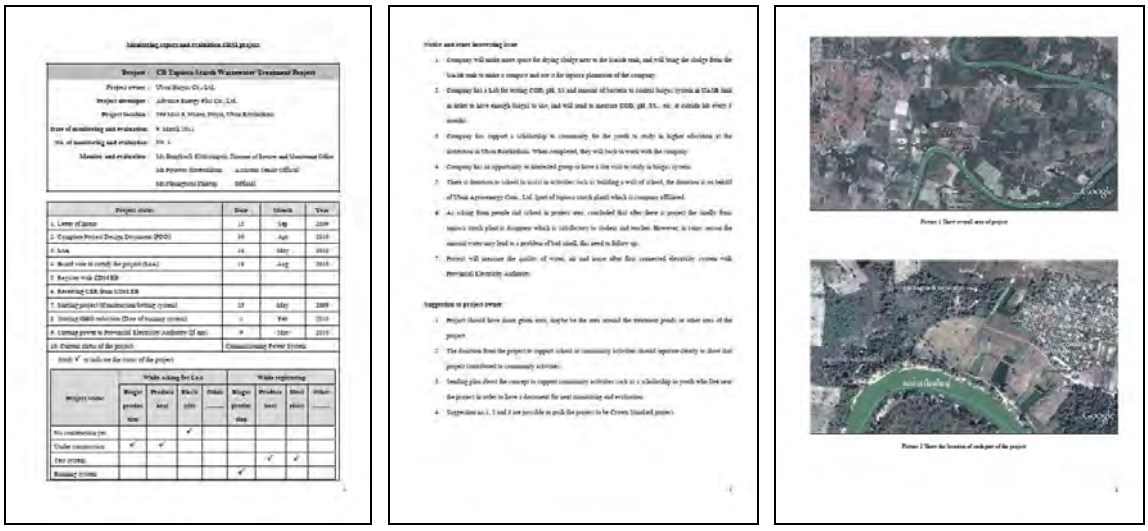


Figure 2-5 Reviewed Evaluation Report

TGO's monitoring process including review of relevant documents, preparation of a check-list, on-site monitoring and reporting, is well developed. It is considered that there is no imminent issue about monitoring procedure itself.

However, several cases were observed that the personnel responsible for the monitoring activity did not have full understanding on what exact parameters should be monitored, which might be caused by the lack of experience and general knowledge regarding monitoring parameters. In Thailand, most of the CDM projects are related to biogas and biomass, and most TGO staff members have enough experience and knowledge to monitor projects in such sector; however, TGO may face more difficulties in understanding what should be monitored and what they should pay attention to, once the project from different sectors starts to increase in number. In order to prevent such difficulties, it is suggested that TGO organize more internal training for monitoring various sectors.

2.3.2 Target and achievement

The target of Activity 3 is set in PDM as follows:

Target
Capacity of TGO to review and monitor GHG mitigation project will be enhanced.

The following indicators are provided in the proposed PDM to measure results of Activity 3.

Objectively Verifiable Indicators
PIN and/or PDD of pilot project(s) are developed.

Referring to the indicators, the results of achievement on Activity 3 are as follows:

Results:

Although TGO staff had basic knowledge on CDM review and monitoring at the beginning of the Project, they did not have much experience in developing or reviewing actual PIN and PDD except for biomass and biogas projects, which have the largest share of approved CDM projects in Thailand.

In order to enhance the capacity of TGO to review and monitor GHG mitigation project other than biomass and biogas projects, PoA and A/R-CDM projects were chosen for PDD development. In addition, projects for PINs development were chosen from the sectors which TGO had little experiences such as fuel switch, bio-fuel, and transportation.

Based on the site visits and information provided by project proponents, assigned TGO personnel developed PINs and PDDs by their own efforts, and finalized them through a series of study sessions and discussions with JICA Expert Team. Assigned TGO personnel also visited and explained to some of the project proponents about the result of PIN and PDD preparation. TGO staff was able to recognize issues which project implementers may face at the process of CDM development through the PIN and PDD preparation activities such as site inspection, data collection, project analysis and discussion with project proponents. It is expected that this experience will allow TGO staff to provide even more appropriate consultation service to project proponents in the future.

At the same time, the project also contributed to enhance capacity of project proponents such as BMA to develop CDM or climate change mitigation projects. Knowledge of such proponents on CDM and mitigation project development was very limited at the beginning of the Project but they obtained f knowledge and experience through various Project activities, including CDM procedure, concept of additionality, necessity of financial analysis, and data/ information collection.

It is considered that the Project has contributed to the enhancement of TGO's capacity on review and monitor CDM projects through development of 6 PINs and 2 PDDs in which TGO staff had recognized key points on CDM formulation especially in sectors TGO had little experience. Although no imminent issues were found in the monitoring process, TGO staff capacity was further enhanced through technical transfer on key points for appropriate monitoring by using actual monitoring reports.

2.4 Output 4: Enhancement of capacity of TGO staff on information management on GHG mitigation

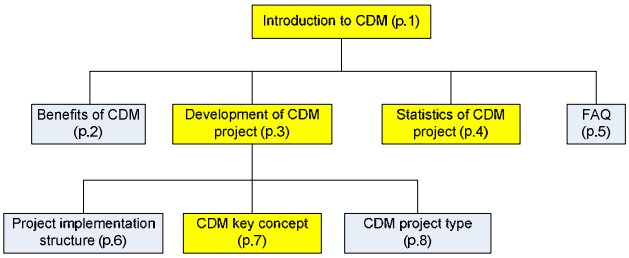
2.4.1 Activities

2.4.1.1 Improvement of TGO website

JICA Expert Team assisted TGO to improve the TGO website (contents) aiming to produce basic information on CDM for project implementing body.

(1) Examination of website structure

The structure of website was decided after discussion with TGO to contain the following points: To obtain easily basic information on CDM by project proponents, To apply 3 categories some as other pages of TGO, To avoid detail descriptions and compile simply on the matter not concerned with project implement body directly, and To utilize existing description of each topic on TGO website.



Introduction to CDM (p.1)

Page no.	Left hand link
1.1	Kyoto Protocol
1.2	Emission reduction
1.3	Carbon credit
1.4	Principle of CDM
1.5	Crediting period
1.6	Carbon market

Development of CDM project (p.3)

Page no.	Left hand link
3.1	LoI
3.2	LoA
3.3	VVM
3.4	Validation
3.5	Monitoring
3.6	Verification & Certification

Statistics of CDM project (p.4)

Page no.	Left hand link : Statistics of …
4.1	CDM project in Thailand – LoA
4.2	CDM project in Thailand – Registration
4.3	CDM project in Thailand – CER
4.4	World CDM project -- Registration
4.5	World CDM project -- CER

CDM key concept (p.7)

Page no.	Left hand link
7.1	Project Design Document
7.2	Baseline Identification
7.3	Methodology
7.4	Additionality

Figure 2-6 Website Structure

(2) Development of Contents

As a result of discussions with TGO, it was decided that training material developed by JICA Expert Team will be utilized for the contents of CDM project. Thai language was used because the target of the contents was CDM project proponents in Thailand. JICA Expert Team gave necessary assistance and advice to develop the contents.

Sample of contents is shown in Figure 2-8.

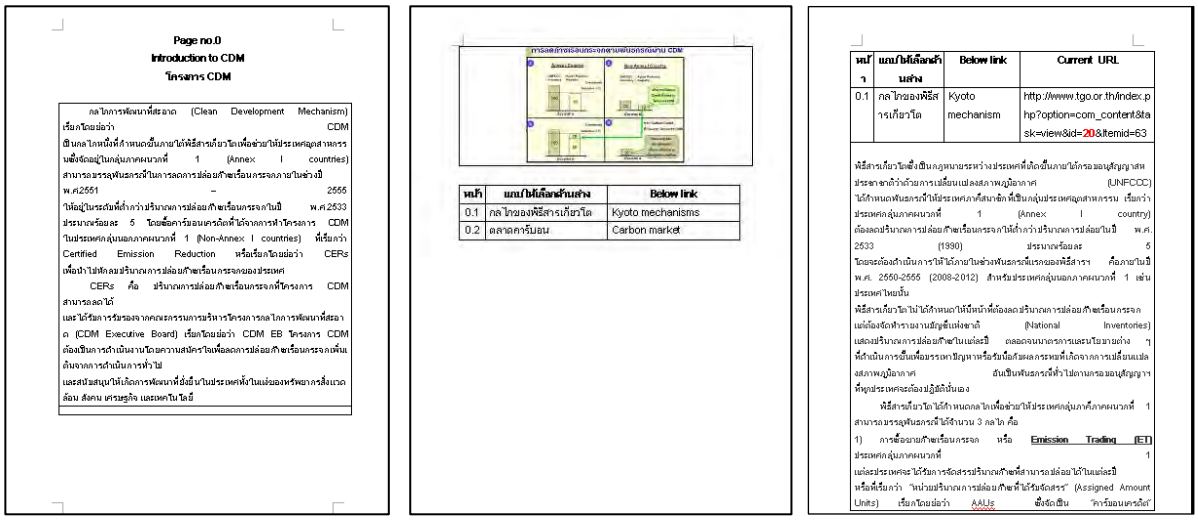


Figure 2-7 Sample of Contents (Introduction of CDM)

2.4.1.2 Development and improvement of TGO database

Database in GHG inventory was developed for TGO to manage fundamental data for GHG inventory calculation effectively. In Thailand, it consists of 4 sectors, such as “industrial sector”, “industrial processing sector”, “agriculture, landuse/ forest sector”, and “waste sector”.

TGO and JICA Expert Team agreed that JICA Expert Team was assigned to data pre treatment to install into database in 2 sectors of “Industrial processing” and to database structure design and data input based on JGSEE data in 2 sectors of "AFOLU" and “Waste”. (JGSEE: Joint Graduate School of Energy and Environment, which calculated a GHG inventory of Thailand.) TGO and JICA Expert Team also developed the additional function to export inventory data in the IPCC format.

The inventory database with output function consists of the following three parts. Developed database including report output function is shown in Figure 2-9.

1) Tables

Data such as data ID, activity data and emission factors are saved in this part. Inputted activity data and emission factor data are normalized and correlated with data ID.

2) Queries

Calculation for inventory is processed in this part, called “Query” in Microsoft Access, based on the data saved in tables. Some queries are combined for calculation to trace the same process in IPCC guideline.

3) Forms

Output forms are developed using “Form” function of Microsoft Access. By using queries developed in the first year, selected items on the top-menu are exported into Excel file.

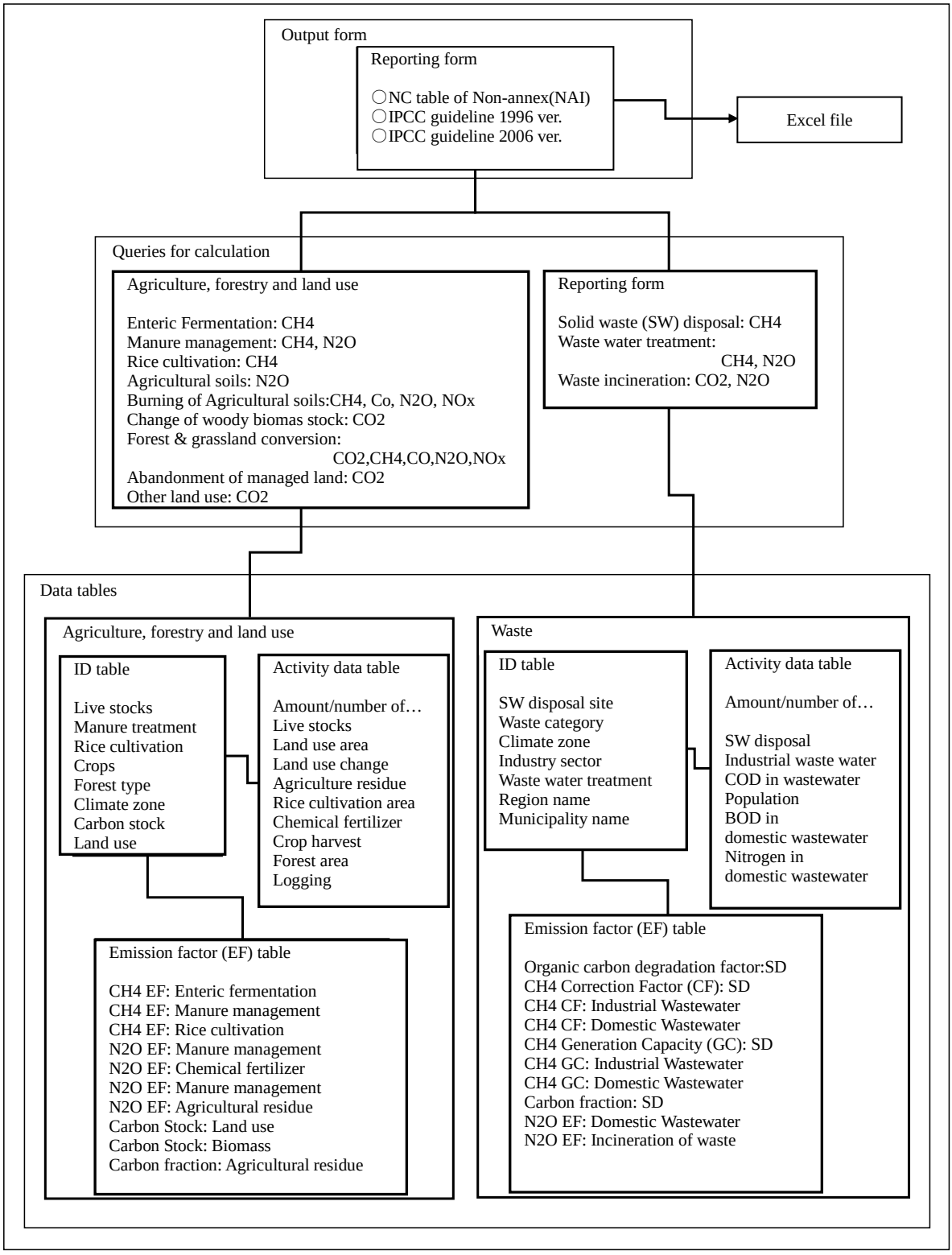


Figure 2-9 Outline of inventory database in agriculture and landuse sector and in waste sector

(1) Confirmation and normalization of consistency between data of emission coefficient and IPCC guideline

JICA Expert Team conducted the following works in order to design the database structure and input data to database in industrial processing sector and waste sector.

- Check for consistency (methodologies and adopted value) in emission factor calculation of JGSEE with 1996 IPCC guideline
- Normalization of emission factor and activity data before data input to database (table below)

Table 2-26 Sample Table of Emission Factor (Compiled by JGSEE)

INDUSTRIAL PROCESSES					
TIER 1					
EMISSION FACTOR					
Type of Emission Factor		Emission Factor (Value and Units)		Reference	Appropriateness to national circumstances
TIER 1					
2A Mineral Product					
2A1	Cement Product			Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories :Workbook. Chapter 2, pp. 2.4	Defualt value of 1996 IPCC Guidelines
	2A1.1 Clinker Production	0.5071 tonnes of CO2 per tonne of clinker produced			
		***The average clinker lime (CaO) percentage was estimated to be 64.6 percent			
	2A1.2 Cement Production	0.4985 tonnes of CO2 per tonne of cement produced			
		***The average lime (CaO) content in cement was estimated to be 63.5 percent.			
		0.3 kg SO2/tonne cement			
2A2	Lime Product			Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories :Workbook. Chapter 2, Table 2.1, pp. 2.5	Defualt value of 1996 IPCC Guidelines
	2A2.1 Lime Kiln-Calcite Feed	0.79 tonnes CO2/ tonne quicklime produced			
	2A2.2 Lime Kiln-Dolomite Feed	0.91 tonnes CO2/ tonne dolomitic lime produced			
2A3	Limestone and Dolomite Use			Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories :Workbook. Chapter 2, pp. 2.6	Defualt value of 1996 IPCC Guidelines
	2A3.1 limestone use	440 kg of CO2 per tonne of net limestone used			
	2A3.2 dolomite use	477 kg of CO2 per tonne of net dolomite used			
2A4	Soda Ash Production and Use			Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories :Workbook. Chapter 2,pp. 2.8	Defualt value of 1996 IPCC Guidelines
	2A4.1 Soda Ash Production (Natural process)	0.097 tonnes of CO2 per tonne of trona			
	2A4.2 Soda Ash Production (synthetic process)	EF = zero, CO2 generated can be in-process recycled (carbon sequestration)			
	2A4.3 Soda Ash Utilization	415 kg of CO2 per tonne of soda ash used			
2A5	Asphalt Roofing			Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories :Workbook. Chapter 2, Table 2.2, pp. 2.9	Defualt value of 1996 IPCC Guidelines
	2A5.1 Asphalt Roofing Production	NMVOC	CO		
		Note: There are no data available for the emission of CO from a process in which the saturation includes a spray section. It was assumed that the emission would be the			
	Emission Factor (Saturation with Spray)	0.13 - 0.16 kg/tonne product	Not Available		
	Emission Factor (Saturation without Spray)	0.046 - 0.049 kg/tonne product	0.0095 kg/tonne product		
	2A5.2 Ashpalt Blowing Process	NMVOC		Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories :Workbook. Chapter 2, Table 2.3, pp. 2.9	Defualt value of 1996 IPCC Guidelines
	Emission Factor (with Afterburners)	0.1 kg/tonne product			
	Emission Factor (No Control)	2.4 kg/tonne product			
2A6	Road Paving with Asphalt	0.023 kg of NMVOC per tonne of asphalt produced in plant		Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories :Workbook.	Defualt value of 1996 IPCC Guidelines
2A7	Others			Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories :Workbook. Chapter 2, pp. 2.10	Defualt value of 1996 IPCC Guidelines
	Concrete Pumice stone Production	0.5 kg SO2/tonne product			
	Glass Production	4.5 kg NMVOC/tonne of product			

Table 2-27 Sample Table of Normalized Data

INDUSTRIAL PROCESSES							EMISSION FACTOR				
NO	1st_c	1st_category	2nd_c	2nd_category	3rd_cat	3rd_category	GHG	EF	EF-Lower	EF-Upper	Unit
1	2A	Mineral Product	2A1	Cement Product	2A1a	Clinker Production	1	0.5071			t-CO2/t
2	2A	Mineral Product	2A1	Cement Product	2A1b	Cement Production	1	0.4985			t-CO2/t
3	2A	Mineral Product	2A1	Cement Product	2A1b	Cement Production	10	0.3			kg-SO2/t
4	2A	Mineral Product	2A2	Lime Product	2A2a	Lime Kiln-Calcite Feed	1	0.79			t-CO2/t
5	2A	Mineral Product	2A2	Lime Product	2A2b	Lime Kiln-Dolomite Feed	1	0.91			t-CO2/t
6	2A	Mineral Product	2A3	Limestone and Dolomite Use	2A3a	limestone use	1	440			kg-CO2/t
7	2A	Mineral Product	2A3	Limestone and Dolomite Use	2A3b	dolomite use	1	477			kg-CO2/t
8	2A	Mineral Product	2A4	Soda Ash Production and Use	2A4a	Soda Ash Production (Natural process)	1	0.097			t-CO2/t
9	2A	Mineral Product	2A4	Soda Ash Production and Use	2A4b	Soda Ash Production (synthetic process)	1	0			t-CO2/t
10	2A	Mineral Product	2A4	Soda Ash Production and Use	2A4c	Soda Ash Utilization	1	415			kg-CO2/t
11	2A	Mineral Product	2A5	Asphalt Roofing	2A5a	Asphalt Roofing Production	9		0.13	0.16	kg/t
12	2A	Mineral Product	2A5	Asphalt Roofing	2A5a	Asphalt Roofing Production	7				
13	2A	Mineral Product	2A5	Asphalt Roofing	2A5a	Asphalt Roofing Production	9		0.046	0.049	kg/t
14	2A	Mineral Product	2A5	Asphalt Roofing	2A5a	Asphalt Roofing Production	7	0.0095			kg/t
15	2A	Mineral Product	2A5	Asphalt Roofing	2A5b	Ashpalt Blowing Process	9	0.1			kg/t
16	2A	Mineral Product	2A5	Asphalt Roofing	2A5b	Ashpalt Blowing Process	9	2.4			kg/t
17	2A	Mineral Product	2A6	Road Paving with Asphalt			9	0.023			kg-NMVOC/t
18	2A	Mineral Product	2A7	Others	2A7a	Concrete Pumice stone Production	10	0.5			kg-SO2/t
19	2A	Mineral Product	2A7	Others	2A7b	Glass Production(Container Glass)	9	4.5			kg-NMVOC/t
20	2A	Mineral Product	2A7	Others	2A7c	Glass Production(Flat Glass)	9	4.5			kg-NMVOC/t

(2) Development Database for Waste Sector

GHG inventory database of waste sector was made using Microsoft Access, which includes four categories (solid waste disposal, domestic wastewater, industrial wastewater and incineration of waste). Following points were taken into account in developing the database.

- The database calculation should be able to reproduce the inventory calculation result which is already calculated by JGSEE
- The database calculation is based on methods described in IPCC Guidelines 1996 which is base of inventory development in Thailand

Form of Access is programmed using Visual Basic for Applications (VBA) for calculation of GHG inventory of FOD model in the solid waste disposal sites category because the description of Query is complicated.

(3) Development Database for AFOLU Sector

GHG inventory database of AFOLU sector made using Microsoft Access, which includes three categories (emission from livestock, change of land use, and emission except CO2 by change of land use) based on IPCC guideline. Following points were taken into account in developing the database.

- The database calculation should be able to reproduce the inventory calculation result which is already calculated by JGSEE
- The database should be able to calculate the inventory with methods described in IPCC Guidelines 1996 and 2006

For data on activity amount and emission coefficient, data of JGSEE was used based on IPCC guideline 1996, and data on activity amount was arranged by TGO internal data and IPCC defaults was used for coefficient. In case of activity amount data was partial loss, it was excluded because database development was not able.

(4) Development of export function in a reporting form

A. Reporting form

Reporting forms are the NAI (non-Annex I) form used as a National communication report form, the currently used 1996 IPCC common reporting form and 2006 IPCC common reporting form, which are not currently used. Outlines of reporting forms are shown in table 2-28.

Table 2-28 Reporting forms

Items	Title		Amount of sheets		Remarks
NAI Reporting	National GHG Inventory		1	1	For use of national communication of non-annex I parties
IPCC 1996 ver.	Sectoral Report	Energy	3	17	Current Common Reporting Format for UNFCCC
		Industry	2		
		Solvent and Other Product Use	1		
		Agriculture	2		
		LandUse Change and Forestry	1		
		Waste	1		
	Summary Report		3		
	Short Summary Report		1		
	Overview Table		3		
IPCC 2006 ver.	Summary Table		6	67	Common Reporting Format (not in use for now)
	Short Summary Table		2		
	Energy Sectoral Table		3		
	Energy Background Table		8		
	IPPU Sectoral Table		2		
	IPPU Background Table		12		
	AFOLU Sectral Table		2		
	AFOLU Background Table		12		
	Waste Sectoral Table		1		
	Waste Background Table		3		
	Cross-Sectoral Table		1		
	Trends		13		
	Uncertainties		1		
	Summary of Key Category analysis		1		

B. Develop the export function

Data export function was programmed using VBA (Visual Basic for Application). The covered items are those that have enough activity data and emission factors to make an inventory in "Agriculture and landuse sector" and "waste management sector". Components of export forms are shown in Figure 2-10. Inventory Year and reporting form can be chosen on Top-menu, and details can be specified on following pages.

Export function was programmed to designate the query for calculating inventory of selected items and to format the results on Excel sheets.

JICA Expert Team and TGO confirmed that the export function worked well, and the results were appropriate. Database files were handed over to the TGO as an output of the technical cooperation activity.

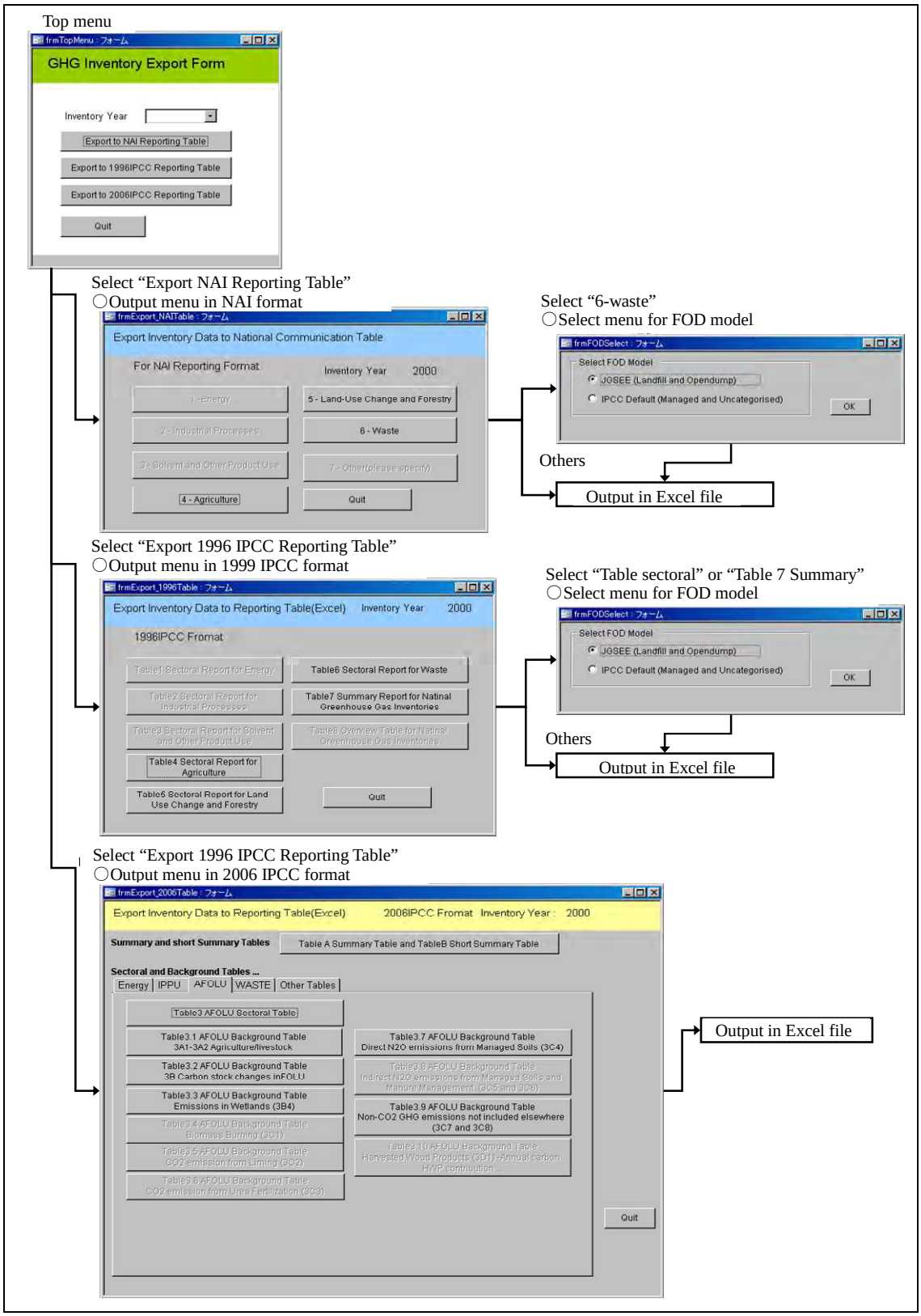


Figure 2-8 Component of output form

2.4.1.3 Development of explanation materials for IPCC Guidelines

Upon request from TGO, JICA Expert Team explained about calculation process of waste sector in IPCC Guidelines since it is essential to understand the contents of IPCC Guidelines to make an inventory database, but it is not easy to understand all the contents because the Guidelines contain very technical information and the volume of documents are quite large.

The materials for explanation were prepared using Microsoft Excel. JICA Expert Team inputted activity data and emission factor into worksheets in addition to the explanation of parameter and equation, and made the materials which could trace a procedure of inventory calculation concretely. Through the study sessions, TGO staff from GHG Information Center was able to enhance his understanding on detailed inventory calculation process in waste sector.

Table 2-29 Study sessions for inventory calculation of waste sector

Session-1	**11/8/2010**
Participants	Total: 3 (TGO: 1, JICA Expert Team: 2)
Topic	Calculation Method for Inventory about Solid Waste Disposal Site(First Order Decay Model)
Items of Technology transfer	JICA Expert Team explained about calculation method, activity data, parameters and equations for Fist Order Decay (FOD) Model used in IPCC Guidelines, and transferred technical knowledge to TGO.
Session-2	**24/8/2010**
Participants	Total: 5 (TGO: 1, JICA Expert Team: 4)
Topic	Calculation Method for Inventory about Domestic Wastewater, Industrial Wastewater and Incineration of Waste
Items of Technology transfer	JICA Expert Team prepared materials and explained about calculation method, activity data, parameters and equations for categories of Domestic Wastewater, Industrial Wastewater and Incineration of Waste, and transferred technical knowledge to TGO.

2.4.2 Target and achievement

The target of Activity 4 is set in PDM as follows:

Target
Capacity of TGO to manage information on GHG mitigation will be enhanced.

The following indicators are provided in the proposed PDM to measure results of Activity 4.

Objectively Verifiable Indicators
TGO website provides comprehensive information on GHG mitigation measures including CDM.
Database of TGO is improved.

Referring to the above indicators, the results of achievement on Activity 4 are as follows:

Although TGO staff had basic knowledge on GHG inventory as well as a skill for programming and database software such as MS Access at the beginning of the Project, they had a limited experience to build and operate national GHG inventory database, which includes a great amount of data, on a full scale. TGO website was considered to cover basic information except some information to promote CDM projects, which was one of the key tasks for TGO. Especially necessary web contents for CDM project proponents was missing in the website. Through the activities of the Project, capacity of information management was further enhanced as follows:

・ Improvement of TGO website

TGO website had been regularly updated and the latest information on major seminar announcement, CDM project approval in Thailand, and TGO newsletter had been updated promptly. However, some very important information for climate change mitigation was missing on the website.

Therefore TGO and JICA Expert Team developed web contents that are useful for the promotion of CDM planning and implementation.

Through these activities, TGO staff recognized the importance to consider and identify what information on climate change mitigation should be included and updated in order to facilitate climate change mitigation activity in Thailand.

・ Development and improvement of GHG inventory database system

Through various activities of the Project on GHG inventory, TGO and JICA Expert Team built integrated database with high accessibility. The database contains the latest inventory data and it can provide sufficient data to be submitted to UNFCCC as a national data of Thailand.
TGO staff enhanced not only their knowledge on GHG inventory and database programming through experiencing to build integrated database with high accessibility, but capacity to improve and update the database as needed.

Institutional capacity was also enhanced in the sense that TGO can analyze the major GHG emission sectors and trend, by using both knowledge obtained from seminars conducted in Activity 1 and also by using actual GHG inventory data taken from the database developed in Activity 4. In addition, TGO can provide training and guidance more effectively to relevant institutions, which hold and manage necessary raw inventory data, by using training materials developed in Activity 2.

As a result of all activities mentioned above, it can be considered that TGO has improved its capacity to manage information on climate change mitigation in an even more efficient and effective manner.

2.5 Overview workshop ("GHG Mitigation and Low Carbon Society")

An international workshop entitled "GHG Mitigation and Low Carbon Society" was held as a part of Climate Thailand Conference 2011 in Bangkok in order to present main outputs of the Project to climate change related stakeholders in Thailand and abroad. The seminar was organized by TGO and co-organizers included JICA, ONEP and others.

The objectives of the overview seminar was to facilitate TGO staff's capacity to conduct technical training and promotion effectively through presenting project outputs such as technical knowledge gained at JICA trainings (Activity 1), training materials developed as well as presentation skills obtained through trainer's seminars (Activity 2), and PDDs developed (Activity 3).

At the overview seminar, government officials from climate change sector in neighboring countries were invited and TGO shared and discussed their ideas on future cooperation and collaboration regarding climate change in the region.

The seminar in which TGO staff made a presentation was held on 17 August, and the roundtable meeting among neighboring countries was held in the afternoon of 19 August.

Table 2-30 Schedule of workshop

Date	Title	Contents
August 17	Training on "GHG Mitigation and Low Carbon Society by JICA and TGO"	Seminar: presentations by TGO
August 18-19	Participating on CTC 2011 "Climate Change and Green Economy: Pathway to Response"	Seminars, workshop, exhibition, etc.
August 19 (afternoon)	Regional meeting on "GHG Mitigation and Low Carbon Society by JICA and TGO"	Roundtable discussion on future cooperation on climate change issues

At the main CTC sessions held on 18 – 19 August, broad range of topics related to climate change including mitigation, adaptation, low carbon city, CDM, market mechanism, forestry and carbon footprint were covered where 1,149 participants attended including various ministries in Thailand, municipalities and universities, and also the representative from Ministry of Environment in Japan, Japan embassy in Thailand, EU and other countries, International organizations such as UNFCCC and World Bank, private companies and NGOs. JICA Expert Team also made presentations at the main CTC sessions.

Photo 2-17 CTC 2011 Opening

Photo 2-18 Presentation by JICA expert

2.5.1.1 Presentation by TGO staff (17 August 2011)

The training seminar had 11 presentations made by 9 TGO staff on 6 themes including CDM, carbon trading, UNFCCC structure and negotiations, GHG mitigation, carbon footprint and GHG inventory.

Participants of the seminar were 124 including those from climate change related agencies, organizations, and universities in Thailand and also from the private sector. Participants from overseas also attended the seminar, including 10 invited personnel from neighboring countries.

The training curriculum for the seminar was developed by TGO in a way that targets a wide variety of participants as mentioned above. Although JICA Expert Team provided technical advice in preparing the curriculum, Capacity Building and Outreach Office of TGO played the main role in planning and conducting the seminar. Training curriculum for CTC is shown in Table 2-31.

Table 2-31 Program for seminar "GHG Mitigation and Low carbon society" at CTC 2011

	Topic
9:00 – 9:30	Opening Speeches Mr. Sirithan Pairoj-Boriboon Executive Director, Thailand Greenhouse Gas Management Organization (TGO) Mr. Masayuki Karasawa Director General of Office for Climate Change, Japan International Cooperation Agency (JICA)
9:30 – 9:45	Achievement of JICA Technical Cooperation Project "The Project for Capacity Development and Institutional Strengthening for GHG mitigation in the Kingdom of Thailand" Mr. Masahiko Fujimoto, Chief Advisor of JICA Expert Team
9:45 - 10:15	Climate Change Law and Negotiations Ms. Weerada Tivasuradej, TGO
10:15 - 10:30	Coffee Break
10:30 - 10:50	Carbon trading Ms. Sumon Sumetchoengprachya, TGO

	Topic
10:50 - 11:15	Basic Knowledge about CDM Dr. Paweena Panichayapichet, TGO*
11:15 – 11:45	PDD Development of Pilot Project: Biogas generation from food waste in Bangkok Ms. Wiriya Puntub, TGO Mr. Yoshihiro Mizuno, JICA Expert
11:45 - 12:45	Lunch Break
12:45 - 13:15	Mitigation Mechanism in Forestry Sector: A/R CDM and REDD+ Ms. Anna Kiewchaum, TGO
13:15 - 13:45	PDD Development of Pilot Project: Mangrove Reforestation for Carbon Sequestration in Chanthaburi Province Ms. Anna Kiewchaum, TGO Mr. Osamu Isoda, JICA Expert
13:45 - 14:15	GHG Mitigation Measures in Thailand Dr. Paweena Panichayapichet, TGO
14:15 - 14:30	Coffee Break
14:30 - 15:30	Carbon footprint: What is it and why is it important? Ms.Phakamon Supappunt, TGO LCA Related Issues and Calculation of Carbon footprint Mr.Thada Varoonchotikul, TGO
15:45 - 16:45	Thailand National GHG Inventory: Overview, Energy & IPPU Sectors Mr .Chessada Sakulku, TGO National GHG Inventory: AFOLU and Waste Sectors Ms. Wasinee Cheunban, TGO
16:45 - 17:00	Closing Speeches Mr. Sirithan Pairoj-Boriboon (TGO) Mr. Masayuki Karasawa (JICA)

Presentations during the seminar were based on the training materials developed through activities related to Activity 2 of this Project. Detailed contents of the presentations were revised and updated to match the expectation of the target participants.

TGO staff who had been trained in the Project made all presentations in English. Although it was the first experience for most of the presenters to make a presentation in English toward more than 100 audiences, they appropriately conducted the presentation as well as answered the questions from the floor.

Photo 2-19 Seminar

Photo2-20 Presentation by TGO staff

After the seminar, questionnaire was distributed to analyze how participants considered about the contents of the presentations as well as the TGO staff's presentation skill. Questions are as follows;

Q1. Information is sufficiently covered for the topic and the latest information is included?
Q2. Length of presentation is appropriate?
Q3. Presenter's voice is clearly audible and talking speed is appropriate?
Q4. Presenter answers to questions appropriately?

Each question was evaluated in scale of five (5 being the highest evaluation) and the result shows almost all presentations were well evaluated by the audience as shown below.

Table 2-32 Score of evaluation on presentation at CTC 2011

No.	Question / Topic	Q1	Q2	Q3	Q4	Average
1	Climate Change Law and Negotiations	4.26	4.26	4.54	4.00	**4.27**
2	Carbon trading	3.68	3.84	3.76	3.72	**3.75**
3	Basic Knowledge about CDM	4.05	3.68	3.62	3.93	**3.82**
4	PDD Development: school biogas generation	4.22	4.14	4.14	3.90	**4.10**
5	A/R CDM and REDD+	4.11	4.00	3.91	3.72	**3.94**
6	PDD Development: Mangrove A/R project	4.00	4.09	3.83	3.86	**3.94**
7	GHG Mitigation Measures in Thailand	4.06	4.12	3.71	3.93	**3.95**
8	Overview of Carbon footprint	4.14	3.91	3.79	4.05	**3.98**
9	Carbon footprint LCA and Calculation	4.03	3.97	3.82	4.11	**3.98**
10	GHG Inventory and Energy and IPPU sector	4.21	4.03	3.94	4.05	**4.06**
11	GHG Inventory: AFOLU and Waste sector	4.21	4.09	4.00	4.05	**4.09**
	Average	**4.09**	**4.01**	**3.92**	**3.94**	

Nearly all topics marked more than or close to 4 points out of 5 and both training materials and presentation skill were highly evaluated by participants.

2.5.1.2 Roundtable meeting with climate change representatives from neighbor countries

TGO has been planning to establish a Climate Change International Training Center (tentative name) since even before the Project started. TGO aims to play a principle role in establishing and operating the Center by using the experience and knowledge gained through the Project.

CTC 2011 was a good opportunity to show the training provision capability of TGO to climate change personnel from neighboring countries. In addition, information on capacity development

and assistance needs at each country was shared among the participants and assessed so that cooperative relationship was developed among TGO and participant countries.

Representatives were 10 government officials from 7 countries. Their affiliation is wide-ranged such as mitigation, adaptation, GHG inventory, carbon trading, forestry and energy. Other than invited participants, the roundtable session had 33 participants including from JICA headquarters, JICA Thailand office, ONEP and Environmental Research and Training Centre (ERTC).

Table 2-33 List of participants from neighbor countries

Country	Name	Organization	Status
Cambodia	Mr.Ou Chanthearith	Ministry of Environment	Deputy Director of Climate Change Department
	Mr.Uy Kamal	Ministry of Environment	Head of GHG Inventory and Mitigation
Indonesia	Mr.Ardiyanto Aryoseno	National Council on Climate Change	Staff of Carbon Trade Mechanism Division
Laos	Mr.Syamphone Sengchandala	Ministry of Natural Resources and Environment	Director of Climate Change Office, Department of Environment
	Mr.Phonepasong Sithideth	Ministry of Energy and Mines	Technical staff, Department of Electricity
Malaysia	Dr.Gary William Theseira	Ministry of Natural Resources and Environment	Deputy Undersecretary
Myanmar	Mr.Hlaing Min Maung	Ministry of Forestry	Head of Branch
	Mr.Than Naing Win	Dry Zone Greening Department	Staff Officer
Philippines	Ms.Donna Lyne S.Sanidad	Climate Change Commission	Information Technology Officer II
Vietnam	Ms.Huynh Thi Lan Huong	Climate Change Research Center, IMHEN, MONRE	Deputy Director

Presentations were made by representatives of each country. Program of the meeting is shown below.

Table 2-34 Program of roundtable meeting

Time	Topic
13:30 - 13:45	Opening and Introduction of International Training Program Mr. Sirithan Pairoj-Boriboon Executive Director, Thailand Greenhouse Gas management Organization: TGO Mr. Masayuki Karasawa Director General of Office for Climate Change, Japan International Cooperation Agency (JICA)
13:45 - 14:45	Presentations by countries Cambodia - Mr. Ou Chanthearith, Mr. Uy Kamal

	Indonesia - Mr. Ardiyanto Aryoseno Lao PDR - Mr. Syamphone Sengchandala, Mr. Phonepasong Sithideth Malaysia - Dr. Gary William Theseira
14:45 - 15:00	Coffee Break
15:00 - 16:00	Presentations by countries (continued) Myanmar - Mr. Hlaing Min Maung, Mr. Than Naing Win Philippines - Ms. Donna Lyne S. Sanidad Vietnam - Dr. Huynh Thi Lan Huong Thailand - Mrs. Nirawan Pipitsombat Acting Director, Office of Climate Change Coordination, Office of Natural Resources and Environmental Policy and Planning
16:00 - 17:15	Discussion Session
17:15 - 17:30	Closing Speech Mr. Sirithan Pairoj-Boriboon Representative from Japan International Cooperation Agency (JICA)
Moderator	Dr. Jakkanit Kananurak Director, Capacity Building and Outreach Office, Thailand Greenhouse Gas management Organization: TGO

Representatives from each country made a presentation on 1) Current situation of climate change mitigation and adaptation, 2) Current situation of GHG inventory and institutional structure, and 3) Assistance needs including capacity development. TGO staff took the role of a session moderator and facilitated active discussion among all participants.

As a result of the discussion, the gap among countries was found in terms of the situation and progress of climate change measures and the GHG inventory development. At the same time, it was revealed that all participated countries have various types of needs for assistance on mitigation measures, adaptation measures and GHG inventory development as summarized by TGO below.

Table 2-35 Assistance needs by countries

Sector	Mitigation								Adaptation								GHG Inventory							
Needs	Cambodia	Indonesia	Laos	Malaysia	Myanmar	Philippines	Thailand	Vietnam	Cambodia	Indonesia	Laos	Malaysia	Myanmar	Philippines	Thailand	Vietnam	Cambodia	Indonesia	Laos	Malaysia	Myanmar	Philippines	Thailand	Vietnam
Institutional	■			■	■		■		■				■	■	■	■	■				■	■	■	■
Technical	■				■	■	■	■	■				■	■	■	■	■				■	■	■	■
Human resource	■			■	■	■	■	■	■				■		■		■				■		■	■
Awareness	■		■				■				■				■	■			■				■	
Financial	■	■	■	■	■		■	■	■		■		■	■	■	■	■		■		■		■	

* Colored cell indicates needs for assistance

Photo 2-21 Discussion

Photo 2-22 TGO staff moderated a discussion

The session contributed to establish and strengthen the relationship among countries and identify the assistance needs. The concept of "Climate Change International Training Center" was generally agreed among participants.

It is expected TGO and Thai government will take initiative for establishing a training center and promote climate change measures not only in Thailand but in neighboring countries in the future.

2.6 Technical Training in Japan

Technical training in Japan was conducted 3 times where 30 TGO executives and technical staff were participated in total. The objective of the each technical training was set depending on the role or position of participants in TGO. The objective for executives was to exchange information with relevant authorities and intuitions related to GHG mitigation policy. For technical staff, on the other hand, it was to further enhance the knowledge and expertise on GHG mitigation and related policy through visiting and having discussions with relevant institutions related to GHG mitigation.

1st year Technical Training in Japan (October –November)

Technical staffs have further enhanced their knowledge and expertise on GHG mitigation and related policy through visiting and having a series of discussions with relevant institutions related to GHG mitigation policy and measures, low-carbon society, carbon trading, and carbon footprint. While executives mainly visited relevant authorities and intuitions related to GHG mitigation policy and low-carbon society and exchange information.

The list of participants is shown below.

Table 2-36 (1) List of participants (Executives)

Name	Position
1. Mr. Sunthad Somchevita	Chairman of the Board of Directors of TGO
2. Mr. Panat Tasneeyanond	Member of the Board Directors of TGO Legal Advisor
3. Mr. Suthep Liumsirijarern	Member of the Board Directors of TGO Deputy-Director, Department of Alternative Energy Development and Efficiency
4. Mr. Sirithan Pairoj-Boriboon	Executive Director of TGO
5. Mrs. Prasertsuk Chamornmarn	Deputy Executive Director of TGO

Table 2-36 (2) List of participants (Staff)

Name	Office	Position
.1 Mr. Chessada Sakulku	GHG Information Center	Acting Director
.2 Ms. Wararat Cha-umkruea		Official
.3 Mr. Rongphet Bunchuaidee	Review & Approval Office	Senior Assistance Official
.4Ms. Penporn Petchsri		Senior Assistance Official
.5 Ms. Paweena Panichayapichet		Senior Assistance Official
.6 Ms. Sumon Sumetchoengprachya	Marketing Office	Senior Assistance Official
.7 Ms. Phakamon Supappunt		Senior Assistance Official
.8 Mr. Jakkanit Kananurak	Capacity Building Office	Acting Director
.9 Ms. Nareerat Thanakasem		Senior Assistance Official
.10Ms. Weerada Tivasuradej	Policy & Strategy Office	Lawyer

Training program and visiting places were discussed and agreed by TGO and JICA Expert Team

Overview of each session is shown in table 2-37.

Table 2-37 Overview of technical training in Japan

San-yu Co., Ltd.	**27/10/2010**
Topic	The advanced waste management (treatment by YM Microorgaism)
Lecturer	Mr. Tatsuro Nagayama, Chief director
Points of discussion	・ Site visit and discussion were conducted. ・ Lecturer explained the treatment process of YM Microorganism method in waste management and fertilizer with by-product of YM Microorganism.
Kitakyusyu City government	**28/10/2010**
Topic	Approaches for Low-Carbon Society by the City of Kitakyushu
Lecturer	Mr. Noriyoshi Sako, Deputy Director International Environmental Strategies Division Environmental Bureau Mr. Takashi Himeno, Manager (World Environmental Capital Coordination) General Affairs Division Environment Policy Department Environment Bureau
Points of discussion	・ Lecturer explained about approaches for low-carbon society by Kitakyushu city. ・ Lecturer explained about the base data of target GHG emission reduction and basic idea of back casting process. ・ Participants discussed the penalty when the target GHG emission reduction is not cleared.

Fukuoka Prefectural government	**28/10/2010**
Topic	Fukuoka Prefecture's Policy for Climate Change
Lecturer	Mr. Koichi Eri Director of Planning & Public Relations Department of Environmental Affairs
Points of discussion	・ Lecturer explained about Fukuoka Prefecture's policy for climate change. ・ Lecturer explained that the target GHG emissions reductions for the private car are 13 % and it includes the renewal of old cars. ・ Fukuoka Prefecture just opened the office in Thailand, and TGO and the Prefecture discussed about future exchange options.
Bridgestone Corporation	**29/10/2010**
Topic	Advanced energy efficiency technology in manufacturing and carbon management
Lecturer	Mr. Hiroto Yoshida, Manager Carbon Management Promotion Unit Strategic Environmental Planning Department
Points of discussion	・ Site visit to the factory was conducted. ・ Lecturer explained about an advance of energy efficiency technology in manufacturing industry and carbon management. ・ Discussed several activities related to the carbon footprint and Eco-label. ・ Lecturer explained that the benefit by introducing carbon footprint is limited because most of the CO_2 emissions of tire LCA occur in the consumption (use of vehicles) stage which involves various factors other than tire usage.
Ministry of the Environment, Japan	**1/11/2010**
Topic	1.for Low Carbon Society - Focused on ETS and Flexible Mechanisms - 2. Japan's Activities to Promote A Co-Benefits Approach
Lecturer	1.Mr. Yasuharu Ueda Director, Office of Market Mechanisms Climate Change Policy Division Global Environment Bureau 2.Mr. Hiroaki Takiguchi, Director, International Cooperation Office Environment Management Bureau
Points of discussion	・ Lecturer explained Japan's policies on various measures toward low-carbon society establishment, including JVETS and bilateral/ multi-lateral mechanisms as well as international cooperation activities on climate change/ GHG mitigation called co-benefit approach. ・ Discussed about the possible credit transaction under JVETS scheme between Thailand and Japan. ・ Discussed about JVETS scheme, Japan's experience on establishment of the scheme and observed issues. ・ Lecturer introduced projects in China and Indonesia that have co-benefits impact.
Overseas Environment Cooperation Center (OECC)	**1/11/2010**
Topic	Development of Carbon Offset Market in Japan and the Institutional Framework for Japan Verified Emission Reduction (J-VER) Scheme
Lecturer	Mr. Makoto Kato, Chief/ Principal Researcher Strategic Business Development Department
Points of discussion	・ Lecturer explained about the J-VER scheme and carbon offset project in Japan. ・ Discussed about the CO-Net scheme and trading system (B to B). ・ Discussed about the merit of carbon offset project and public awareness (by certification labeling and information disclosure).

Japan Environment Management Association for Industry (JEMAI)	**2/11/2010**
Topic	1.Current Status and Issues of Carbon footprint Program in Japan 2.LCA/CFP database in Japan - Development and dissemination -
Lecturer	1.Mr. Akiyoshi Ishizuka, Adviser/ Deputy Director Center of Product and Environmental Aspects Department of Product and Environmental Aspects 2.Mr. Yasushi Shiraishi, General Manager LCA Department Office Center of Product and Environmental Aspects Department of Product and Environmental Aspects
Points of discussion	・ Lecturer explained about structure of Japanese carbon footprint and development of LCA/ CFP database. ・ Discussed the difference between ECOLEAF and Carbon footprint and merit of each system. Carbon footprint system focuses only on GHG emissions, while ECOLEAF system includes the information not only GHG emission but also environmental information. ・ Discussed about the possibility of interactive linkage between carbon footprint system in Thailand and Japan.
Tokyo metropolitan government	**2/11/2010**
Topic	Tokyo Climate Change Strategy
Lecturer	Ms. Yuki Arata, Director for Emission Trading Urban and Global Environment Division Bureau of Environment
Points of discussion	・ Lecturer explained about the climate change strategy of Tokyo metropolitan government especially Tokyo－Emission Trading System. ・ Discussed the ETS coverage area (including overseas trading) of Tokyo－ETS, the limit of trade amount and penalty system. ・ Discussed the subsidy system for investment in renewable energy
Kyoto city government	**5/11/2010**
Topic	1. Programs of ”Kyoto City as an Environment Model City” toward Realization of Low-Carbon Society 2. Low Carbon Transport – Mass Transit and Green Vehicle (Biodiesel fuel production project in Kyoto City)
Lecturer	1. Mr. Masanori Nakayama, Manager of Low Carbon City Section Climate Change Policy Office Environmental Policy Bureau 2. Mr. Hiroaki Hori, Manager of Biomass Section Office of Waste Recycling Planning Waste Management and Recycling Promotion Division Environmental Policy Bureau
Points of discussion	・ Lecturer explained about Programs of ”Kyoto City as an Environment Model City” toward realization of low-carbon society. ・ Discussed the enforcement of “energy-saving label” system and response from Kyoto citizens. ・ Discussed the importance of forest management for carbon sink and difference of the management system between Thailand and Japan. ・ Lecturer explained about Low Carbon Transport–Mass Transit and Green Vehicle (Biodiesel fuel production project in Kyoto City)
Shiga prefectural government	**5/11/2010**
Topic	Realization of Low Carbon society (Efforts in Shiga Prefecture)
Lecturer	Mr. Kazuomi Okuda, Assistant Section Chief Global Warming Issues Division Department of Lake Biwa and the Environment
Points of discussion	・ Lecturer explained about the efforts in Shiga Prefecture for realization of low carbon society especially about the preparation of the roadmap scheme. ・ Site visit for Biwako lake museum was conducted. ・ Discussed the relationship between Shiga government and its citizens about the preparation of the roadmap.

Participants to the training attended the evaluation meeting at JICA Headquarters at the end of the training period. The participants discussed about the result and insight of the training program in Japan and also expressed their ideas on how to apply the knowledge and experience obtained through this trip to climate change policies and strategies in Thailand.

Photo2-23 Site visit (San-yu Co., Ltd)

Photo2-24 Lecture on low-carbon society (Kitakyushu)

Photo 2-25 Site visit to manufacturing industry (Bridgestone Corporation)

Photo 2-26 Discussion on climate change policy (MOEJ)

Photo 2-27 Lecture on J-VER (OECC)

Photo 2-28 Discussion on carbon footprint (JEMAI)

Photo 2-29 Lecture on low-carbon society (Kyoto)

Photo 2-30 Opinion exchange with Shiga prefecture (Shiga)

(1) 2nd year Technical Training in Japan (Executive course: May, Technical staff course: August-September)

Technical staff have further enhanced their knowledge and expertise on GHG mitigation and related policy through visiting and having a series of discussions with relevant institutions related to GHG mitigation policy and measures, low-carbon society, carbon trading, and carbon footprint. While executives mainly visited relevant authorities and intuitions related to GHG mitigation policy and low-carbon society and exchanged information and opinions.

The list of participants is shown below

Table 2-38 (1) List of participants (Executives)

Name	Position
1. Mr. Sunthad Somchevita	Chairman of the Board of Directors of TGO
2. Mr. Damrong Sripraram	Member of the Board Directors of TGO
3. Mr. Chamroon Tangpaisalkit	Deputy Permanent Secretary, Ministry of Transport
4. Mrs. Prasertsuk Chamornmarn	Deputy Executive Director of TGO
5. Dr.Jakkanit Kananurak	Director of Capacity Building office of TGO

Table 2-38 (2) List of participants (technical staff)

Name	Position
1. Dr. Chaiwat Munchroen	Deputy Executive Director
2. Ms. Puttipar Rotkittikhun	Assistant Senior Official
3. Ms. Anna Kiewchaum	Assistant Senior Official
4. Mr. Rongphet Bunchuaidee	Assistant Senior Official
5. Ms. Wasinee Cheunban	Assistant Senior Official of GHG Information Center
6. Ms. Mewadee Seresathiansub	Official of GHG Information Center
7. Mr. Thada Varoonchotikul	Assistant Senior Official
8. Ms. Natteera Kanjawatkul	Official
9. Ms. Natchanan Wathanachinda	Official
10. Ms. Wiriya Puntub	Official

Training program was developed based on discussions between TGO and JICA Expert Team.

Overview of each session is shown in table 2-39 and 2-40.

Table 2-39 Overview of technical training in Japan (Executives)

Ministry of Land, Infrastructure, Transport and Tourism	18/5/2011
Topic	Policies and Measures for Climate Change in Japan
Lecturer	Mr. Kenta Sakamaki, Director of Global Environmental Policy Office, Environmental Policy Division Mr. Keishi Kamada, Director for Environment Planning Coordination, City Planning Division, City and Regional Development Bureau
Points of Discussion	・ Lecturer explained about policies for Low carbon city in Japan. ・ Discussed how to motivate companies and users to introduce hybrid cars.
Yokohama City	19/5/2011
Topic	Policies and Measures for Low-carbon Society in Yokohama City
Lecturer	Mr. Toru Hashimoto Policy Bureau Center of Co-Governance and Creation Co-Governance and Creation Division Mr. Soichiro Sugihara, Climate Change Policy Headquarters Mr. Takashi Suzuki, Transportation Pollution Measures Division Environmental Conservation Department Environmental Planning Bureau Mr. Manabu Nakatsubo, Resources & Wastes Recycling Bureau, City of Yokohama Mr. Takahito Oikawa Environmental Planning Bureau Sewerage Treatment Center
Points of Discussion	・Lecturers explained about policies and measures related to low-carbon society in Yokohama city. ・Discussed the introduction of renewable energy, incentives for general public and infrastructure development for EV cars.
Ministry of Environment	20/5/2011
Topic	International Cooperation Related to Climate Change
Lecturer	Mr. Yutaka Matsuzawa Director, Research Information Office ,Global Environment Bureau Mr. Yuji Mizuno Senior Planning Officer, Office of Market Mechanisms, Climate Change Policy Division, Global Environment
Points of Discussion	・ Lecturers explained Japan's policies on NAMAs Bilateral offset crediting mechanism and REDD+. ・ Discussed further assistance on enhancement of capacity in climate change issues for Thailand.
Forestry Agency	20/5/2011
Topic	REDD+, Measure on Illegal Logging
Lecturer	Mr.Satoshi Akahori, Director, Forest Carbon Sink Strategy Office Mr.Nobuyuki Muto,Deputy Director, International Forestry Cooperation Office Mr.Toru Gomi, Assistant Director, International Affairs, Forest Carbon Sink Strategy Office
Points of Discussion	・Lecturers explained current international negotiations on REDD+ and measures for illegal logging in Japan. ・Discussed current situation of REDD+ in Thailand and possibility to conduct F/S.
Yamato Transport CO., LTD	23/5/2011
Topic	Measures for reducing emission by private company
Lecturer	Mr. Eiji Hujiguchi, Director, CSR promotion division Ms. Kayo Akimoto Manager CSR promotion division
Points of Discussion	・Lecturer explained various measures implemented by Yamato Transport.
ORIX CO., LTD	24/5/2011
Topic	Measures for reducing emission by private company

Lecturer	Mr. Hiroyuki Okada, General Manager Mr. Mitsumasa Takayama Supervisory department of rental car.
Points of Discussion	・Lecturer explained about "Car-sharing", especially their approach to promote Car-sharing and points to introduce the system.

Table 2-40 Overview of technical training in Japan (Technical staff)

Ministry of Land, Infrastructure, Transportation and Tourism	25/8/2011
Topic	Guideline of Low Carbon City and MRV
Lecturer	Mr. Keita Sakairi, City planning division, City bureau Mr. Ryosuke Fukae, City planning division, City bureau
Points of Discussion	・ Lecturer explained about guideline of low carbon city and methodology to estimate GHG emission. ・ Participants practiced estimation in greenery, buildings and transportation sector.
Institute for Global Environmental Strategies (IGES)	26/8/2011
Topic	The outline of MRV in CDM, J-VETS, J-VER, and J- MRV
Lecturer	Mr. Asuka Jusen Climate Change Director, IGES Mr. Takahashi Kentaro Market Mechanism Associate Researcher, IGES Ms. Okubo Nozomi Market Mechanism Policy Researcher, IGES Ms. Fukui Akiko Market Mechanism Research Assistant, IGES Mr. Nakao Tsuyoshi Principal consultant, ERM Japan
Points of Discussion	・ Lecturer explained the outline of MRV in CDM, J-VETS, J-VER, and J-MRV. ・ Participants asked various questions including the process to develop J-MRV and J-VETS, its international reputation and costs for cooperation. ・ Discussed whether Thailand can apply "Global action for Reconciling Economic growth and Environmental preservation" conducted by JBIC.
Ministry of Environment	29/8/2011
Topic	Japan's International Cooperation on Climate Change
Lecturer	Mr. Hiratsuka Motoshi Mitsubishi UFJ Research and Consulting Co., Ltd
Points of Discussion	・ Lecturer explained REDD, REDD+ and relationship market mechanism. ・ Discussed possible REDD+ in Thailand. ・ Participants asked about the level of consensus on the REDD+ concept and the possible process of verifying credit and selecting DOE.
Forestry and Forest Products Research Institute REDD Research and Development Center	30/8/2011
Topic	Scientific technology related to REDD and REDD+
Lecturer	Mr. Matsumoto Mitsuo Director of REDD research and development Center Mr. Kiyono Yoshiyuki Director of Plant Ecology Mr. Hirata Yasumasa Chief of Global Warming Response Promotion Office Mr. Toma Takeshi Chief of Partnership promotion office
Points of Discussion	・ Lecturer explained scientific technology related to REDD and REDD+ including estimation method and remote sensing. ・ Relationship between community and forestry were explained. ・ Participants asked various questions including situation of Japan's carbon stock estimation and contribution of REDD to forest conservation and reforestation,
Greenhouse Gas Inventory Office of Japan	31/8/2011
Topic	Japan's structure to develop Inventory
Lecturer	Mr. Hirai Keizo GHG inventory expert Mr. Tamai Akihiro GHG inventory expert
Points of Discussion	・ Information was exchanged about inventory development and role of GIO and TGO. ・ Lecturer explained Japan's inventory development method and practices. Participants asked how to collect data and detailed calculation methods.
Energy Conservation Center Japan	1/9/2011
Topic	A Policy on Energy Saving in Japan
Lecturer	Mr. Kenichi Kaneko, Technical Expert

Points of Discussion	・ Lecture explained about "Top Runner Program" which is one of the policies for energy saving in Japan. ・ Participants asked about legal system related to the Top Runner Program, the process of system development and the arrangement among other certifications.

Participants to the training attended the evaluation meeting at JICA Headquarters at the end of the training period. The participants discussed the result and insight of the training program in Japan and also expressed their ideas on how to apply the knowledge and experience obtained through this trip to climate change policies and strategies in Thailand.

2.7 Terminal Evaluation Survey

Terminal evaluation survey of the project was conducted from 12 to 22 December 2011, where JICA Expert Team supported joint evaluation team to coordinate the survey and provide necessary information.

The objectives of the terminal evaluation are as follows;

- To verify and evaluate the outputs and achievements of the project

- To provide recommendations on the project activities for the remaining period and after the termination of the project

- To draw lessons for implementing similar projects in the future.

The members of joint evaluation team consist of JICA terminal evaluation team and three TGO executive directors. The joint evaluation team members from Thai side and the schedule of terminal evaluation are shown in table 2-41 and table 2-42, respectively.

Table 2-41 Members of the joint evaluation team (Thai side)

Name	Position/Organization
Mr. Sirithan Pairoj-Boriboon	Executive Director, TGO
Ms. Prasertsuk Chamornmarn	Deputy Executive Director, TGO
Mr. Chaiwat Munchroen	Deputy Executive Director, TGO

Table 2-42 Schedule of terminal evaluation

Date	Activities
14 Dec.	Interview with TGO (Jakkanit Kananurak, Thawatchai Somnam, Puttipar Rotkittikhun, Rongphet Bunchuaidee and Sumon Sumetchoengprachya)
15 Dec.	Interview with TGO (Natchanan Wathanachinda and Wiriya Puntub) Interview with DNP (Chingchai Viriyabuncha and Phanumard Ladpala)

Date	Activities
	Interview with BMA(Suwanna Jungrungrueng, Woranuch Suaykakaow, Siwat Aripetpun, Rudhpol Jatoorapreuk and Wankaew Homnan)
16 Dec.	Interview with TGO (Chaiwat Munchroen, Wasinee Cheunban and Phakamon Supappunt) Meeting with the joint evaluation team
19 Dec.	Interview with TGO executive directors (Sirithan Pairoj-Boriboon and Prasertsuk Jamornmarn) Meeting on Joint Evaluation Report with TGO and the evaluation team
21 Dec.	Meeting on Joint Evaluation Report with TGO and the evaluation team
22 Dec.	Joint Coordinating Committee meeting

The joint evaluation team evaluated the project regarding 1) Relevance, 2) Effectiveness, 3) Efficiency, 4) Impact, and 5) Sustainability and made recommendations. The results of the terminal evaluation were reported in “Joint Terminal Evaluation Report” and shared with relevant agencies and organizations of Thailand at Joint Coordinating Committee (JCC).

JCC meeting was held on 22nd December 2011 where 29 participants attended from JICA Thailand, TGO, DNP, BMA, RFD, DEDE, DIW, ONEP, TICA, and JICA Expert Team besides the joint evaluation team.

The main points of evaluation results are as follows;

(1) Five evaluation criteria

Relevance, effectiveness and efficiency were evaluated as high. It was especially evaluated that the project succeeded to enhance both personal and institutional capacity development despite the short project period in terms of effectiveness and efficiency. In addition, 6 different examples are referred as impacts of the project, such as introduction of TVER and carbon footprint labeling in Thailand, achievements of CTC 2011, a side event at COP17, relationship enhancement between TGO and other government agencies, and plans to establish the Climate Change International Training Center. In view of national policy, financial trend of TGO and capacity of staff members, the report evaluated that the achievements are likely to be maintained and sustainability is also evaluated high.

(2) Recommendations

Recommendations made at JCC were as follows;

1) The project should ensure that the final Capacity Assessment Test will be taken by all concerned TGO counterparts.
2) The project should ensure that all relevant training materials are properly translated into Thai.

3) The project should revise the Objectively Verifiable Indicator of the Overall Goal.
4) TGO should establish and implement a capacity development programme for its staff.
5) TGO should upgrade the GMaP and outreach programme for stakeholders in climate change mitigation in the region.
6) TGO should consider forging partnership in capacity development of stakeholders in climate change mitigation in the region.
7) JICA should consider assisting the TGO to further development its capacity in the required field.
8) The project period should be extended until the end of February 2012.

Concerning 3) revising the Objectively Verifiable Indicator of the Overall Goal, following 3 items are suggested by the joint evaluation team and considered.

(a) TGO consults at least 12 training courses for stakeholders utilizing achievements of project by the end of 2014.
(b) At least one new GHG inventory report is produced by the end of 2014.
(c) Methodologies for TVER is proposed to TGO Board by the end of 2012.

The results of joint terminal evaluation including suggestion above were shared among relevant participants. Recommendations regarding 1) final Capacity Assessment and 2) translation of relevant training materials were implemented in February by TGO and JICA Expert Team. Recommendations regarding 4) capacity development programme for its staff, and 5) capacity development programme for stakeholders have been initiating by Capacity building and Outreach Office. In 2012, 7 training seminars and 2 curriculums (basic and advance) are planned as training programme for stakeholders. 6) partnership forging have also been initiating by TGO, where information on "Climate Change International Training Center" has been shared among neighboring countries for the purpose of its realization.

2.8 Revision of PDM

The Project was implemented in accordance with M/M signed on October 21, 2009. It was agreed that the PDM should be finalized in the first Joint Coordinating Committee (JCC) meeting. However, it was discussed and there are no appropriate indicator to evaluate the achievement of project purpose and activities. The fact was found in the terminal evaluation survey and JICA Expert Team considered new Objectively Verifiable Indicator, as shown below.

Overall Goal	Objectively Verifiable Indicators (as appeared in original PDM)	Objectively Verifiable Indicators (suggestion by JICA Expert Team)
GHG mitigation activities will be promoted in Thailand	Number of CDM projects submitted to TGO for national approval.	TGO consults at least 12 training courses for stakeholders utilizing achievements of project by the end of 2014. At least one new GHG inventory report is produced by the end of 2014. Methodologies for TVER are proposed to TGO Board by the end of 2012.
Project Purpose	**Objectively Verifiable Indicators (Original)**	**Objectively Verifiable Indicators (Revised)**
Capacity development for human resources and institutional strengthening on GHG mitigation for TGO will be achieved.	TGO can provide technical instruction, and can promote awareness of climate change mitigation policy to the other stakeholders. Capacity Development Progress Evaluation Check List on GHG Mitigation Policy, Carbon trading, UNFCCC individual sector Number	TGO can provide technical instruction, and can promote awareness of climate change mitigation policy to the other stakeholders. TGO staff level of knowledge and expertise are increased. Number of training course provided by TGO is increased
Output	**Objectively Verifiable Indicators (Original)**	**Objectively Verifiable Indicators (Revised)**
1. The level of knowledge and expertise of TGO staff on GHG mitigation will be enhanced.	TGO staff level of knowledge and expertise are increased. Scoring XX % of the Capacity Development Progress Evaluation Check list	Score of the Capacity Development Progress Evaluation Check list is increased. More than 50 % of submitted post training test are evaluated as “good” or “fair”.
2. Capacity of TGO to provide training will be enhanced.	Curriculum and training material will be produced. Series of training courses are designed	Not changed
3. Capacity of TGO to review and monitor GHG mitigation project will be enhanced.	PIN and/or PDD of pilot project(s)	PIN and/or PDD of pilot project(s) are developed.
4. Capacity of TGO to manage information on GHG mitigation will be enhanced.	TGO website access increase by XX% Database of TGO	TGO website provides comprehensive information on GHG mitigation measures including CDM. Database of TGO is improved.

2.9 Achievement of the Project Purpose and Overall Project Goal

2.9.1 Achievement of Project Purpose

The Project Purpose and Verifiable Indicators of the Project are as follows;

Project Purpose

Capacity development for human resources and institutional strengthening on GHG mitigation for TGO will be achieved.

Objectively Verifiable Indicators

a) TGO can provide technical instruction, and can promote awareness of climate change mitigation policy to the other stakeholders.

b) TGO staff level of knowledge and expertise are increased.

c) Number of training course provided by TGO is increased

Referring to the above indicators, achievement of the Project Purpose is assessed below.

As described in Activity 2, 14 training materials including 3 materials on CDM, 1 material on carbon trading, 3 materials on UNFCCC structure and negotiations, 2 materials on carbon footprint and 5 materials on GHG inventory were developed, which can be used at external seminars and workshops on climate change mitigation conducted by TGO. In addition, 10 TGO staff members were trained and improved their training provision capacity through trainer's training seminars in July 2010, November 2010 and March 2011.

Therefore it can be considered that the Project contributed to develop fundamental capacity to provide technical instructions and promotion on climate change mitigation to stakeholders in Thailand and abroad.

In addition, 10 TGO trainers successfully made presentations to stakeholders in Thailand and neighboring countries at Climate Thailand Conference (CTC 2011) by using training materials developed in the Project. It shows TGO staff capacity was sufficiently enhanced to the level indicated in the proposed Objectively Verifiable Indicator "TGO can provide technical instruction, and can promote awareness of climate change mitigation policy to the other stakeholders".

The experience and know-how on project formation and PDD development of PoA and A/R CDM projects obtained through activities of Activity 3 will be highly useful in providing

technical consultation to prospective project proponents or developers and also to promote similar types of CDM project activities.

The capacity on providing training seminars was relatively limited at the beginning of the Project because only a limited personnel such as a executives and directors had sufficient experience in making a presentation for training. Through the project activities, 10 technical staff were trained as trainers and they are expected to take initiative in providing training seminars in the future. TGO staff also had an experience to develop curriculum for CTC 2011 and it contributed to enhance the capacity to systematically develop training courses.

As shown in previous clause for the achievement of Activity 1, the result of capacity assessment has significantly improved. It proves that many TGO staff members have gained systematic and wide range of knowledge on climate change mitigation. It is also considered that the TGO enhance organizational capacity to collaborate among sections by sharing fundamental knowledge on climate change.

Overall, the project purpose which is capacity development for human resources and institutional strengthening on GHG mitigation has been achieved.

2.9.2 Direction to Overall Project Goal

Overall Project Goal:
GHG mitigation activities will be promoted in Thailand.

It can be said that the fundamental capacity to promote GHG mitigation activities by TGO and related agencies was very much strengthened.

CDM projects, for example, the types of approved CDM projects in Thailand were limited in particular sectors at the beginning of the Project. However, the capacity to respond to projects of other sectors has been significantly enhanced by experiencing many activities in the Project such as PIN and PDD development for PoA and A/R CDM. It is expected TGO can now conduct even more extensive promotion of CDM projects in all sectors.

In judging the achievement toward the Overall Project Goal, it may be somewhat misleading to judge only considering the number of CDM projects, as suggested in the original PDM since the environment surrounding climate change mitigation has evolved since the Project was formulated,

and also the Project covered various kinds of GHG mitigation topics such as carbon training and carbon footprint. And therefore, it is recommended to monitor various activities regarding GHG mitigation conducted in Thailand in order to more thoroughly evaluate the achievement of the Overall Project Goal.

It is expected to promote GHG mitigation activities through continuous implementation of external activities such as Climate Thailand Conference which were held in 2010 and 2011. Moreover, TGO has been planning to take initiative to GHG mitigation activities in neighbor countries, and the role of GHG mitigation related agencies in Thailand including TGO is expected to expand in promoting GHG mitigation.

Based on the above analysis, it is concluded that the Project has contributed to a great extent to create a path to the Overall Project Goal, and at the same time, in terms of positive impact of the Project to the surrounding countries, the Project has achieved a significant result.

Chapter 3 INPUT TO PROJECT

3.1 Project Schedule

The Technical Cooperation project was implemented from January 2010 to March 2012. Following table shows the schedule as initially planned at the start of the project as well as the actual schedule of each project activity.

Table 3-1 Project Schedule (First Year)

Work Item \ Schedule	FY 2009				FY 2010											
	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Works in Japan (Phase 1)																
Development of Project Implementation Plan (Phase 1)																
Explanation/ discussion of draft Inception Report																
Training in Japan (Phase 1)																
Development of Project Completion Report (Phase 1)																
Work in Thailand (Phase 1)																
Joint Coordinating Committee (JCC) Meeting																
Implementation of Capacity Assessment																
Development of Project Implementation Plan																
Output 1) Enhancement of level of knowledge and expertise of TGO staff on GHG mitigation																
Conduct Trainingf on CDM																
Conduct Training on Carbon Trading and Carbon Footprint																
Conduct Training on GHG mitigation in relevant sectors																
Conduct Training on UNFCCC Structure and Negotiations																
Conduct Training on GHG Inventory																
Output 2) Enhancement of capacity of TGO to provide training																
Develop and Revise Training Curriculum and Materials																
Conduct "Train the trainer's" seminars																
Conduct evaluation of the Training Curriculum and Materials																
Output 3) Enhancement of capacity of TGO to review and monitor GHG project																
Make a list of potential pilot projects																
Establish criteria for selection of pilot projects																
Select pilot projects																
Prepare PINs/PDDs																
Output 4) Enhancement of capacity of TGO to manage information on GHG mitigation																
Improve website																
Improve database																
Development of Progress Report (No. 1 and No. 2)																

Legend : Plan Actual

Table 3-2 Project Schedule (Second year)

Work Item \ Schedule	FY 2011											
	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Works in Japan (Phase 2)												
Development of Project Implementation Plan (Phase 2)												
Submission of Project Implementation Plan (Phase 2)												
Training in Japan (Phase 2)												
Development of Project Completion Report (Phase 2)												
Work in Thailand (Phase 2)												
Joint Coordinating Committee (JCC) Meeting												
Implementation of Capacity Assessment												
Implementation of Overview Seminar												
Output 1) Enhancement of level of knowledge and expertise of TGO staff on GHG mitigation												
Conduct Trainingf on CDM												
Conduct Training on Carbon Trading and Carbon Footprint												
Conduct Training on GHG mitigation in relevant sectors												
Conduct Training on UNFCCC Structure and Negotiations												
Conduct Training on GHG Inventory												
Output 2) Enhancement of capacity of TGO to provide training												
Develop and Revise Training Curriculum and Materials												
Conduct "Train the trainer's" seminars												
Conduct evaluation of the Training Curriculum and Materials												
Output 3) Enhancement of capacity of TGO to review and monitor GHG project												
Prepare PINs/PDDs												
Conduct monitoring exercise												
Output 4) Enhancement of capacity of TGO to manage information on GHG mitigation												
Improve website												
Improve database												
Development of Progress Report (No. 3)												
Development of Project Activity Completion Report												

Legend : Plan Actual

3.2 Input to Project

3.2.1 Dispatch of experts

JICA Expert Team dispatched experts as shown in table below.

Table 3-3 Dispatch of JICA experts

Name	Assignment	Period Dispatched	Main Activities
Masahiko Fujimoto	**Chief Advisor/ CDM/ GHG mitigation 2**	1. 2010/1/13-2/11 2. 2010/4/17-6/15 3. 2010/8/1-8/26 4. 2010/9/6-10/30 5. 2011/2/1-3/11 6. 2011/5/2-5/16 7. 2011/8/14-9/1 8. 2011/12/17-12/23	Overall management and super-vision of JICA Expert Team and interaction with C/P and stakeholders. Provision of lectures at various seminars, technical support on training curriculum and training material development and overview workshop coordination. Coordination and implementation of technical training in Japan
Kazuhito Yamada	**Deputy Chief Advisor/ Carbon trading/ GHG mitigation 1**	1. 2010/1/13-2/11 2. 2010/4/19-5/3 3. 2010/6/20-7/7 4. 2010/9/6-9/23 5. 2010/10/10-10/22 6. 2010/11/13-11/25 7. 2011/1/10-1/25 8. 2011/5/8-5/17 9. 2011/8/4-8/10 10.2011/8/13-8/24	Provision of lectures on Carbon trading and Climate change mitigation. Technical assistance on training curriculum and training material development.
Mariko Fujimoto	**UNFCCC structure and negotiations**	1. 2010/1/16-1/29 2. 2010/1/13-2/26 3. 2010/4/19-5/3 4. 2010/5/16-5/28 5. 2010/6/20-7/7 6. 2010/9/6-9/23 7. 2010/10/10-10/22 8. 2011/1/10-1/22 9. 2011/2/13-2/27 10.2011/5/8-5/17 11.2011/8/7-8/9 12.2011/8/13-8/24	Provision of lectures on UNFCCC structures and negotiations. Carbon trading and Carbon footprint. Technical assistance on training curriculum and training material development.

Name	Assignment	Period Dispatched	Main Activities
Osamu Isoda	**GHG mitigation in Forestry Sector/ Training Curriculum and Materials 2**	1. 2010/1/13-2/26 2. 2010/2-28-4/10 3. 2010/4/17-5/2 4. 2010/7/7-10/4 5. 2010/11/7-12/13 6. 2011/5/2-5/12 7. 2011/8/7-8/20 8. 2011/10/17-10/27 9. 2012/2/7-2/26	CDM potential survey on A/R project, technical assistance on PIN and PDD development. Supporting "Training Curriculum and Materials 1"
Akihumi Nishihata	**GHG mitigation in Relevant Sectors 1**	1. 2010/5/16-6/14 2. 2010/8/1-9/14 3. 2011/5/8-5/17	CDM potential survey project, CDM project list and PIN/PDD development
Yoshihiro Mizuno	**GHG mitigation in Relevant Sectors 2**	1. 2010/9/1-30 2. 2010/11/1-11/30 3. 2011/7/28-8/21	Technical assistance on PIN and PDD development. Monitoring on actual registered project
Fumihiko Kuwahara	**GHG Inventory**	1. 2010/8/24-10/7 2. 2011/1/9-2/22 3. 2011/5/3-6/1 4. 2011/8/9-8/23	Provision of lectures on GHG inventory. Technical assistance on training curriculum and training material development.
Tetsuya Yoshida	**Training Curriculum and Materials 1**	1. 2010/4/17-7/15 2. 2010/9/1-10/22 3. 2010/11/14-12/6 4. 2011/1/9-3/9 5. 2011/5/2-5/16 6. 2011/7/11-8/21 7. 2011/12/7-12/23	Technical assistance on training curriculum and training material development. Implementation of trainer's training.
Takahiro Yasunaga	**Website and Database**	1. 2010/5/9-6/8 2. 2010/7/11-9/8 3. 2011/1/9-2/22 4. 2011/5/3-6/1	Development of database system and improvement of website.
Wataru Morimoto	**Training Curriculum and Materials 2/ Coordinator**	1. 2010/8/9-10/7 2. 2011/1/9-2/7	Technical assistance on training curriculum and training material development. Coordination and implementation of technical training in Japan
Fumio Tsukamoto	**Coordinator**	1. 2011/12/7-12/23 2. 2012/1/30-2/28	Project coordination

3.2.2 Training in Japan

Details of training in Japan are explained in Chapter 2.

3.2.3 Provision of equipment

Following equipments were provided based on the request from the Thailand side. All equipments are managed under Capacity Building and Outreach Office of TGO.

Table 3-4 List of equipment provided

	Equipment	Qty	Date of inspection	Place of usage	Current condition of usage and management
1	LCD projector	1	7 October 2010	TGO Office	Used for seminars. Kept by Capacity Building and Outreach Office
2	Photocopy machine	1	7 October 2010	TGO Office	Used for daily and seminars. Kept by Capacity Building and Outreach Office
3	Computer	1	7 October 2010	TGO Office	Used for seminars. Kept by Capacity Building and Outreach Office

3.2.4 Project cost

First year：152,710,950 JPY

Second year：59,343,900 JPY (estimated)

The potential survey on CDM projects in Thailand were conducted in 1st year by following company.

Table 3-5 subcontracting company

Company	Duration	Price (THB)	Task
PCBK International Co., Ltd	4 menthes	847,975*	Potential survey on CDM projects in Thailand

* Approximately 344,000JPY (1JPY=2.465 JICA February 2012)

3.2.5 Input from Thailand side

Counterpart personnel are shown below.

Table 3-6 List of counterpart

Name	Position/Office
Mr. Sirithan Pairoj-Boriboon	Executive Director
Ms. Prasertsuk Chamornmarn	Deputy Executive Director
Mr. Chaiwat Munchroen	Deputy Executive Director
Mrs. Supapak Tanasamrit	Internal Audit, Executives Office
Ms. Thitiporn Chunsano	Secretary, Executives Office
Ms. Tassana Rattanawadee	Secretary, Executives Office
Ms. Pornnapakanin Kaewpradittun	Secretary, Executives Office
Ms. Thippawan Sahatara	Secretary, Executives Office
Ms. Aimorn Saichumdee	Accounting, Administration Office
Ms. Supaporn Prakodchue	Administrative Officer, Executives Office
Mr. Visut Aeam-aram	Officer, Executives Office
Ms. Bussabongkot Deewaja	Budget Officer, Executives Office
Ms. Natarika Wayuparb	Director, Policy and Strategy Office

Name	Position/Office
Ms. Tritib Suramaythangkoor	Senior Official, Policy and Strategy Office
Mr. Noppayut Pichainarong	Officer, Policy and Strategy Office
Mr. Thawatchai Somnam	Assistant Senior Official, Policy and Strategy Office
Ms. Sinsom Sangkapong	Lawyer, Policy and Strategy Office
Ms. Weerada Tivasuradej	Lawyer, Policy and Strategy Office
Ms. Janyaporn Khaoklin	Project staff, Policy and Strategy Office
Mr. Chessada Sakulku	Director, GHG Information Center
Ms. Wasinee Cheunban	Assistant Senior Official, GHG Information Center
Ms. Wararat Chaumkruea	Official, GHG Information Center
Ms. Mewadee Seresathiansub	Official, GHG Information Center
Ms. Thanaporn Wannasiri	Inventory Project, GHG Information Center
Ms. Paweena Panichayapichet	Assistant Senior Official, Review and Monitoring Office
Ms. Penporn Petchsri	Assistant Senior Official, Review and Monitoring Office
Ms. Puttipar Rotkittikhun	Assistant Senior Official, Review and Monitoring Office
Ms. Anna Kiewchaum	Assistant Senior Official, Review and Monitoring Office
Mr. Rongphet Bunchuaidee	Assistant Senior Official, Review and Monitoring Office
Ms. Nhungrutai Chortip	Official, Review and Monitoring Office
Ms. Neeracha Tridech	Official, Review and Monitoring Office
Mr. Thanachart Sarnmetha	Staff, Review and Monitoring Office
Mr. Pahol Savetjinda	BRESL Project, Review and Monitoring Office
Mr. Sarawut Thepanondh	Staff, Review and Monitoring Office
Ms. Pongvipa Lohsomboon	Director, Carbon Business Office
Ms. Nattanan Kitvorawat	Staff, Carbon Business Office
Ms. Phakamon Supappunt	Assistant Senior Official, Carbon Business Office
Ms. Sumon Sumetchoengprachya	Assistant Senior Official, Carbon Business Office
Ms. Natalie Ward	Staff, Carbon Business Office
Mr. Thada Varoonchotikul	Assistant Senior Official, Carbon Business Office
Ms. Leyla Arpac	Officer, Carbon Business Office
Mr. Nathasith Chiarawatchai	Staff, Carbon Business Office
Mr. Jakkanit Kananurak	Director, Capacity Building and Outreach Office
Ms. Nareerat Thanakasem	Assistant Senior Official, Capacity Building and Outreach Office
Mr. Thitipong Piboolgulsamlit	Official, Capacity Building and Outreach Office
Ms. Natteera Kanjawatkul	Official, Capacity Building and Outreach Office
Ms. Natchanan Wathanachinda	Official, Capacity Building and Outreach Office
Mr. Danupat Putwatana	Staff, Capacity Building and Outreach Office
Mr. Darmp Phadungsri	Staff, Capacity Building and Outreach Office
Ms. Wiriya Puntub	BRESL Project, Capacity Building and Outreach Office
Mr. Saroj Srisai	Assistant Senior Official, Capacity Building and Outreach Office
Mr. Chinnawat Choochuen	Staff, Capacity Building and Outreach Office

Input from Thailand side is shown below.

Table 3-7 Items provided from Thailand side

No.	Items
1	office for JICA Expert Team
2	equipments (desks, Phone, Fax, stationeries)
3	administration cost (electricity, internet, phone bill)
4	seminar space, audio equipment

3.2.6 Record of Joint Coordinating Committee (JCC) Meeting

1st	9/2/2010
Topic	・ Activity plan for the Project (ICR)
2nd	11/5/2011
Topic	・ Progress of the Project and activity plan for the 2nd year. ・ Outline of Mangrove A/R project in Chantaburi province and progress of PDD development. ・ Outline on biogas generation project and progress of PDD development ・ Progress on training material development and trainer's training.
3rd	22/12/2011
Topic	・ Outline of project outputs ・ Results of Terminal Evaluation

Chapter 4 Conclusion and Recommendations

4.1 Conclusion

Referring the outputs described in previous chapters, the Project can be summarized as follows;

- TGO staff members have gained systematic and wide range of knowledge on climate change mitigation through the Project. It is also considered that the TGO has enhanced its institutional capacity to collaborate among sections by sharing fundamental knowledge on climate change. In addition, the training sessions had diverse participants, including those from government institutions and other organizations, all related to the of climate change mitigation field. It is considered that the training sessions had contributed to the knowledge enhancement for these stakeholders as well.

- The training materials and curriculum were developed, which can be used at external seminars and workshops on climate change mitigation by TGO. In addition, 10 TGO staff members were trained and they have significantly improved their training provision capacity through trainer's training seminars. Those trainers have made presentations to stakeholders in Thailand and neighboring countries at various seminars including Climate Thailand Conference (CTC 2011) by using training materials. By developing capacity of these new trainers from all technical departments of TGO, it will be adequate to conclude that TGO, as an organization, has been further strengthened. Many TGO staff were also encouraged to participate the trainer's training session and had experienced the interactive learning process. In addition, developed training materials were designed to be used for various types of audiences and also designed for any technical staff of TGO to present. Therefore it can be considered that TGO has enhanced its organizational capacity on improving and developing training materials and training new trainers.

- It is considered that the Project has contributed to the enhancement of TGO's capacity on reviewing and monitoring CDM projects through development of 6 PINs and 2 PDDs, in which TGO staff had learned important points on CDM formulation especially in sectors TGO had had limited experience. Although no imminent issues were found in the monitoring process, TGO staff capacity was further enhanced through technical transfer on key points for even more appropriate monitoring by using actual monitoring reports. The prospective project proponents such as BMA participated in seminars and working sessions for PIN/ PDD development and enhanced their knowledge.

- TGO and JICA Expert Team identified what information on climate change mitigation should be included in TGO website and developed web contents that are useful for the promotion of new climate change mitigation actions including CDM projects.

- Through various activities of the Project on GHG inventory, TGO and JICA Expert Team built integrated database with high accessibility. The database contains the latest inventory data and it can provide sufficient data to be submitted to UNFCCC as a national data of Thailand. TGO staff enhanced not only their knowledge on GHG inventory and database programming through experiencing to build integrated database with high accessibility, but also enhanced the capacity to improve and update the database as needed. In addition, TGO can provide training and guidance more effectively to relevant institutions, which hold and manage necessary raw inventory data, by using training materials. Institutional capacity was also enhanced in the sense that TGO can analyze the major GHG emission sectors and emission trend, by using both knowledge obtained from seminars and also by using actual GHG inventory data taken from the database developed. It can contribute to promote climate change mitigation actions effectively.

- Overall, it can be concluded that the project purpose which is capacity development for human resources and institutional strengthening on GHG mitigation has been achieved. Moreover, the Project has contributed to a great extent to create a path to the achievement of the Overall Project Goal, and at the same time, in terms of positive impact of the Project to the surrounding countries, the Project has achieved a significant result.

4.2 Recommendations

Recommendations toward achievement of the Overall Project Goal are as follows.

- TGO should establish internal capacity development program referring curriculums and capacity assessment system in order to ensure TGO staff knowledge on climate change mitigation are maintained and continuously updated.

- TGO should keep the training materials updated both in English and Thai language. Capacity Building and Outreach Office should take initiative to implement external training courses and seminars for stakeholders planned in GMaP. In addition, TGO should continuously implement international seminars such as CTC and improve their training courses in order to enhance capacity of climate change relevant institutions in Thailand and abroad. As a part of this, TGO should continue the promotion of developing “Climate Change International

Training Center" and forging partnership between neighboring countries.

- TGO should utilize improved website to find new climate change related projects and provide technical assistance and consultation in order to facilitate climate change mitigation. In addition, TGO should take initiative to promote climate change mitigation through not only CDM projects but various mitigation measures such as T-VER and carbon footprint.

Deliverables

- Presentation Materials for Training Seminars
- Training materials, Guideline for Trainers
- PIN/PDD for pilot projects
- Database structure

Output 1: Presentation materials for trainings

JICA Training Seminar
Session Topics

Items	Training Topics	Date	No.
CDM	1. Background and history of CDM/ current situation and issues	20/04/2010	CDM1
	2. Technical aspects of baseline determination	27/04/2010	CDM2
	3. Overview of large-scale/small-scale methodologies	25/05/2010	CDM3
	4. Technical aspects of additionality demonstration	06/07/2010	CDM4
	5. Measures to obtain CER of CDM project	07/09/2010	CDM5
	6. Validation and Verification including communication with DOE	07/09/2010	CDM6
	7. Overview of programmatic CDM (PoA)	21/09/2010	CDM7
	8. Exercise: Programmatic CDM (PoA)	21/09/2010	CDM8
	9. Development of CDM project activity	28/09/2010	CDM9
	10. AR-CDM/current situation and issues	23/11/2010	CDM10
Carbon Trading	1. Background, history and overview of carbon trading markets in the world	20/04/2010	CT1
	2. Overview of European Emission Trading System (EU-ETS) and Tokyo ETS	27/04/2010	CT2
	3. Overview of emission trading systems in the United States, and future international trading system in post 2012	22/06/2010	CT3
	4. Overview of voluntary emission trading system in Japan - J-VER	29/06/2010	CT4
	5. Overview of national registry system	06/07/2010	CT5
	6. Japan's Voluntary Emission trading Scheme (J-VETS)	10/05/2011	CT6
UNFCCC Structure and Negotiations	1. Overview of UNFCCC and international negotiations: from establishment to present	20/04/2010	UN1
	2. UNFCCC and key international negotiations after COP 3	27/04/2010	UN2
	3. Overview of international negotiations over post-2012 mechanisms	25/05/2010	UN3
	4. Overview of international negotiations by EU and the United States over post-2012 mechanisms	22/06/2010	UN4
	5. MRV/NAMA/ SCM	29/06/2010	UN5
	6. Exercise: MRV/NAMA/SCM	29/06/2010	UN6
	7. REDD/ carbon sink	06/07/2010	UN7
	8. Exercise: REDD/ carbon sink	06/07/2010	UN8
	9. UNFCCC Structure & Negotiations :Technology Transfer	11/01/2011	UN9
	10. Exercise: UNFCCC Structure & Negotiations :Technology Transfer	11/01/2011	UN10
GHG Mitigation in relevant sectors	1. International trend in GHG mitigation measures	28/09/2010	GHG1
	2. Monitoring of contribution to the sustainable development by mitigation measures, including co-benefit approach	19/10/2010	GHG2
	3. Importance of low carbon society/low carbon city	19/10/2010	GHG3
	4. Mitigation measures in commercial building and residential sectors	23/11/2010	GHG4
	5. Exercise: Quantification of GHG emission reduction with MRV (commercial building and residential sectors)	23/11/2010	GHG5
	6. Mitigation measures in waste management sector	23/11/2010	GHG6
	7. Exercise: Quantification of GHG emission reduction with MRV (waste management sector)	23/11/2010	GHG7
	8. Mitigation measures in energy and industry sectors	18/01/2011	GHG8
	9. Exercise: Quantification of GHG emission reduction with MRV (energy and industry sectors)	18/01/2011	GHG9
	10. Mitigation measures in transportation sector	15/02/2011	GHG10
	11. Exercise: Quantification of GHG emission reduction with MRV (transportation sector)	15/02/2011	GHG11
Carbon Footprint	1. Overview of carbon footprint concept and current situation of the system in the world	12/10/2010	FP1
	2. LCA related issues	12/10/2010	FP2
	3. Calculation of carbon footprint	12/10/2010	FP3
	4. Issues in implementation and dissemination of carbon footprint system	19/10/2010	FP4
	5. Issues in carbon footprint system for sevices -Example of printing servises-	22/02/2011	FP5
	6. Carbon footprint for organization	10/05/2011	FP6
GHG Inventory	1. Overview of IPCC Guideline	07/09/2010	INV1
	2. Introduction of GHG inventory of Japan and Thailand	14/09/2010	INV2
	3. Overview of energy sector	14/09/2010	INV3
	4. Overview of industrial processes and product use sector (IPPU)	14/09/2010	INV4
	5. Overview of agriculture, forestry, and other land-use sector (AFOLU)	21/09/2010	INV5
	6. Overview of waste sector	28/09/2010	INV6
	7. Overview of QA/QC of IPCC Guidelines and example of QA/QC measures taken in Japan	11/01/2011	INV7
	8. Analysis of key categories and assessment of uncertainties, example from Japanese cases	15/02/2011	INV8
	9. Review and Practice of Greenhouse Gas Inventory	22/02/2011	INV9
	10. Exercise: Review and Practice of Greenhouse Gas Inventory	22/02/2011	INV10

JICA Training Seminar
Session Schedule

1st Qtr	Training hours	**April**																													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	X
		Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	X
	10:00-12:00																				CDM1							CDM2				
	13:00-15:00																				CT1							CT2				
	15:00-17:00																				UN1							UN2				
	Training hours	**May**																													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
		Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon
	10:00-12:00																															
	13:00-15:00																									CDM3						
	15:00-17:00																									UN3						
	Training hours	**June**																													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	X
		Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	X
	10:00-12:00																						CDM4							CT4		
	13:00-15:00																						CT3							UN5		
	15:00-17:00																						UN4							UN6		
	Training hours	**July**																													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
		Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat
	10:00-12:00						CT5																									
	13:00-15:00						UN7																									
	15:00-17:00						UN8																									
2nd Qtr	Training hours	**August**																													
	Training hours	**September**																													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	X
		Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	X
	10:00-12:00							CDM5							INV2							INV5							GHG1			
	13:00-15:00							CDM6							INV3							CDM7							CDM9			
	15:00-17:00							INV1							INV4							CDM8							INV6			
	Training hours	**October**																													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
		Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun
	10:00-12:00												FP1							FP4												
	13:00-15:00												FP2							GHG2												
	15:00-17:00												FP3							GHG3												
	Training hours	**November**																													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	X
		Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	X
	10:00-12:00																							GHG4/5								
	13:00-15:00																							GHG6/7								
	15:00-17:00																							CDM10								
	Training hours	**December**																													
3rd Qtr	Training hours	**January 2011**																													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
		Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon
	10:00-12:00											UN9							GHG8													
	13:00-15:00											UN10							GHG9													
	15:00-17:00											INV7																				
	Training hours	**February**																													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	X	X	X
		Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	X	X	X
	10:00-12:00															GHG10							INV9									
	13:00-15:00															GHG11							INV10									
	15:00-17:00															INV8							FP5									
	Training hours	**March**																													
4th Qtr	Training hours	**April**																													
	Training hours	**May**																													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
		Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue
	10:00-12:00										CT6																					
	13:00-15:00										FP6																					
	15:00-17:00																															

:CDM :carbon trading :GHG mitigation :UNFCCC structure and negotiation
:carbon footprint :GHG inventory

CDM 1
Background and history of CDM/ current situation and issues

20th April 2010
Chief Advisor of JICA Expert Team
Masahiko FUJIMOTO

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Contents

- Background of CDM establishment
- History of changing CDM
- Current situation of CDM
- Issues about CDM

Background

- **IPCC First Assessment Report (FAR) (1990)**
  - Intergovernmental Panel on Climate Change (IPCC)
  - Provision of **FAR** was decided in the 1st conference of IPCC held in Geneva, in November 1988
  - Climate experts around the world assessed and synthesized the most recent climate-change issues in FAR
  - FAR warned that if anthropogenic greenhouse gases will continue to be emitted to the atmosphere, climate change can occur that may impose major impacts on ecosystem and human species
- **The establishment of the United Nations Framework Convention on Climate Change (UNFCCC) (1992)**
  - The First Assessment Report (FAR) of the IPCC supported the establishment of the (UNFCCC at the United Nations Conference on Environment and Development (UNCED, commonly known as "The Earth Summit") held in Rio de Janeiro, Brazil, in 1992.

History of CDM (1)

- Berlin Mandate(COP1, 1995)
  - The Berlin Mandate establishes a process that would enable the Annex I countries to take appropriate action for the period beyond 2000
    - including a strengthening of developed country commitments, through the adoption of a protocol or other legal instruments
  - The Berlin Mandate exempted non-Annex I countries from additional binding obligations
- Kyoto Protocol and CDM establishment(COP3, 1997)
  - Most industrialized nations and some central European economies in transition (all defined as Annex B countries) agreed to legally binding reductions in greenhouse gas emissions of an average of 6 to 8% below 1990 levels between the years 2008-2012
  - **Kyoto Protocol** provides for several flexible mechanisms ("Kyoto Mechanism") which enable Annex I countries to meet their GHG emission targets by acquiring GHG emission reductions credits
    - Flexible mechanisms are emissions trading, the clean development mechanism (CDM) and joint implementation (JI)

History of CDM (2)

- Discussions on institutional design of CDM (COP4～COP 6 bis)
  - COP3 left many issues about institutional design of CDM remained unresolved.
  - → After COP3, technical analysis and political negotiations were carried out in COP and subsidiary body (SB).
  - Major points of discussion and corresponding decisions are as below:

Points of Discussion	Decision
Limitation of amounts of carbon credits acquired by Annex I Parties from all three mechanisms (ET, CDM, JI) should be set if they utilize carbon credits to comply with part of quantified emission limitation or reduction commitments. (FCCC/ SB/1999/8)	•Limitation of carbon credits acquired was not defined.
The concept of 'fungibility' among the three mechanisms (ET, CDM, JI) of the Protocol is unacceptable. (FCCC/ SB/1999/8)	•The concept of 'fungibility' among the three mechanisms (ET, CDM, JI) was accepted.
Members of the CDM executive board: Option1: 8 members from Annex I countries, and 8 members from non-Annex I countries Option2: 3 members from each of the five United Nations regional groups	•1 member from each of the five United Nations regional groups, •1 member from the small island developing States, •2 members from Annex I countries, •2 members from non-Annex I countries (plus one "alternate member" from each of the above groups)

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History of CDM (3)

Points of Discussion	Decision
If funding provided through official development assistance (ODA) is additional to the current ODA, its funding can be utilized for CDM projects.	Public funding for CDM projects from Annex I Parties is not to result in the diversion of official development assistance (ODA). [Currently, ODA can be used for CDM projects as long as host country and investing country declare such ODA is not diverted.]
Criteria for determination of whether a proposed project activity contributes to the sustainable development: • Option 1: it is made solely by non-Annex I country • Option 2: it is specified by non-Annex I country in its letter of Endorsement • Option 3: it is made by non-Annex I country using procedures developed by the United Nations Environment Programme (UNEP) and the Commission on Sustainable Development (CSD) as they become available • Option 4:It is made by non-Annex I country using international guidelines, indicators and/or standards developed by the Parties • Option 5:It is made by non-Annex I country and confirmed in a written statement	It is the host Party's prerogative to confirm whether a CDM project activity assists it in achieving sustainable development [Since SD contribution has not been evaluated, alternative approach such as co-benefit approach is drawing increasing attention.]

History of CDM (4)

Points of Discussion	Decision
Criteria of investment additionality: Option 1: Investment additionality is given if the risk-adjusted internal rate of return of the CDM project activity is below X %. The executive board determines a country-specific risk adjustment factor and the value of X %. Option 2: The threshold criterion for additionality is established. The designated operational entity determines it is properly applied.	The risk-adjusted internal rate of return and the threshold criterion for additionality were not adopted. [Currently, in demonstrating additionality of a project that generates income other than CER sales, it is essential to show in PDD the financial performance of the project using IRR.]
Baseline establishment: Option 1: Baselines shall be established on a project-specific basis Option2 :Baselines may use either project-specific or multi-project baseline methodologies	Baselines are established on a project-specific basis. [Currently, discussions are resumed in the post-2012 framework, such as in SCM.]

History of CDM (5)

Points of Discussion	Decision
Approach for selecting baseline methodology: Project participants shall select the lowest from among the following approaches. (a) Existing actual or historical emissions, as applicable; (b) Emissions from a technology that represents an economically attractive course of action, taking into account barriers to investment; or (c) Option 1: The average emissions of the top [20%] of such activities in the Annex I or host Party or an appropriate region undertaken during the previous two years. Option 2: Recently undertaken comparable activities or facilities, such as, for example, the average emissions rate of comparable projects activities that were undertaken during the previous five years in Annex I or host Party or an appropriate region.	Project participants shall select from among the following approaches the one deemed most appropriate for the project activity. (a) Existing actual or historical emissions, as applicable; or (b) Emissions from a technology that represents an economically attractive course of action, taking into account barriers to investment; or (c) The average emission or removal rates of similar projects activities undertaken in the previous five years, in similar social, economic, environmental and technological circumstances, and whose performance is among the top 20 percent of their category.
A baseline chosen for a new activity or facility in sectors of heavy industry and heat and/or power supply shall at least reach a level of stringency equal to the top [20%] of all such sources constructed in the last 3 years in Parties included in Annex II.	It was not adopted.

History of CDM (6)

Points of Discussion	Decision
Positive list of safe and environmentally sound eligible projects in CDM, based on the following categories, taking into account the national priority needs of each Non-Annex I Party: (a) Renewable energy, (b) Energy efficiency, (c) Demand-side management, (d) Sustainable land-use, land-use change and forestry activities	Positive list was not provided. The categories of small scale CDM (renewable energy, energy efficiency improvement, and others) and their limitation were established. [Currently, small-scale CDM structure in the post-2012 framework is discussed]
CDM project activities shall not include the use of nuclear power and large scale hydro power plant.	Parties included in Annex I are to refrain from using certified emission reductions generated from nuclear facilities to meet their commitments. [Currently, whether to include nuclear facilities in CDM after 2012 is discussed.]

History of CDM (7)

- Marrakech Accord（COP7) 2001
  - Bonn Agreement in COP6 bis was adopted
    - Institutional design of CDM was approved
      - Shown in "Decisions" columns in previous slides
  - Specific CDM operational rules were decided
  - 1st CDM Executive Board meeting was held

Changing CDM (1)

Major decisions/ changes in CDM system (post-Marrakech Accord 2008 to present)

Oct 2004 (EB 16)	Introduction of Additionality Tool	First comprehensive guideline from CDM-EB describing how to prove additionality
Sep 2005 (EB 21)	Bundling of project activities	EB presented definition and principle of bundling. Multiple small-scale projects can be registered as a single CDM project.
Nov 2006 (COP/ MOP2)	Expansion of small-scale eligibility	Maximum ceiling for small-scale project activity was raised for energy efficiency (Type II) and other types (Type III).

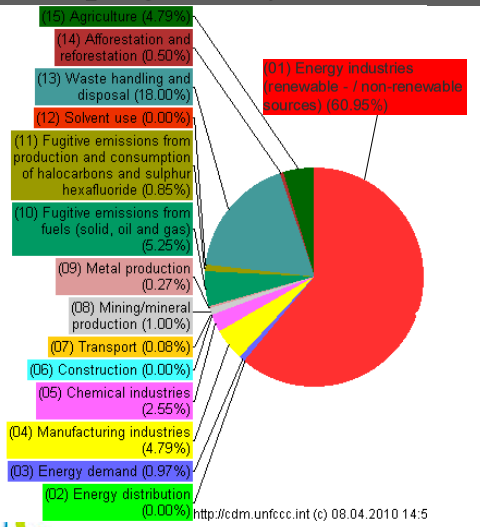
Changing CDM (2)

June 2007 (EB 32)	Introduction of programmatic CDM (PoA)	A programme of activities can be registered as a single CDM project activity.
May 2008 (EB 39)	Introduction of investment analysis guidance	First comprehensive guideline by EB showing how to perform financial analysis in order to assess and demonstrate additionality using investment analysis.
2009	Simplified A/R methodologies	Simplified consideration of pre-project activities and simplified monitoring activities are approved by CDM-EB.

Current situation of CDM: Statistics and Analysis

- Registered CDM projects
- Countries hosting CDM projects
- Countries generating CERs
- Investing counties
- Approved methodologies by sector and scale
- Frequently used methodologies
- Rejected projects and reason

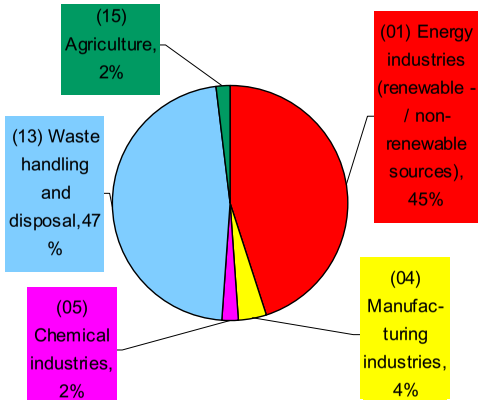
Stats (1): Number of registered CDM projects by sectoral scope (world)



Sectoral Scope	No.
(01) Energy industries (renewable - / non-renewable sources)	1578
(02) Energy distribution	0
(03) Energy demand	25
(04) Manufacturing industries	124
(05) Chemical industries	66
(06) Construction	0
(07) Transport	2
(08) Mining/mineral production	26
(09) Metal production	7
(10) Fugitive emissions from fuels (solid, oil and gas)	136
(11) Fugitive emissions from production and consumption of halocarbons and sulphur hexafluoride	22
(12) Solvent use	0
(13) Waste handling and disposal	466
(14) Afforestation and reforestation	13
(15) Agriculture	124

(Source: UNFCCC)

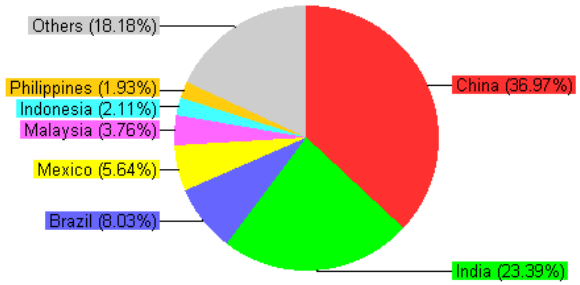
Stats (2): Number of registered CDM projects by sectoral scope (Thailand)



Sectoral Scope	No.
(01) Energy industries (renewable - / non-renewable sources)	**23**
(02) Energy distribution	-
(03) Energy demand	-
(04) Manufacturing industries	**2**
(05) Chemical industries	**1**
(06) Construction	-
(07) Transport	-
(08) Mining/mineral production	-
(09) Metal production	-
(10) Fugitive emissions from fuels (solid, oil and gas)	-
(11) Fugitive emissions from production and consumption of halocarbons and sulphur hexafluoride	-
(12) Solvent use	-
(13) Waste handling and disposal	**24**
(14) Afforestation and reforestation	-
(15) Agriculture	**1**

(Source: UNFCCC)

Stats (3): Number of registered projects by host country



Country	Number Of Projects
China	787
India	498
Brazil	171
Mexico	120
Malaysia	80
Indonesia	45
Philippines	41
Thailand	**35**
Others	352

(Source: UNFCCC)

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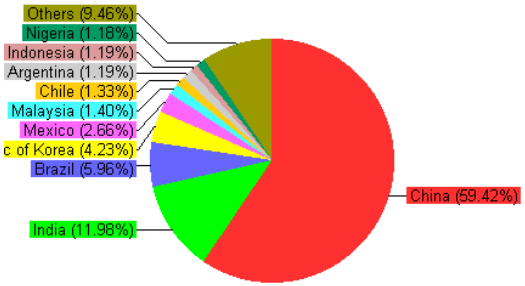
Stats (4): Amount of expected CERs by host country



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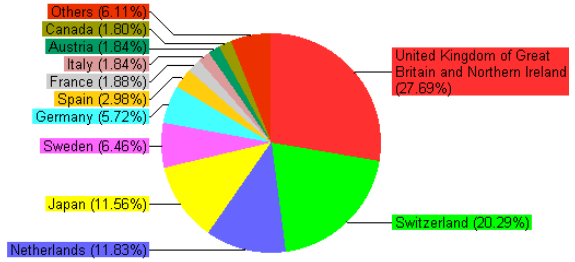
Country	Annual average reduction
China	209,403,147
India	42,208,758
Brazil	21,012,856
Korea	14,905,164
Mexico	9,385,734
Malaysia	4,929,444
Chile	4,702,400
Argentina	4,206,791
Indonesia	4,177,742
Nigeria	4,154,978
Thailand	**2,095,745**
Others	31,230,426

Unit: ton CO_2 equivalent

(Source: UNFCCC)

Stats (5): Number of registered projects by investing country



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Country	Number of projects
UK	707
Switzerland	518
Netherlands	302
Japan	295
Sweden	165
Germany	146
Spain	76
France	48
Austria	47
Italy	47
Canada	46
Others	156

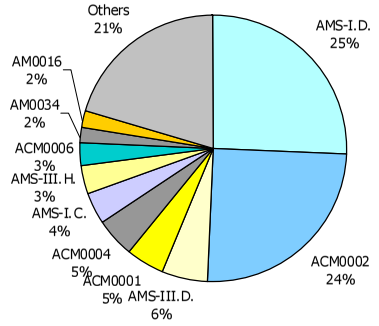
(Source: UNFCCC)

Stats (6): Number of approved methodologies

Scope No.	Sectoral Scope	Approved Methodology	Approved Consolidated Methodology	Approved Small Scale Methodology	Number of Registered Projects
1	"Energy industries (renewable - / non-renewable sources)"	32	9	9	1,578
2	Energy distribution	1	0	1	0
3	Energy demand	7	0	7	25
4	Manufacturing industries	11	5	10	124
5	Chemical industries	12	1	5	66
6	Construction	0	0	0	0
7	Transport	1	1	5	2
8	Mining/mineral production	0	1	0	26
9	Metal production	7	0	0	7
10	Fugitive emissions from fuels (solid, oil and gas)	6	1	1	136
11	Fugitive emissions from production/ consumption of halocarbons/ sulphur hexafluoride	6	0	2	22
12	Solvent use	0	0	0	0
13	Waste handling and disposal	6	3	9	466
14	Afforestation and reforestation	9	2	6	13
15	Agriculture	1	1	3	124

(Source: UNFCCC)

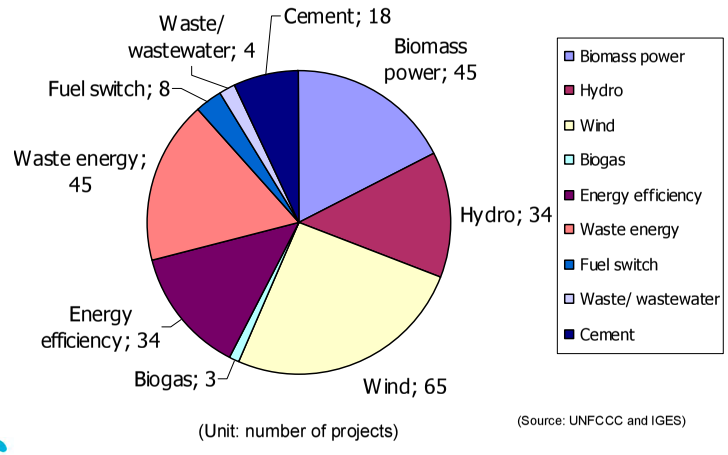
Stats (7): Registered projects by methodologies



AMS: approved methodology for small-scale
ACM- approved consolidated methodology
AM: approved methodology

Methodology Number	Technology/ Measure	Number of Reg. Projects
AMS-I.D.	Grid connected renewable electricity	615
ACM0002	Grid connected renewable electricity	592
AMS-III.D.	Methane recovery in animal manure management systems	134
ACM0001	Landfill gas project	113
ACM0004	Waste gas for power generation	111
AMS-I.C.	Thermal energy production with or without electricity	96
AMS-III.H.	Methane recovery in wastewater	80
ACM0006	Electricity generation from biomass residues	65
AM0034	Reduction of N_2O at nitric acid plants	48
AM0016	Animal manure management	40
Others	Others	494

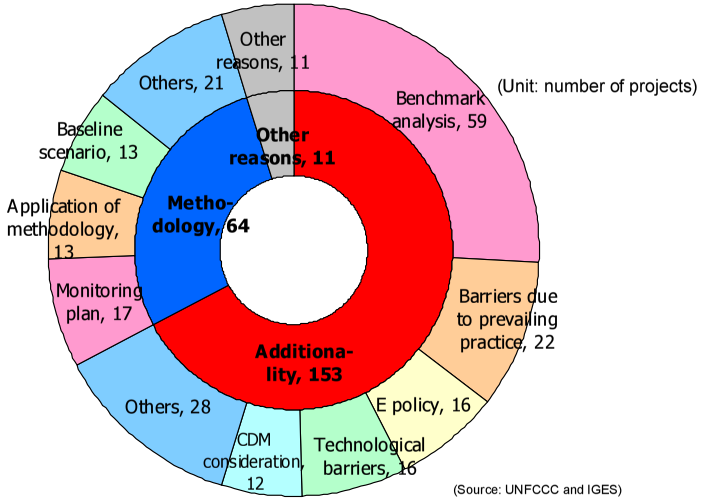
Stats (8): Number of rejected projects by sector/ measure



(Unit: number of projects)

(Source: UNFCCC and IGES)

Stats (9): Number of rejected projects by reason



(Unit: number of projects)

(Source: UNFCCC and IGES)

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Issues in CDM (1)

- Issues in additionality demonstration
  - In accordance with decision 3/CMP.1, annex, paragraph 43
    "A CDM project activity is additional if anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered CDM project activity".
  - However, taken into more account was how to demonstrate that "Without CDM, the proposed project would not have been realized" by assessing barriers the project activity is facing.
  - As a result, some sectors whose additionality is easier to be demonstrated were facilitated;
    - including CH_4 recovery and utilization, N_2O destruction, and HFC23 destruction.
  - On the contrary, other sectors whose additionality is difficult to be demonstrated but safe and environmentally sound in nature were not facilitated as CDM
    - energy efficiency improvement projects
    - Project that generates financial benefit other than CER sales

Issues in CDM (2)

- Dominance by non-CO_2 CDM projects
  - Non-CO_2 CDM projects take advantage of strong commercial incentive by selling big volume of CER
    - CH_4, N_2O, and HFC23 (high global warming potential)
  - In addition, non-CO_2 CDM is easy to demonstrate its additionality and thus easy to be registered

  → Generate about 80% of total CERs from registered CDM projects
  - However, such gases (CH_4, N_2O, and HFC23) constitutes only less than 5% of overall GHG emissions on earth, and more than 60% of all GHG emissions in developing countries are CO_2
  - As a potential in such non-CO_2 projects is limited, increasing numbers of CO_2 projects have been proposed and registered in these days

Issues in CDM (3)

- Lack of authentication of SD achievement by host country
  - It is the host Party's prerogative to determine whether a CDM project activity assists it in achieving sustainable development (SD)
  - Current CDM system is not requiring project activity to check SD contribution to host country
  - Thailand evaluates SD contribution by applying Crown Standard system

- Uneven distribution of host countries
  - More than 80% of CERs that will be generated by 2012 come from 5 host countries
    - China, India, Brazil, Mexico, Korea
  - Many countries that have low foreign direct investment rate and GNP have no CDM project activity registered
  - CDM projects should be more evenly distributed geographically

CDM 2
Technical aspects of Baseline determination

27th April 2010

Chief Advisor of JICA Expert Team
Masahiko FUJIMOTO

A1-10

Contents

What is baseline?

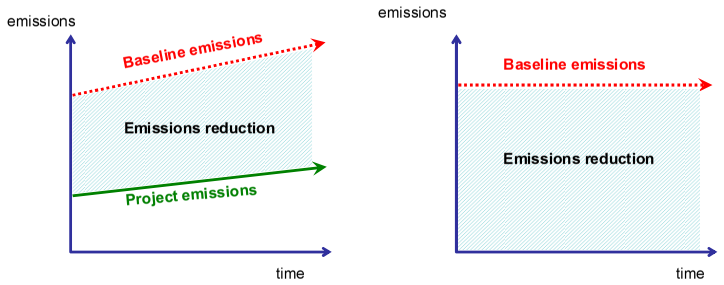
Baseline Scenario:

"the scenario that reasonably represents the anthropogenic emissions by sources of greenhouse gases that would occur in the absence of the proposed project activity"

- **Project proponent should determine project-specific baseline in accordance with the methodology(ies)**
- **Taking into account national/ sectoral policies and circumstances**

What is baseline?

Baseline is different by each project, depending on technology/ measure, project type, condition, policy, etc.



Why baseline needs to be identified?

- Let's discuss the reason why we have to identify baseline in CDM.
  - Because PDD requires it ?
  - What do you think about it?

How to identify baseline (1)

- Project proponent (PP) must identify baseline using the methods and steps specified in the baseline methodology(ies) that is applied to the project activity.
- Baseline methodologies shall require narrative descriptions of project. PP must analyze all reasonable baseline scenario options, which may include:
  - Continuation of the current activity
  - Implementation of the proposed project activity
  - Other scenarios
- PP must describe how a baseline scenario is selected among possible baseline scenario options.

How to identify baseline (2)

Baseline is determined by applying one of the following 3 patterns, depending on the baseline methodologies applied;

Case 1 : Methodology presents a fixed baseline scenario.

- ✓PP demonstrates that the baseline scenario is the only relevant and plausible business-as-usual scenario.
- ✓Small-scale methodologies and some large-scale methodologies

Case 2 : Methodology presents several possible baseline options for various components of the project activity.

- ✓PP identifies the most plausible baseline scenario, which is a combination of baseline options.

How to identify baseline (3)

Case 3 : Methodology does not present any baseline option and PP must present possible baseline options using a step-wise approach resembling the additionality/ combined tool for the identification of a baseline scenario.

- ✓To apply step 1a of the "Combined tool to identify the baseline scenario and demonstrate additionality"
- ✓Only applicable if all potential alternative scenarios are available options to project participants, such as
  - Modifications to an existing installation operated by PP
  - Construction of new facilities, if all alternative scenarios are available options to PP

Method to identify baseline

When using Case 2, PP must follow methodology to identify baseline.

- For example, **ACM0014**: "Mitigation of greenhouse gas emissions from treatment of industrial wastewater"

ACM0014 requires to apply the following 4 steps;

Step 1. Identification of alternative scenarios

Step 2. Eliminate alternatives that are not complying with applicable laws and regulations

Step 3. Eliminate alternatives that face prohibitive barriers (Barrier Analysis)

Step 4. Compare economic attractiveness of remaining alternatives (Investment Analysis)

Step 1. Identification of alternative scenarios

Identify realistic and credible alternative scenarios to the project activity

- Methodology provides list of alternatives that provide outputs or services comparable to the proposed CDM project, including;
  - Continuation of current practice
  - Proposed project activity undertaken without CDM
  - All other plausible and credible alternative scenarios

Step 2. Eliminate alternatives that are not complying with applicable laws and regulations

Check whether the listed alternatives are in compliance with all legal requirements of the country/ region

- Legal requirements include those not related to GHG emission reductions (e.g. air, water, etc.)
- If only a proposed CDM project activity can comply with laws, the project will be undertaken anyway, and thus, NOT additional and will not be eligible to be registered as a CDM project

Step 3. Eliminate alternatives that face prohibitive barriers (1)

Identify barriers that would prevent the implementation of alternative scenarios (**Barrier Analysis**)

- For each of the alternative scenarios identified in Step 1, identify realistic and credible barriers that may prevent alternative scenarios to occur
- Barriers may include the following 4 barriers.

1. Investment barriers
   - Similar activities have been implemented only with grants or other non-commercial finance
   - No private capital is available from domestic or international capital markets due to real or perceived risks associated with investment in Thailand

Step 3. Eliminate alternatives that face prohibitive barriers (2)

2. Technological barriers
   - Skilled/ properly trained labor to operate and maintain the technology is not available in the country/region
   - Lack of infrastructure for implementation and logistics for maintenance of the technology
   - The particular technology used in the proposed project activity is not available in the region
   - Risk of technological failure in the local circumstances is significantly greater than for other technologies
3. Barriers due to prevailing practice
   - The project activity is the "first of its kind"
4. Other barriers

Note: PP must provide transparent and documented evidence

Step 3. Eliminate alternatives that face prohibitive barriers (3)

Eliminate alternative scenarios which are prevented by the identified barriers

- Identify which alternative scenarios are difficult to be realized due to the barriers listed, whic are preventing realization of scenarios
- Eliminate such alternative scenarios from further consideration (such scenarios will not be baseline)
- All alternative scenarios shall be compared to the same set of barriers.

Note: PP must provide transparent and documented evidence

If only one scenario is remained, it is considered as baseline scenario

IF there are still several alternative scenarios remaining,

Go to Step 3 (investment comparison analysis)

Step 4. Compare economic attractiveness of remaining alternatives

Check which alternative is most financially attractive without revenues from CERs, or have highest possibility to occur as business as usual

(Investment comparison analysis)

1. Determine financial indicator : IRR (Internal rate of return)
2. Calculate financial performance for the remaining scenarios
3. Compare results

The most economically or financially attractive alternative scenario (e.g. the scenario that has highest IRR) is considered as baseline scenario.

Group Discussion
Case of biogas project in Thailand

- Let's determine baseline by yourself using "TBEC Tha Chang Biogas Project".
  - Group Discussion and fill out blank table (30 min)
  - Presentation from each group (30 min)

1) Which is baseline scenario for the treatment of wastewater? What is the reason?

Options		W1: The use of open lagoons for the treatment of the wastewater	W2: Direct release of wastewaters to a nearby water body;	W3: Aerobic wastewater treatment facilities (e.g., activated sludge or filter bed type treatment);	W4: Anaerobic digester with methane recovery and flaring	W5: Anaerobic digester with methane recovery and utilization for electricity or heat generation
1. compliance with all legal requirements						
2. Barrier Analysis	Investment barrier					
	Technological barrier					
	Barriers due to prevailing practice					
	Other barriers					
	Result					
3. Investment Comparison analysis, if necessary						
Result of baseline selection						

The Project for Capacity Development and Institutional Strengthening for GHG Mitigation in the Kingdom of Thailand

2) Which is baseline scenario for the generation of electricity? What is the reason?

Options		E1: Power generation using fossil fuels in a captive power plant	E2: Electricity generation in the grid	E3: Electricity generation using renewable sources
1. compliance with all legal requirements				
2. Barrier Analysis	Investment barrier			
	Technological barrier			
	Barriers due to prevailing practice			
	Other barriers			
	Result			
3. Investment Comparison analysis, if necessary				
Result of baseline selection				

.

CDM 3: Overview of Large-scale/ Small-scale Methodologies

25 May, 2010

Deputy Chief Advisor of JICA Expert Team
Kazuhito YAMADA

CDM 3: Large/small scale BL Methodologies:

- What are the roles of BL methodologies?
- What is the procedure to approve BL methodologies?
- Introduction of large scale BL methodologies
- Introduction of small scale BL methodologies
- Present status of registered CDM projects in Thailand
- Discussion

Objectives of this section

Objectives of this section are:

To understand large and small scale BL methodologies,

To discuss:

At the present stage, which methodology will be useful for sustainable development in Thailand?

In the future, what kind of BL methodology do we need in Thailand?

What are the roles of BL methodologies?

The roles of BL methodologies are:

to ensure that CDM project activities have:

- **real**, **measurable**, and **long-term** benefits related to the mitigation of climate change (GHG emission reductions);
- reductions in emissions that are **additional** to any that would occur in the absence of the certified project activity.

Briefly speaking, BL methodologies include appropriate formulae how to quantify BL and PJ emissions, and leakage.

What is the procedure to approve BL methodologies?

The procedure (large) is:

- PPs shall propose a new BL methodology, **through a DOE/AE**, submitting the draft CDM-PDD, CDM-NM;
- The **DOE/AE** shall determine whether the proposed project activity intends to use a new BL methodology, and **check whether the documents are complete** and forward them to EB for its consideration and approval;
- The **UNFCCC secretariat** shall forward them to **EB** and **Meth Panel** after having checked that the documentation is complete;
- **The secretariat** shall make the new BL methodology **publicly available on the UNFCCC CDM web site** and invite public inputs for a period of 15 working days. Comments shall be forwarded to Meth Panel;

What is the procedure to approve BL methodologies?

The procedure (large) is (continued):

Meth Panel shall make :

(a) A final recommendation to EB to approve the BL methodology (referred to as **A**);

(b) A final recommendation to EB not to approve the BL methodology (referred to as **C**); or

(c) A **preliminary recommendation** to PPs who may provide clarification regarding the issues raised, or Meth Panel continues the consideration of the PNM (referred to as **work-in-progress WIP**)

EB finally decide whether the BL meth. is acceptable or not.

What is the procedure to approve BL methodologies?

The procedure (small) is:

- **PPs**, **DOEs**, **DNAs** or **stakeholders** shall propose a new SSC-BL methodology, submitting the draft CDM-SSC-PDD, CDM-SSC-NM;
- After performing a completeness check, the **UNFCCC secretariat** shall forward the documentation to **EB** and **SSC-WG**;
- **The secretariat** also shall make the proposed new SSC methodology **publicly available on the UNFCCC CDM website** and invite public inputs for a period of ten (10) working days;
- **Public inputs** shall be forwarded to **SSC WG** soon after receipt and made publicly available;
- **SSC WG** shall make a **recommendation** regarding the approval of the proposed new SSC methodology to EB at its next meeting;

EB finally decide whether the BL meth. is acceptable or not.

Introduction of large scale BL methodologies

Large scale:

- Approved Methodologies (AM0001-87): 69 meth. active;
- Approved Consolidated Methodologies (ACM0001-18): 17 meth. active;
- 10 tools such as 'additionality tool' are available;
- ACM0002 is used by 647 registered projects;
- On the other hand, 46 AM and 5 ACM have no registered project;
- Non-CO_2 methodologies such as HFC23, N_2O and CH_4 have been used compare to CO_2 methodologies.

Introduction of small scale BL methodologies (1)

small scale:

- Type I (AMS-I):
  Renewable energy (capacity: <15MW)
- Type II (AMS-II):
  Energy efficiency improvement (<60GWh/year)
- Type III (AMS-III):
  Others types (<60,000 tCO_2/year)

Introduction of small scale BL methodologies (2)

small scale:

- AMS-I (I.A-I.E): 5 meth. active;
- AMS-II(II.A-II.J): 10 meth. active;
- AMS-III(III.A-III.AJ); 36 meth. active
- AMS-I.D is used by 638 registered projects;
- On the other hand, AMS-II has only 66 registered projects in total;
- Type III has many Non-CO_2 methodologies such as CH_4, HFC23, and N_2O.

Present status of registered CDM projects in Thailand

Registered CDM projects in Thailand:

- AMS-I.D. 17
- AMS-III.H. 11
- AM0022 6
- AMS-I.C. 5
- ACM0006 5
- AMS-III.D. 4
- ACM0002 3
- AM0024 2
- AM0013 2
- ACM0001 2
- AM0028 1

Discussion

- At the present stage, which methodology will be useful for sustainable development in Thailand?
- In the future, what kind of BL methodology do we need in Thailand?

CDM 4: Technical Aspects of Additionality Demonstration

22 June, 2010

Deputy Chief Advisor of JICA Expert Team
Kazuhito YAMADA

Objectives of this section

Objectives of this section are:

To understand basic concept and latest discussions of the 'additionality',

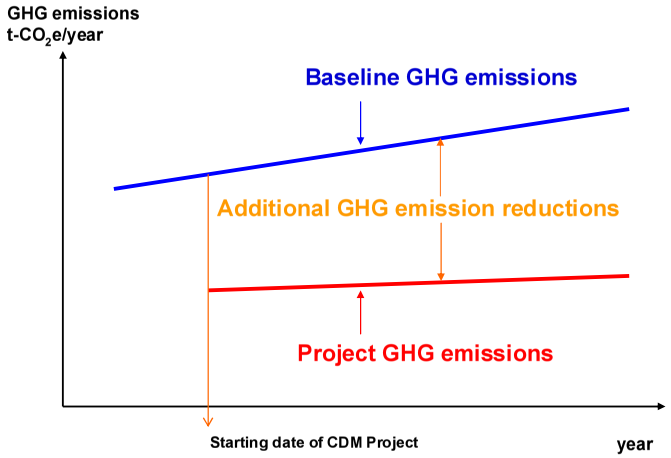
To discuss:

What is the best way to demonstrate the 'additionality' of representative CDM project in Thailand?

CDM 4: Additionality:

- What is the 'additionality'?
- Additionality in Kyoto Protocol
- Additionality in Marrakesh Accord
- History of Additionality
- Additionality tool
- Guidance on the assessment of investment analysis
- Combined additionality tool
- Additionality: TBEC Tha Chang Biogas Project
- Request for review: TBEC Tha Chang Biogas Project
- Discussion

What is the 'additionality'?



Additionality in Kyoto Protocol

Additionality is stipulated as:

5 Emission reductions resulting from each project activity shall be certified by operational entities to be designated by the Conference of the Parties serving as the meeting of the Parties to this Protocol, on the basis of:

(a) Voluntary participation approved by each Party involved;

(b) Real, measurable, and long-term benefits related to the mitigation of climate change; and

(c) Reductions in emissions that are additional to any that would occur in the absence of the certified project activity.

Additionality in Marrakesh Accord

Additionality is stipulated as:

43. **A CDM project activity is additional** if anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered CDM project activity.

There is no concrete definition of 'additionality'

44. The baseline for a CDM project activity is the scenario that reasonably represents the anthropogenic emissions by sources of greenhouse gases that would occur in the absence of the proposed project activity. A baseline shall cover emissions from all gases, sectors and source categories listed in Annex A within the project boundary. A baseline shall be deemed to reasonably represent the anthropogenic emissions by sources that would occur in the absence of the proposed project activity if it is derived using a baseline methodology referred to in paragraphs 37 and 38 above.

History of Additionality

December 1997:	Kyoto Protocol (article 12)
November 2001:	Marrakesh Accord (Modalities & Procedures for CDM)
August 2002:	EB5 decided that

para5. Paragraph 43 of the CDM modalities and procedures stipulate that **a CDM project activity is additional if its emissions are below those of its baseline.** The definition of a baseline is contained in paragraph 44 of the CDM modalities and procedures. The executive board agreed that no further work is required regarding this issue.

October 2004:	Additionality tool
December 2005:	CMP1 (Montreal)
November 2006:	Combined additionality tool
July 2008:	Addition of the 'Guidance on the assessment of investment analysis' as annex to the additionality tool

Additionality tool (see Annex 1)

- "Tool for the demonstration and assessment of additionality" was approved at CDM-EB16 (October 2004).
- This tool provides for a step-wise approach to demonstrate and assess additionality. These Steps include:

  - Identification of alternatives to the project activity;

  - Investment analysis to determine that the proposed project activity is either: 1) not the most economically or financially attractive, or 2) not economically or financially feasible;

  - Barriers analysis; and

  - Common practice analysis.

- Based on the information about activities similar to the proposed project activity, the common practice analysis is to complement and reinforce the investment and/or barriers analysis.

Guidance on the assessment of investment analysis

- This guidance was added by CDM-EB as an annex to the Additionality tool (July 2008).
- Background: In consideration of issues identified through request for reviews and reviews of requests for registration the EB considers it necessary to provide project participants and DOEs with guidance on the preparation, presentation and validation of investment analysis.

  This general guidance is to be considered a as complement to existing materials in this area including, the additionality tool, the combined tool.
- The guidance includes 1) general issues in calculation and presentation of IRR/NPV, 2) investment comparison analysis and benchmark analysis, 3) selection and validation of appropriate benchmarks, 4) sensitivity analysis, etc.

Combined additionality tool (Annex 2)

- "Combined tool to identify the baseline scenario and demonstrate additionality" was approved at CDM-EB27 (November 2006).
- Methodologies using this tool are only applicable if all potential alternative scenarios to the proposed project activity are available options to project participants. This applies, for example, to project activities that make modifications to an existing installation that is operated by project participants, such as, for example:

  - Energy efficiency improvements at existing installations operated by project participants;

  - Fuel switch at existing installations operated by project participants;

  - Changes in waste management practices at existing solid waste disposal sites operated by project participants;

  - Reduction of N_2O, HFC-23 or PFC emissions at existing installations operated by project participants.

Additionality: TBEC Tha Chang Biogas Project (see Annex 3)

TBEC Tha Chang Biogas Project (1)

- The Tha Chang Biogas Project involves the construction of an anaerobic wastewater treatment facility at the Tha Chang Palm Oil and Rubber Factory in Surat Thani. The project will install a covered in-ground anaerobic reactor (CIGAR), designed to capture the gases produced from the digestion of organic matter in the combined wastewater streams of the palm oil mill and the rubber factory. This biogas will be used to initially fuel a 1.4MW biogas engine to produce electricity to be sold to the Provincial Electricity Authority (PEA). A second 1.4MW engine will most likely be installed in 2010. Any excess biogas will be consumed in an open flare.

Additionality: TBEC Tha Chang Biogas Project (see Annex 3)

TBEC Tha Chang Biogas Project (2)

- The purpose of the project is to:

  - Capture the waste gases and reduce odour currently produced from the factory's deep treatment lagoons by installing a CIGAR biogas system

  - Use the captured biogas to produce renewable electricity for sale to the national grid to support the Thai Government's policy to reduce dependency on fossil fuels

  - Improve the treatment of the factory wastewater

  - Reduce greenhouse gas emissions and create Certified Emission Reductions (CERs)

Additionality: TBEC Tha Chang Biogas Project (see Annex 3)

TBEC Tha Chang Biogas Project (3)

- The baseline scenario is the scenario existing prior to the start of implementation of the project activity

  - continued treatment of the wastewater in deep anaerobic lagoons, which currently emit CH_4 to the atmosphere.

  - continued CO_2emissions from the Thai electricity grid which currently uses electricity generated from a combination of natural gas, coal, oil, hydro and other sources

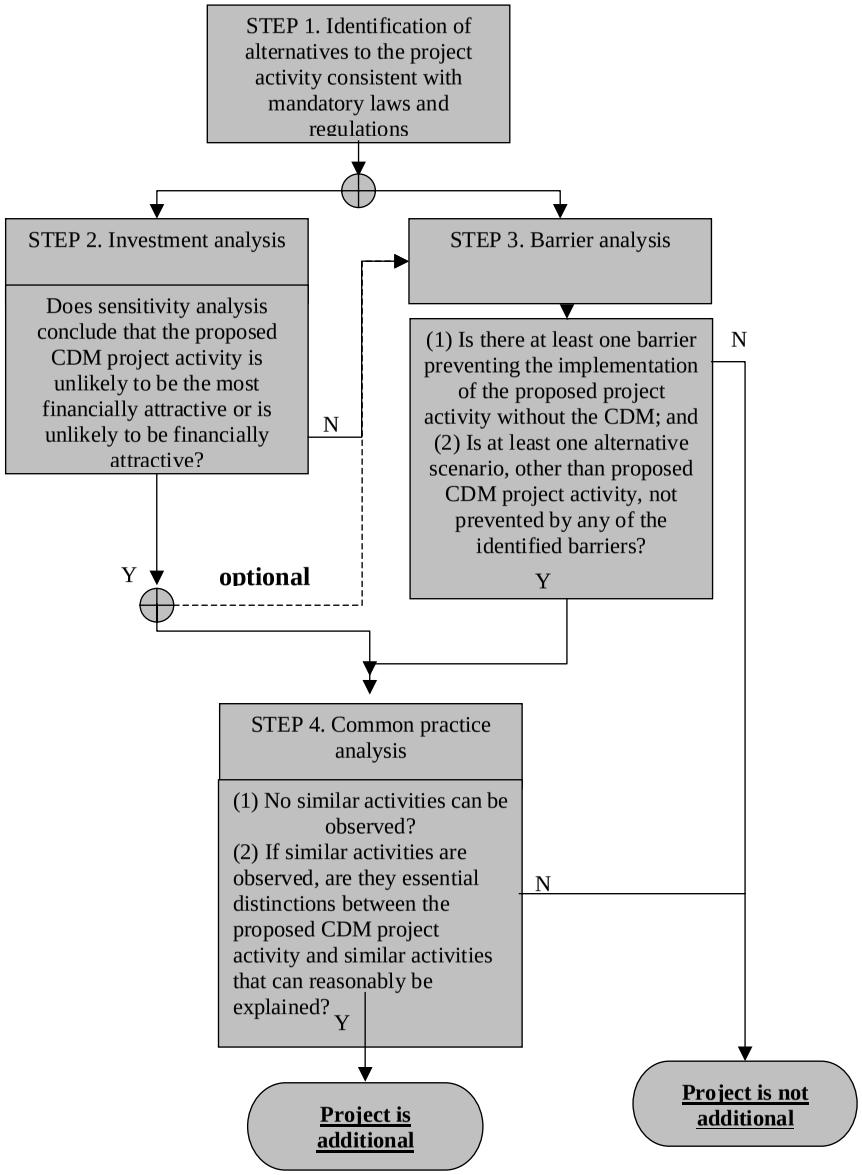
Request for review: TBEC Tha Chang Biogas Project (see Annex 4)

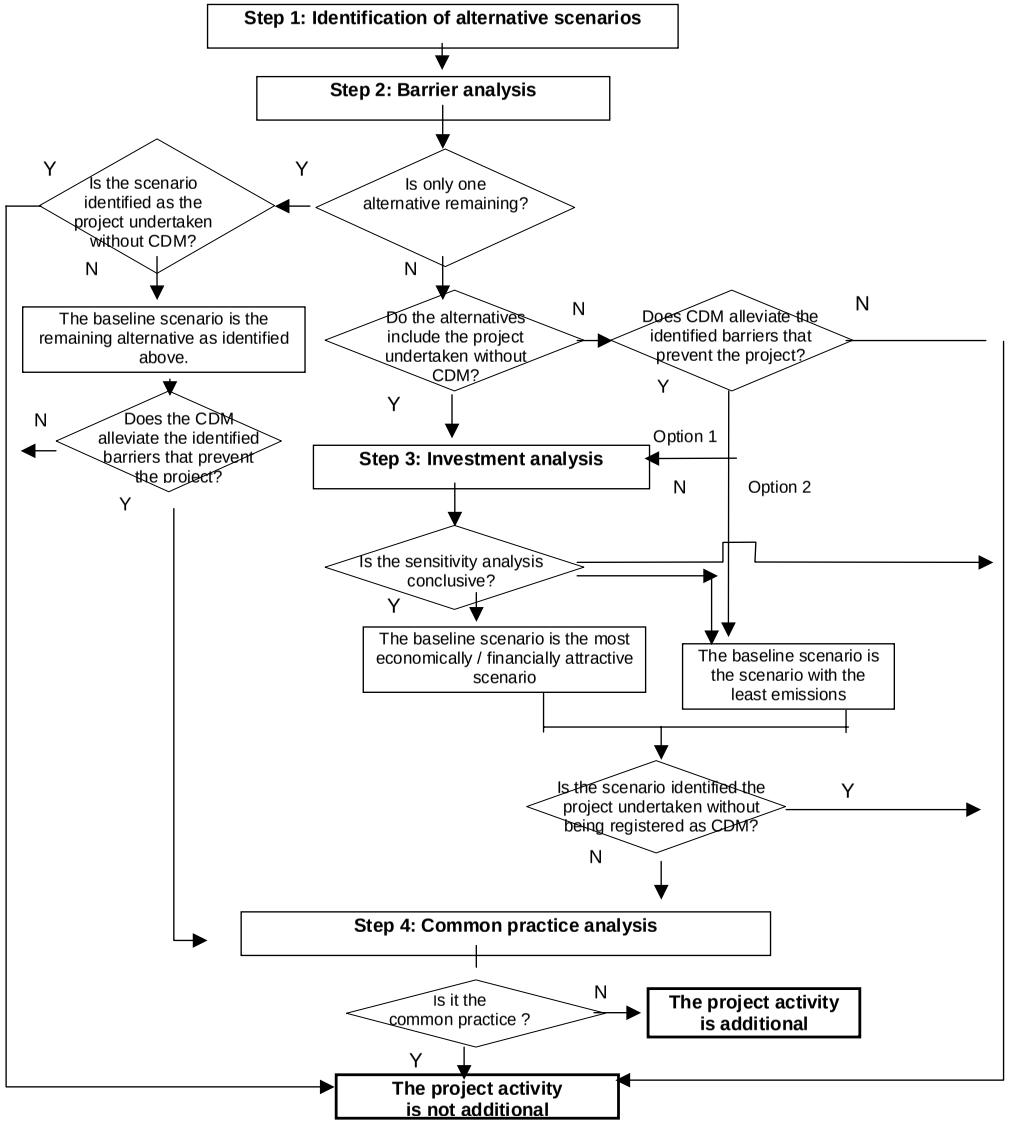
CDM-EB decided:

- The DOE should further substantiate the technological, investment and business culture barriers presented in the PDD, in line with the VVM paragraphs 113, 114, 115 and 116. The PP/DOE are reminded that if the barriers cannot be sufficiently substantiated, they have an option to **establish additionality through investment analysis**.

Discussion

- What is the best way to demonstrate the 'additionality' of representative CDM project in Thailand?


STEP 1. Identification of alternatives to the project activity consistent with mandatory laws and regulations
STEP 2. Investment analysis
Does sensitivity analysis conclude that the proposed CDM project activity is unlikely to be the most financially attractive or is unlikely to be financially attractive?
N
Y
optional
STEP 3. Barrier analysis
(1) Is there at least one barrier preventing the implementation of the proposed project activity without the CDM; and (2) Is at least one alternative scenario, other than proposed CDM project activity, not prevented by any of the identified barriers?
Y
N
STEP 4. Common practice analysis
(1) No similar activities can be observed? (2) If similar activities are observed, are they essential distinctions between the proposed CDM project activity and similar activities that can reasonably be explained?
Y
N
Project is additional
Project is not additional


Step 1: Identification of alternative scenarios
Step 2: Barrier analysis
Is only one alternative remaining?
Y
N
Is the scenario identified as the project undertaken without CDM?
Y
N
The baseline scenario is the remaining alternative as identified above.
Do the alternatives include the project undertaken without CDM?
N
Y
Does CDM alleviate the identified barriers that prevent the project?
N
Y
Does the CDM alleviate the identified barriers that prevent the project?
N
Y
Option 1
Option 2
Step 3: Investment analysis
N
Is the sensitivity analysis conclusive?
Y
The baseline scenario is the most economically / financially attractive scenario
The baseline scenario is the scenario with the least emissions
Is the scenario identified the project undertaken without being registered as CDM?
Y
N
Step 4: Common practice analysis
Is it the common practice ?
N
The project activity is additional
Y
The project activity is not additional

prohibitive barrier in the form of legal regulation prohibiting the practice. The key barrier faced by scenario W3, aerobic wastewater treatment, is the financial barrier due to high operating costs and the absence of incentives through regulation or direct revenue. Scenario W4 & W5 face prohibitive technological and investment barriers due to the performance risk translating to commercial risk . The key barriers faced by Scenario E1 and E3 are the technical and financial barriers associated with high cost of installing and operating a fossil fuel or renewable power plant at the factory.

In summary, all alternative scenarios are eliminated through the barrier analysis except W1, the use of open lagoons for the treatment of wastewater and E2, electricity generation in the grid.

Step 4: Compare economic attractiveness of remaining alternative
Only one alternative remains after elimination of alternatives that face prohibitive barriers, therefore Step 4 is not applicable.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality):

The project reduces anthropogenic emissions of GHG through the destruction of methane which is produced through the anaerobic decay of wastewater from the Palm Oil Mill and Rubber Factory at Tha Chang. By combusting methane that would otherwise have been released to the atmosphere, the project results in the reduction of 362,760 tCO2e of emissions in the first crediting period. The equipment used to capture and combust methane would not have been installed in the absence of the registered CDM project, as demonstrated below.

Start Date and Implementation Timeline
The start date of the project was prior to the date of validation. Evidence that the incentive from the CDM was seriously considered in the decision to proceed with the project activity has been supplied to the DoE.

Project Timeline	**Dates**	
Investment Decision made	01/04/07	Contract signed between TBEC and factory owner for BOOT investment, including a sharing of carbon credit revenue between factory owner and TBEC.
Date construction works	01/07/07	Date Civil works planned to begin (26/06/07 contract signed)
Construction	Completed	Project construction delays due to significant wet season in Southern Thailand in 2007
Date of commissioning	27/11/08	Commissioning of genset and gas system
Start up	06/01/09	Commercial Operation Date

CDM Timeline	**Dates**	
Investment Decision made	01/04/07	Contract signed between TBEC and factory owner for BOOT investment. Contract clearly shows the intention and CDM incentive seriously considered, as it discusses share of revenue from carbon credits.
CDM Consultancy	06/05/07 31/07/07	CDM Contract Consultancy negotiations begin Date of signature of Consultancy contract
CDM Consultation	29/10/07	Gold Standard initial consultation meeting
PDD submitted to TBEC for	11/04/08	PDD delayed due to cancellation of AM0022 and

review		delays in collecting data
PDD submitted to DoE	04/09/08	Validation commenced

ACM0014v2.1 requires that the additionality of the project be demonstrated and assessed using the latest version of the "Tool for the demonstration and assessment of additionality" v05.2 (EB39) The tool defines a step-wise approach as follows:

1. Identification of alternatives to the project activity;
2. Investment analysis to determine that the proposed project activity is not the most economically or financially attractive;
3. Barriers analysis; and
4. Common practice analysis.

Step 1. Identification of alternatives to the project activity consistent with current laws and regulations
The realistic and credible alternatives to the project activity are identified through the following two steps:

Sub-step 1a. Define alternatives to the project activity:

The project activity involves the provision of two outputs/services; wastewater treatment and electricity generation. Realistic and credible alternative scenarios that deliver similar outputs and services to the project activity were identified in section B4 as per the "procedure for the identification of the most plausible baseline scenario" described in ACM0014 v2.1. Plausible alternative scenarios were identified as follows:

Wastewater Treatment
W1. The use of open lagoons for the treatment of the wastewater;
W2. Direct release of wastewaters to a nearby water body;
W3. Aerobic wastewater treatment facilities (e.g., activated sludge or filter bed type treatment);
W4. Anaerobic digester with methane recovery and flaring;
W5. Anaerobic digester with methane recovery and utilization for electricity or heat generation (the proposed project activity without CDM)

Generation of Electricity
E1. Power generation using fossil fuels in a captive power plant;
E2. Electricity generation in the grid;
E3. Electricity generation using renewable sources

Sub-step 1b. Consistency with mandatory laws and regulation:
As determined in section B4, all alternative scenarios are in compliance with applicable legal and regulatory requirements except for the direct release of wastewater into nearby water bodies (W2) which is eliminated from further analysis.

Step 2. Investment analysis
In the step-wise approach described in the "Tool for the demonstration and assessment of additionality", project participants may chose to perform either an investment analysis or a barrier analysis. The Barrier Analysis method has been chosen for this project and an investment analysis is not applied.

Step 3. Barrier analysis
The barrier analysis method has been chosen as a means to demonstrate additionally because the project activity faces barriers that prevent its implementation and these barriers do not prevent the implementation of the current practice (Scenarios W1 and E2). CDM registration of the project activity will help the proponents overcome these barriers. The barrier analysis was performed through the following two steps:

Sub-step 3a. Identify barriers that would prevent the implementation of the proposed CDM project Activity:
There are realistic and credible barriers that would prevent the implementation of the project if it were not registered as a CDM activity. These barriers identified for this project are classified as follows:

- *Investment barriers*
- *Technological barriers*
- *Other Barriers (as specified in original methodology AM22 Business Culture barriers)*

According to the 'Guidelines for Completing CDM PDDs V7.0 (EB41) Section B.4 and B.5 are complimentary and the same information need not be replicated in both sections. Therefore these barriers will not be elaborated again, except to elaborate in Sub-step 3b how the CDM helps to overcome these barriers to show that the project, without the CDM, would not go ahead.

Sub-step 3 b. Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity):

In section B4 it has been established that the scenario W1, the use of open lagoons, and scenario E2, electricity generation in the grid, face no barriers to their implementation/continued use. These two scenarios represent the existing standard practice for the industry and are not affected by the barriers which the proposed CDM project faces and demonstrated by the fact that they are common practice in Thailand. In addition, the following pages outlines how the CDM helps alleviate the barriers identified in Section B.4

Technological barriers alleviated by CDM
CDM alleviates the technical barriers previously described by ensuring that the necessary expertise, technical skills and technology are delivered to the project. Thai Biogas Energy Company (TBEC) was formed in 2004 to finance, build and operate biogas projects. CDM has been central to the business plan of TBEC and a crucial aspect in the decision making processes of all biogas projects they have implemented. To date TBEC have commissioned three biogas plants in Thailand, all of which have been applying under the CDM procedure as shown in table B.5.a.

Name	Plant Type	Start of Construction	Developed under CDM?
Kitroongruang	Tapioca	July 2004	Yes
Jiratpattanna	Tapioca	March 2005	Yes
Chao Khun Agro	Tapioca	June 2005	Yes

Table B.5.a: TBEC biogas Projects in Thailand

Without CDM the Tha Chang factory would not have access to the technical knowledge and skills available through TBEC. TBEC have hired Waste Solutions Ltd (WSL), who is the project designer. WSL have 15 years of international experience in CIGAR technology which they are transferring to Thailand. Whilst WSL have been involved in CIGAR biogas plants in other agriculture industries in Thailand, all of these projects have been implemented with CDM.

The incentives from the CDM have created an environment which is attractive for TBEC to pursue biogas energy projects in Thailand. TBEC approached the Tha Chang factory with an offer to design, build and operate a biogas plant which will be transferred to Tha Chang factory after 10 years of operation. Without the offer from TBEC to build and operate the plant, Tha Chang factory would not be capable of sourcing the technical expertise necessary for completion of the project. The factory owners 'did not want to take on the headache of operating a biogas plant … and believed TBEC would be more efficient as they have the expertise and staff who already know how to operate other biogas plants'. A description of how each technical barrier is removed through registration as a CDM project is as follows:

<u>Anaerobic Digester Performance Risk</u>
Through the technology from WSL, TBEC will have access to international experts with detailed understanding of the biological system of the CIGAR. TBEC will assume the risk due to uncertainty in digestor performance associated of the CIGAR. The alternative revenue streams provided by CDM through the destruction of methane reduce the risk of the project defaulting through decreased electricity revenues. Developing the biogas plant as a CDM project allows TBEC to offset the risk of decreased electricity production from poor performance of the digestor. Furthermore, the contract with WSL ensures access to experiences technology providers capable of successfully managing the performance characteristics of the CIGAR.

<u>Access to Technology and Expertise</u>
TBEC will draw on the expertise of its partner WSL to bring the necessary knowledge and skills to the project. This international technology provider has been involved in the transfer of its CIGAR technology to Thailand through the successful introduction of CDM.

<u>Access to Skilled Labour and Technical Services</u>
TBEC will own and operate the plant for the first ten years of operation. During this time TBEC will use the knowledge and skills it has acquired through its portfolio of CDM projects to ensure that the biogas plant operates effectively. Prior to handing over the plant, TBEC will train factory personnel in the correct operation and maintenance procedures for the biogas plant.

<u>Energy Production barriers</u>
TBEC will access industry best technology in the form of a GE Jenbacher dedicated gas engine to ensure the efficient and reliable production of energy from the biogas produced from the anaerobic digester. To ensure the continued operation of this complicated machinery, TBEC will attract, train and retain appropriately skilled staff and draw on the previous experience it has gained through its portfolio of CDM projects. As previously discussed, it is only through the incentives provided by CDM that TBEC have been able to access the necessary technology and skills required to successfully develop similar biogas projects in Thailand.

Investment barriers alleviated by CDM

The investment barriers alleviated by the CDM are demonstrated by the fact that biogas plants at palm oil plants and most agriculture plants were very rare in Thailand prior to the introduction of the CDM, despite the fact that these projects could earn revenue or make savings from electricity production. It is clear that the CDM has alleviated this commercial risk and tipped the balance to proceed and break from the prevailing practice of open anaerobic lagoons.

Only through the participation of TBEC, a biogas energy developer with interest in CDM certified emission reductions, was the factory willing to accept the concept of installing a biogas plant. TBEC approached the Tha Chang factory and offered to finance and build a biogas plant through the provisions of a build own operate and transfer contract. TBEC assume the risk associated with application of a technology which is relatively new to Thailand and new to the application to POME streams.

Other Barriers - Business Culture barriers
Due to the significant technical and financial risks, combined with a general lack of understanding of newer technologies, shareholders are more reluctant to invest in anaerobic digesters and aerobic waste water treatment systems. Furthermore, there are no legal incentives to move away from the existing practice of anaerobic local lagoons.

For TBEC at the time of their decision to proceed with the Tha Chang project, there was no experience in applying CIGAR POME technology in Thailand, and only 6 CIGAR systems are in other industries, such as cassava (built with CDM). This made it difficult for TBEC to have confidence in the starch CIGAR technology in its performance with POME and combined rubber wastewater. TBEC Shareholders were only convinced about the viability of the proposed project through the combined estimate of electricity and CDM revenues. The estimate of combined revenue streams helped to mitigate the risk perceived in investing high upfront capital in otherwise unproven and unfamiliar technology and at a 3rd party factory site where they did not control the project inputs.

Summary: The project faces significant barriers that would prevent the project from being completed in the absence of CDM registration. The prevailing practice of Scenario W1 and E2, would continue in the absence of the project.

Step 4 – Common Practice Analysis
Sub-step 4a. Analyse other activities similar to the proposed project activity:

As mentioned in Section B.4 The prevailing practice for palm oil mills in Thailand is to dispose and treat the POME in open lagoons[15]. As indicated by a letter from the Chairman of the Palm Oil Crushing Mill Association[16], there are around 33 large palm oil crushing mills in Thailand, and prior to the effective implementation of CDM, it was not common practice for biogas plants to be installed. This is also confirmed from interviews with experts[17] on the Thai palm oil industry, which indicates that palm oil

[15] As outlined in Section A.4 the project is a predominately POME biogas system, with a tiny fraction of organic load from the rubber wastewater (less than 4%). Nevertheless, the prevailing practice for disposal of rubber wastewater is in open lagoons, according to Dr Saroach (Footnote 2), a Thai rubber wastewater expert, 50-60% of rubber factories treat their wastewater in open lagoons. The remaining rubber wastewater is treated with other systems, mainly a combination of activated sludge and UASB systems (see Footnote 4). Dr Saroach explained that more recently other treatment systems have been used mainly when there are issues in accessing enough land or to improve the treatment of the wastewater for compliance.

[16] As cited previously in Footnote 1

[17] As cited previously in Footnote 2

mills in Thailand used open pond systems. There were only 2 small pilot biogas plants in operation[18], one of which was installed with a government research grant, the other was built because that factory was reported to have a pollution problem with the existing treatment ponds, and this project has applied for CDM. Since the implementation of CDM a number of biogas plants have been built with support of the CDM. In accordance with Page 9 of the "Tool for the demonstration and assessment of additionality", CDM project activities are not to be included in this analysis.

Tha Chang Palm Oil and Rubber factory complies with all environmental regulations and has sufficient space within the compound to treat the wastewater from the rubber factory. In fact, not all of the open lagoons at Tha Chang are being used. Therefore there is no compliance or land access reason why they would install a covered lagoon or other treatment system in the baseline case.

Sub-step 4b. Discuss any similar options that are occurring

Both the biogas projects previously developed at Palm Oil Mills were based on tank reactors and used modified reconditioned truck engines as generators. One of these projects has applied under the CDM. These technologies are considerably less complex and less efficient than the covered in-ground anaerobic digestor and dedicated gas engine used in the project activity. The tank reactor and reconditioned truck engine represent a cheaper alternative and one that is more likely to be subject to technical problems during operation.

There are significant differences between the biogas plant and the project activity which ensure that these projects do not contradict the arguments made in the barrier analysis. One of these plants was installed with the aid of a government research grant. This grant helped to remove the technical and financial barriers which are encountered by the project activity. Therefore, this project differs significantly from the proposed project activity, and do not contradict the claim that the project is additional. The 2nd project is a CDM project and therefore excluded from the common practice analysis.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

The applicable methodology, ACM0014, is suitable for project activities aimed at reducing methane emissions from industrial wastewater treatment. Two scenarios are applicable to the methodology as described in the following table from ACM0014. Scenario 1 is applicable to the project activity as established in section B.2.

Scenario	Description of the baseline situation	Description of the project activity
1	The wastewater is not treated, but directed to open lagoons that have clearly anaerobic	The residence time of the wastewater treated in the open lagoons is over 552 days (please refer to Section B.2). The wastewater is treated in a new anaerobic digester. The biogas extracted from the anaerobic digester is

[18] As cited previously in Footnote 14

Annex 26

Registration

Scope of the review on
"TBEC Tha Chang Biogas Project" (2970)

1. The Board agreed to undertake a review of the project activity "TBEC Tha Chang Biogas Project" (2970).

2. The Board agreed that the scope of the review relating to issues associated with validation requirements shall cover a review to assess the additionality of the project activity, through an assessment of:

(a) The barrier analysis, in particular how the DOE has validated the technological, investment and business culture barriers presented in the PDD, in line with the VVM paragraphs 113, 114, 115 and 116; and

(b) The investment analysis, in particular, how the DOE has validated the:

(i) Suitability of the benchmark, as the ROE has not been fully substantiated;

(ii) Suitability of the input values, regarding: how the electricity generation (8,680 MWh/y) from the WSL Report has been considered more conservative than the value calculated by the CDM consultants (9,164 MWh/y); the O&M costs, including the 2% annual escalation; and the exclusion of the variation in the electricity generation in the sensitivity analysis; and to present and validate the investment analysis considering the input values in line with the total capacity after the second electricity generator is installed (i.e., 2.8MW).

- - - - -

Project 2970	EB 53, Annex 26, 26 March 2010	**Decision Class**: Ruling **Document Type**: Scope of Review **Business Function**: Registration

CDM 5: Measures to obtain CERs from CDM projects

7 September, 2010

JICA Expert Team
Mariko FUJIMORI

Objectives of this section

Objectives of this section are:

- To understand basic procedures to obtain CERs from CDM projects, from the view point of project participants (PPs),
- To understand difficulties and barriers which the PPs encounter frequently, and
- To consider options how to avoid these difficulties.

Critical points to obtain CERs

From our experiences:

From very beginning stage of the project!

- Selection of a project type,
- Selection of a DOE (and person(s) in charge), for validation,

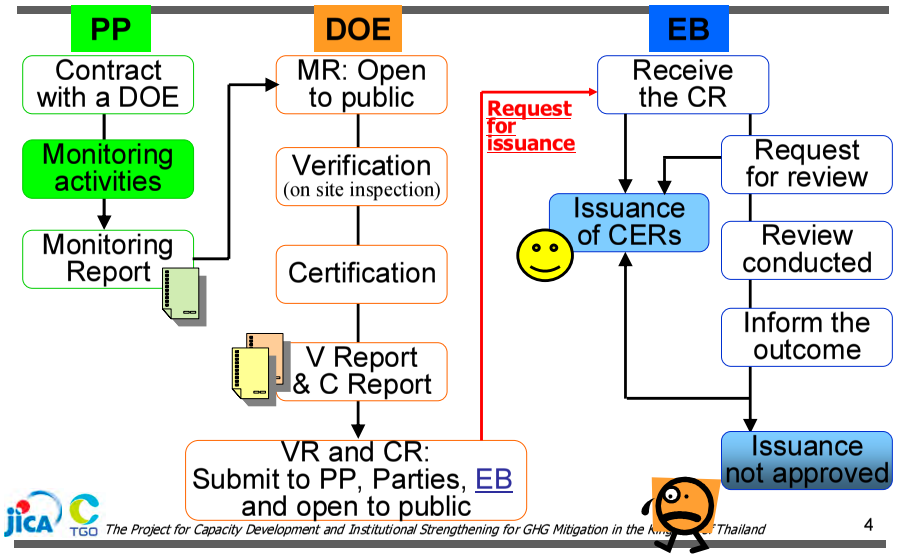
Registration

- Implementation of the project (including ERPA),
- Monitoring,
- Selection of a DOE for verification/certification (In case of SSC: same DOE is OK.),
- Request for issuance --> obtain CERs.

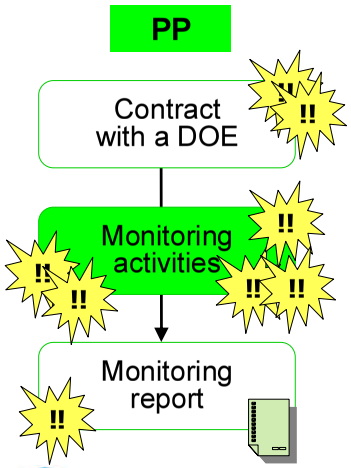
Until middle and final stage of the project!

Procedures for issuance of CER

Steps and necessary documents



Where are the "pitfalls" for the PPs?



- Which DOE (and who) do you select?
- Systems are lack/not in place (most common: calibration),
- Emission calculation is different from the registered PDD,
- Higher claim of CERs than estimated in the PDD without justification,
- The DOE failed to request for deviation or revision of the monitoring plan,
- Detailed excel sheet is not available.

Reasons of issuance rejection

Latest examples 1

EE project in India:

- PDD requires to calculate the emission reductions using total operating hours in the project x the difference between the pre- and post-project hourly power consumption for each project measure,
- Whereas the PP/DOE calculated the baseline emissions based on annualized electricity consumption.

Reasons of issuance rejection

Latest examples 2

Wind power project in the Philippines:

- The formulae to calculate the electricity supplied to the grid by the project was applied correctly: not sufficiently demonstrated,
- The calculation of electricity supplied takes into account all sources of electricity imports from the grid to the project: not sufficiently demonstrated,
- The DOE failed to request for deviation or revision of the monitoring plan: additional meters were installed but original plan was direct measurement.

Reasons of rejection - examples

- PP and DOE did not provide adequate evidence of the existence and significance of a barrier,
- DOE has accepted a modification of the approved monitoring methodology without requesting a deviation,
- DOE has not sufficiently verified that the monitoring plan is in accordance with the approved methodology,
- PP and the DOE could not demonstrate that independent assessment has been conducted to confirm that the claimed emission reductions result solely from the project activity,
- There is no reference on what time the daily sample was taken,

Difference of emission reduction in PDD and monitored results

Registered CDM projects in Thailand (last three years) using ACM0006 - Consolidated methodology for electricity generation from biomass residues

Ref. No.	Project Name	Reduction in PDD	Reduction in MR	Reduction in PDD / monitored		Monitored months
1519	Surat Thani Biomass Power Generation Project in Thailand	106,592	42,993	106,592	40.3%	12
1024	Phu Khieo Bio-Energy Cogeneration project (PKBC)	102,493	395,010	307,479	128.5%	36
1020	Dan Chang Bio-Energy Cogeneration project (DCBC)	93,129	328,954	279,387	117.7%	36
1036	Khon Kaen Sugar Power Plant	61,449	50,811	46,087	110.3%	9
1026	A.T. Biopower Rice Husk Power Project in Pichit, Thailand	70,772	104,689	106,158	98.6%	18

Source: UNFCCC (as of June 2010)

Difference of emission reduction in PDD and monitored results

10 registered CDM projects (last three years, except for Thailand) using ACM0006

Reduction in PDD	Reduction in MR	Reduction in PDD / monitored		Monitored months
183,692	47,527	229,615	20.7%	8
46,680	14,923	50,570	29.5%	6
113,433	77,995	160,697	48.5%	12
41,284	10,479	13,761	76.1%	13
54,502	6,982	9,084	76.9%	2
45,750	303,686	305,000	99.6%	15
130,638	87,621	87,092	100.6%	17
19,937	105,647	94,701	111.6%	57
140,695	178,263	140,695	126.7%	80
39,636	59,152	19,818	298.5%	4

Source: UNFCCC (as of June 2010)

A1-29

Why such differences occur?

Project design itself;

- Applicability/ability of the utilized technology,
- Inappropriate operation of the project,
- Delay of project implementation (construction, operation, ERPA, etc.),

Monitoring;

- Monitoring plan was not realistic,
- Correct calibration was not carried out,
- Monitoring methodology was not suitable to the project.

Technical issues - LFG

Problem of methodology itself

- LFG collection and destruction/utilization projects,
- Average emission reduction achievement: less than 40%,
- Problem of approved methodology (methodological tool): Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site
- The calculation is based on a first order decay (FOD) model. --> caused overestimation.

Technical issues - HFC

Information Note (EB55): Request for the Meth panel to continue work on HFC projects

(1) Developments of supply and demand in the global HCFC22 market, clarifying whether CDM HFC facilities are increasing their production and whether more HFC23 had or could have been generated than would have happened without the CDM.

Request for review:

- 10 HFC projects requested for issuance are under request for review, and the total CER amount from them are 13,560,073.

How to avoid these problems

Monitoring is most important!!

- Establish correct, practical and realistic monitoring plan,
- Carry out the monitoring accurately,
- In some methodologies, monitoring parameter tables are attached, indicating relevant parameters which shall be monitored.

Table III.AK.2

No	Parameter	Description	Unit	Monitoring/ recording Frequency	Measurement Methods and Procedures
1	$A_{k,y}$	Total area in which oil seed type *k* is cultivated for use in the project plant in year *y*	ha	Annually	Measured or calculated (e.g. using maps). Measurements results shall be consistent with yield of the cultivation
2	$P_{BD,y}$	Production of biodiesel in the project plant in year *y*	tonnes	Continuously or in batches	Measurements are undertaken using calibrated meters. Measurement results shall be cross checked with records for consumption and sales (e.g. invoices/receipts)
3	$P_{BD,ex\text{-}situ,y}$	Quantity of biodiesel that is either produced with other alcohols than methanol from	tonnes	Continuously or in batches	Measurements are undertaken using calibrated meters at production site

GHG Mitigation Measures in Commercial Building and Residential Sector

23, November, 2010

Deputy chief advisor of JICA Expert Team
Kazuhito YAMADA

Today's Agenda

1. Characteristics of GHG emissions in Commercial building and household Sector
2. Overview of Energy Efficiency Principle
3. GHG mitigation options in buildings and equipment
4. Barriers to adopting building technologies and practices that reduce GHG emissions
5. Energy consumption in Thailand
6. Energy Intensity in Thailand and Japan
7. Japanese experience
8. GHG mitigation measures in buildings/households sector: case studies (Hotel, Commercial building, underground shopping mall)
9. Comparison between CFL and LED
10. New Technology: CCFL
11. Exercises

Characteristics of GHG emissions in Commercial building and household Sector (WG.3, IPCC-AR4)

- Substantial reductions in CO_2 emissions from energy use in buildings can be achieved over the coming years using mature technologies for energy efficiency that already exist widely and that have been successfully used (high agreement, much evidence).
- In spite of the availability of these high-efficiency technologies and practices, energy use in buildings continues to be much higher than necessary. There are many reasons for this energy waste in buildings.
- Measures to reduce GHG emissions from buildings fall into one of three categories: reducing energy consumption and embodied energy in buildings, switching to low-carbon fuels including a higher share of renewable energy, or controlling the emissions of non-CO_2 GHG gases.

Overview of Energy Efficiency Principle (WG.3, IPCC-AR4)

- Reduce heating, cooling and lighting loads
- Utilize active solar energy and other environmental heat sources and sinks
- Increase efficiency of appliances, heating and cooling equipment and ventilation
- Implement commissioning and improve operations and maintenance
- Change behavior
- Utilize system approaches to building design
- Consider building form, orientation and related attributes
- Minimize halocarbon emissions

GHG mitigation options in buildings and equipment (WG.3, IPCC-AR4)

- Thermal envelope (insulation, windows, air leakage)
- Heating systems (passive solar heating, space heating systems)
- Cooling and cooling loads (reducing the cooling load, passive and low-energy cooling techniques
- Heating, ventilation and air conditioning (HVAC) systems
- Building energy management systems (BEMS)
- Active collection and transformation of solar energy (Building-integrated PV, solar thermal energy for heating and hot water

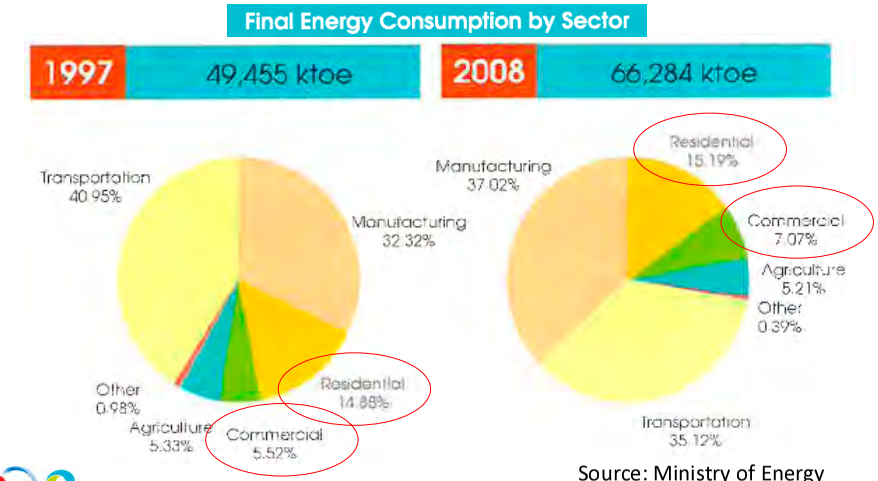
GHG mitigation options in buildings and equipment (WG.3, IPCC-AR4) continued

- Domestic hot water
- Lighting systems (high efficiency electric lighting)
- Daylighting
- Household appliances, consumer electronics and office equipment
- Supermarket refrigeration systems
- Energy savings through retrofits
- Trade-offs between embodied energy and operating energy
- Trade-offs involving energy-related emissions and halocarbon emissions

Barriers to adopting building technologies and practices that reduce GHG emissions (WG.III, AR4)

- Limitations of the traditional building design process and fragmented market structure
- Misplaced incentives
- Energy subsidies, non-payment and theft
- Regulatory barriers
- Small project size, transaction costs and perceived risk
- Imperfect information
- Culture, behavior, lifestyle and the rebound effect

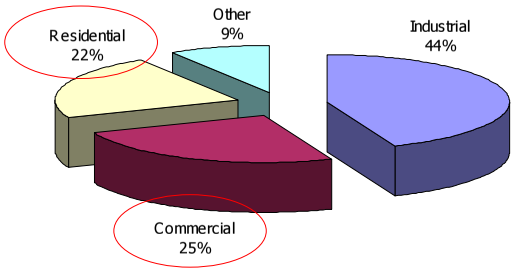
Energy consumption in Thailand



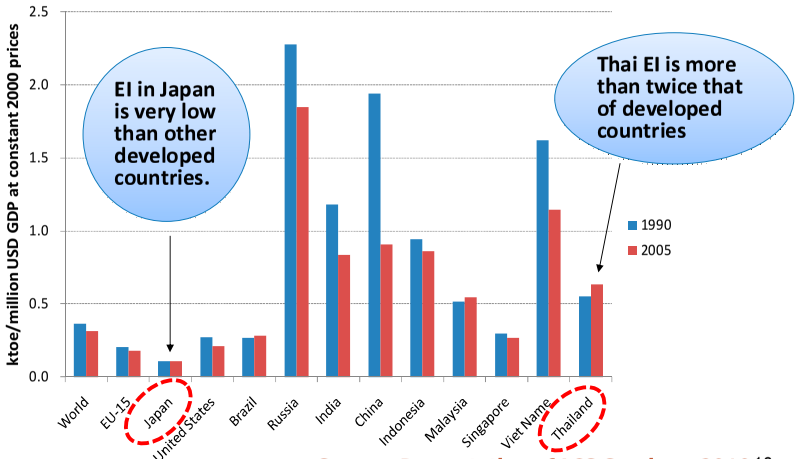
Source: Ministry of Energy

Energy consumption in Thailand

Share of electricity use:
Electricity consumption in buildings



Energy Intensity in Thailand and Japan



Source: Presentation of LCS Seminar, 2010

Japanese experience: Amendment of Rationalization in Energy Use Law

- The "Act on the Rational Use of Energy" was established on 1979.
- The main objectives are to assure the effective use of fuel resources and rationalize the energy use
- In order to further rationalize the energy use in industry and household, the Act was revised in 2008 and came into force in 2009.
  - Factories,
  - Transportation,
  - Residences and buildings, and
  - Machinery and appliances.

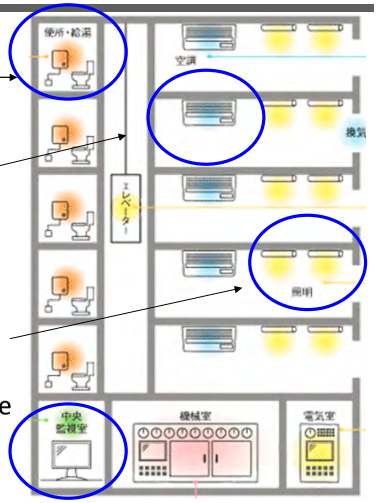
Japanese experience: Main revised points related to Building

- **Stepped-up security for large*1 residences and buildings** (introduction of orders in addition to instructions and notices) in case of only significantly insufficient energy-saving measures have been carried out,
- Report on energy-saving methods by owners of **small- to medium-sized residences and buildings** above a certain size*2 ,
- Adoption of energy-saving measures by **businesses engaged in the construction and sales of residences** (security through recommendations and orders for those who are engaged in the construction and sales of a large number of residences),
- Indication of the **energy saving performance of residences and buildings**. (specify effort of housing businesses engaged in the sales and lease of buildings)

Large scale: over 2,000m² total floor area, Small to medium: over 300m² total floor area

Japanese experience: Example of energy efficiency of the building

- Hot-water supply facility, Feed-water and drainage facility
  - temperature control, reclamation water
- Air conditioning, ventilating facilities
  - temperature control, install high efficiency facility
- Lighting facility, elevator, electric equipment
  - install high efficiency facility, voltage adjustment
- Management etc.



Source: http://www.eccj.or.jp/law/pamph/outline_revision/08-5.html

Japanese experience: Energy efficiency diagnosis

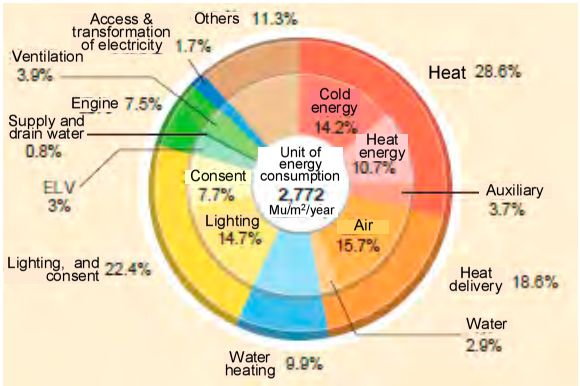
- Non-charge energy efficiency diagnosis submitted by ECCJ (The Energy Conservation Center, Japan)
- Advices by external expert
  - Hearing investigation
  - On-site review
  - Analysis of current situation and submit the proposal for improvement

Source: http://http://www.eccj.or.jp/audit/build_guide10/index.html

GHG mitigation measures in buildings/households sector: Buildings -1-

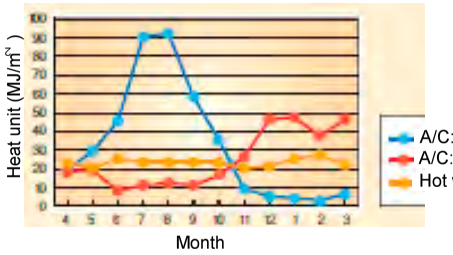
Hotels - Important resource for tourism in Thailand

Basic structure of energy consumption in hotels

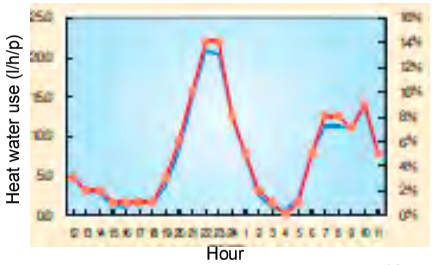


GHG mitigation measures in buildings/households sector: Buildings -1-

Heat load trend in hotels



Daily hot water supply trend in hotels



Hotels - Important resource for tourism in Thailand

GHG mitigation measures in buildings/households sector: Buildings -1-

Example of ESCO for a hotel: Gifu Grand Hotel, Japan

- Completion of construction: 1973
- Gloss floor area: 34,037 m^2
- Scale: 10 stories above the ground and 2 underground stories, including main, east and west buildings
- Hotel type: Resort hotel
- Duration of ESCO: 2003 - 2013 (continuing)

GHG mitigation measures in buildings/households sector: Buildings -1-

Items introduced to the Gifu Grand Hotel by ESCO:

	Facilities/equipments for energy efficiency improvement	Estimated effect of EE
1	Introduction of high efficiency freezing machines	1.8 %
2	Introduction of high efficiency boilers	**3.7 %**
3	Introduction of inverter control to water heat pumps	0.6 %
4	Introduction of BEMS (buildings energy management system)	**3.1 %**
5	Control of appropriate external air introduction	1.0 %
6	Introduction of inverter control to air conditioning machines	0.6 %
7	Heat insulation of steam bulbs and back-flow water pipes	0.5 %
8	Renewal of air conditioning system in the West building	**2.5 %**
9	Control of air blower thermostat	0.1 %
10	Revision of cooling water plumbing (pump-and-pipe system)	0.3 %
	Total	14.2 %

GHG mitigation measures in buildings/households sector: Buildings -1-

Results - total:

	Planned value	Actual performance (2004)	Actual performance (2005)
Energy consumption before ESCO	116,058.5 GJ	-	-
Energy consumption after ESCO	99,558.1 GJ	103,629.8 GJ	101,743.7 GJ
Energy reduction	16,470.1 GJ	12,429.8 GJ	14,314.9 GJ
Ratio of energy efficiency (%)	14.2 %	10.7 %	12.3 %
Achievement ratio (%)	-	75.4 %	86.6 %

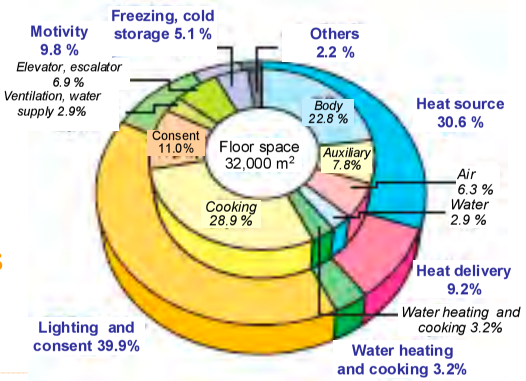
GHG mitigation measures in buildings/households sector: Buildings -1-

Results - details: Adjustment of freezing machine operation is one of the most important issues to improve the performance of EE.

	Facilities/equipments for energy efficiency improvement	Estimated effect	Actual (2005)
1	Introduction of high efficiency freezing machines	1.8 %	1.5 %
2	Introduction of high efficiency boilers	3.7 %	3.7 %
3	Introduction of inverter control to water heat pumps	0.6 %	0.2 %
4	Introduction of BEMS (buildings energy management system)	3.1 %	2.3 %
5	Control of appropriate external air introduction	1.0 %	1.0 %
6	Introduction of inverter control to air conditioning machines	0.6 %	0.5 %
7	Heat insulation of steam bulbs and back-flow water pipes	0.5 %	0.5 %
8	Renewal of air conditioning system in the West building	2.5 %	2.2 %
9	Control of air blower thermostat	0.1 %	0.1 %
10	Revision of cooling water plumbing (pump-and-pipe system)	0.3 %	0.3 %
	Total	14.2 %	12.3 %

GHG mitigation measures in buildings/households sector: Buildings -2-

Basic structure of energy consumption in department stores



Commercial buildings

Another important resource for tourists

GHG mitigation measures in buildings/households sector: Buildings -2-

Example of ESCO for a department store: Takashimaya, Tachikawa, Japan

- Completion of construction: 1994
- Gloss floor area: 66,911 m²
- Scale: 10 stories above the ground and 4 underground stories
- Store type: sale of goods (mainly clothing)

GHG mitigation measures in buildings/households sector: Buildings -2-

Items introduced to the Takashimaya, Tachikawa

1	Temperature control of air conditioning system by introducing PMV (Predicted Mean Vote) index
2	Introduction of inverter control to air ventilation fans
3	Control of air conditioning system by intermittent operation control
4	Energy management by BEMS equipment

PMV: Index for thermal (warm/cool) comfort condition to individuals
BEMS = buildings energy management system

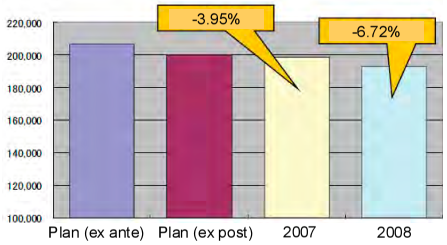
GHG mitigation measures in buildings/households sector: Buildings -2-

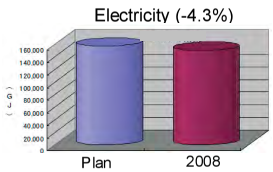
Results

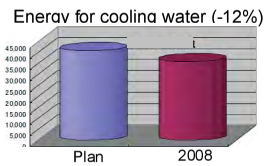
	Planned value	Actual performance (2007)	Actual performance (2008)
Energy consumption before ESCO	206,555 GJ	-	-
Energy consumption after ESCO	200,147 GJ	198,394 GJ	192,680 GJ
Energy reduction	6,407 GJ	8,160 GJ	13,874 GJ
Ratio of energy efficiency (%)	3.10 %	3.95 %	6.72 %
Energy consumption unit	2,991 MJ/m²/y	2,965 MJ/m²/y	2,880 MJ/m²/y

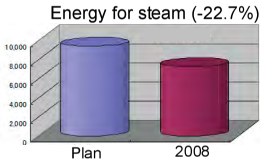
GHG mitigation measures in buildings/households sector: Buildings -2-

Results









GHG mitigation measures in buildings/households sector: Buildings -3-

Example of ESCO for a underground shopping mall "Azalea", Kawasaki, Japan

- Completion of construction: 2008 (upgraded)
- Gloss floor area: 56,000 m²
- Scale: 2 stories above the ground and 2 underground stories
- Store type: shops, restaurants and pathways to major train stations (24 hours accessible)

GHG mitigation measures in buildings/households sector: Buildings -3-

Map of Azalea's main floor - *shopper's paradise!*

GHG mitigation measures in buildings/households sector: Buildings -3-

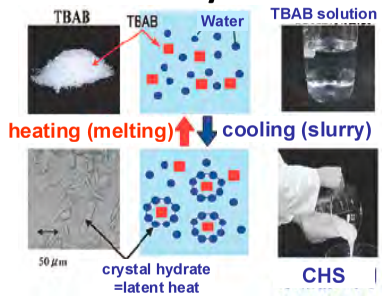
Items introduced to the Azalea, Kawasaki

*CHP: next page

1	Air conditioning system using clathrate hydrate slurry (CHS)*
2	Introduction of inverter control to secondary pumps for water
3	Introduction of inverter control to air conditioning fans
4	Introduction of inverter control to ventilation fans for basement car park
5	Revision to high efficiency cool/hot water generators
6	Introduction of free cooling system for air conditioning
7	Energy management by BEMS equipment

GHG mitigation measures in buildings/households sector: Buildings -3-

Clathrate Hydrate Slurry (CHS) system



- Developed by a Japanese company and NEDO
- A kind of liquid clathrate hydrate with tetra-n-butylammonium bromide (TBAB)
- Latent heat in the range of 5-12 deg C,
- Cooling storage capacity is 2-3 times larger than conventional chilled water,
- Suitable for both cooling storage and pumping,
- Introduced to buildings in Japan, Singapore, and the USA.

Slurry generator

GHG mitigation measures in buildings/households sector: Buildings -3-

Results: Total CO_2 emission reduction = 1,188 tCO_2/y

	Energy efficiency improvement equipments	Energy reduction	CO_2 reduction
1	Air conditioning system using clathrate hydrate slurry (CHS)*	382 MWh	212 tCO_2/y
2	Introduction of inverter control to secondary pumps for water	144 MWh	80 tCO_2/y
3	Introduction of inverter control to air conditioning fans	94 MWh	52 tCO_2/y
4	Introduction of inverter control to ventilation fans for basement car park	357 MWh	198 tCO_2/y
5	Revision to high efficiency cool/hot water generators	294529 m^3 of gas	613 tCO_2/y
6	Introduction of free cooling system for air conditioning	38 MWh	21 tCO_2/y
7	Energy management by BEMS equipment	-	12 tCO_2/y

Comparison between CFL and LED

	CFL	LED
Power Consumption (W)	13	8
Life time (h)	6,000-7,000	40,000-50,000
Unit Price (USD) *1	10-13	40
CO_2 emissions (tCO_2/year) *2	22,667	12,205

Note: compare as 60W light bulb type corresponding

Emission reduction;
10,462 tCO_2/year

*1: 1USD= 80Yen

*2: Calculation condition;
Lightning period = 3,000 h/year, EF=0.5812tCO2/MWh,
replace number = 1,000,000

New Technology: CCFL (Cold Cathode Fluorescent Lamp)

- Fluorescent tube that has been used as backlight of monitor of LCD TV and personal computer
- Long life (as well as LED) , and energy saving compared with a fluorescent lamp
- Low heat, and high light emission compared with LED

Commercial building and household Sector

Exercise:

How to implement the GHG mitigation measures in hotels and shopping buildings?

- **Who are implementers? owners/government/tourist?**
- **How to implement the mitigation measures?**

  Possible tools: regulation/economic incentives/carbon credits (T-VER)/carbon foot print/subsidies/etc.
- **What is the role of TGO?**

CDM7: Overview of Programme of Activities (PoA)

21, September, 2010

Deputy chief advisor of JICA Expert Team
Kazuhito YAMADA

Today's Agenda

- What is PoA ?
- History of PoA
- Registered PoAs:
  Mexico, Brazil, Uganda, India, Honduras
- Procedures of PoA
- Issues of PoA
- Possible PoAs in Thailand

What is PoA ? -1

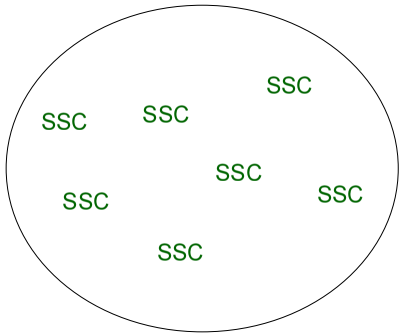
- A **programme of activities** (**PoA**) is a voluntary coordinated action by a private/public entity which coordinates and implements any policy/measure or stated goal (i.e. **incentive schemes and voluntary programmes**), which leads to anthropogenic GHG emission reductions or net anthropogenic GHG removals by sinks that are additional to any that would occur in the absence of the PoA, via an unlimited number of **CDM programme activities** (**CPAs**).

What is PoA ? -2

- **A CPA is a project activity under a PoA.**
- A **CPA** is a single, or a set of interrelated measure(s), to reduce GHG emissions or result in net anthropogenic GHG removals by sinks, applied within a designated area defined in the baseline methodology/ies.

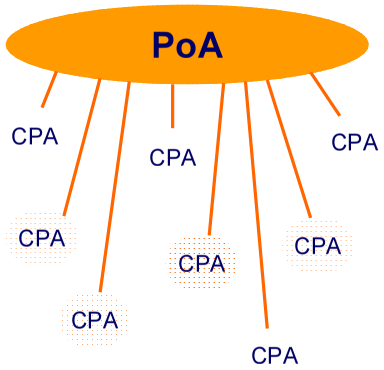
What is PoA ? -3

Small Scale CDM - bundling



Type I: <15MW
Type II: <60GWh/y
Type III: <60kt-CO_2/y

PoA



no limit of CPAs

History of PoA

- COP/MOP2 (**2006**) decided that a local/regional/national policy or standard cannot be considered as a CDM project activity, but that project activities under a programme of activities can be registered as a single CDM project activity.
- EB28 (**2006**) submitted the 'Guidance on the registration of project activities under a PoA'.
- The first PoA (Brazil) was started to validate in **2008**.
- The first PoA (Mexico) was registered in **2009**.
- Registered PoAs are only five (Mexico, Brazil, Uganda, India, Honduras).
- Under validation; China(6), Brazil(2), India(8), Mexico(1), Indonesia(3), Viet Nam(5)
- ***Thailand has one PoA under validation.***

Registered PoAs: Mexico -1

Goal of the PoA:

- The goal is to transform the energy efficiency of Mexico's residential lighting stock by distributing up to **30 million compact fluorescent lamps (CFLs) to households**.

Coordinating/managing entity:

- Cool nrg Carbon Investments Pty Ltd

Project participants:

- Cool nrg Mexico SRL de CV (Mexico)/
  Cool nrg Carbon Investments Pty Ltd (UK/Australia)

Estimated GHG emission reductions:

- **520,365 t-CO_2/y**

Registered PoAs: Mexico -2

Figure 1: Geographic boundary of PoA - Mexico

- Residents will come to distribution points with their old incandescent bulbs and exchange them for CFLs with equivalent or greater lumen output. Incandescent bulbs collected during the exchange will be destroyed to prevent leakage.
- Each SSC-CPA will involve the distribution and installation of CFLs for use by Mexican households.
- CFLs will be made available at a large number of distribution points within the area covered by the SSC-CPA.
- These distribution points will typically be those provided by Cool nrg's retail partners, who have a network of approximately 3,550 outlets across Mexico available to participate in the PoA.

Registered PoAs: Brazil -1

Goal of the PoA:

- The PoA consists of **installing a biodigester** system to capture CH_4 and an enclosed flare system to combust it in 5 states of Brazil with **market farms and breeding Farms**.

Coordinating/managing entity:

- Instituto Sadia de Sustentabilidade (ISS)

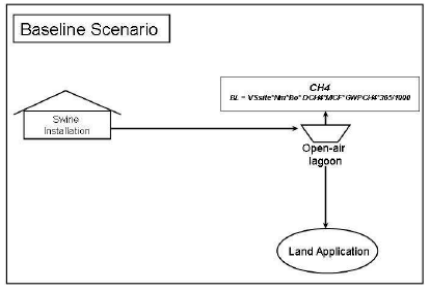
Project participants:

- ISS (Brazil)/European Carbon Fund (ECF) (UK)

Estimated GHG emission reductions:

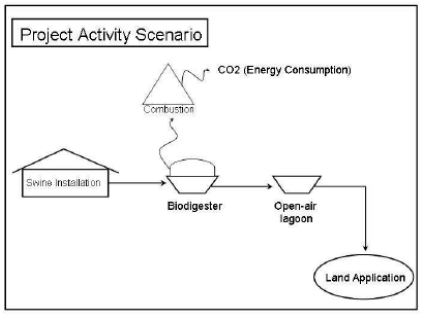
- **591,418 t-CO_2/y**

Registered PoAs: Brazil -2



- The estimated amount of installed biodigester and enclosed flare systems in the PoA of the ISS is of 1,103 in 1,074 farmers.

- The sampling random method to be applied in verification by the DOE's is estimated as 25% in each round for each verification. These samplings estimate that every 4 rounds or every 4 verifications the amount to be verified is 100% of the farms.



Registered PoAs: Uganda -1

Goal of the PoA:

- The goal is to avoid CH_4 emissions from municipal waste landfills by undertaking composting of the wastes and using the organic matter in wastes as humus for soil conditioning and plant growth.

Coordinating/managing entity:

- National Environmental Management Authority (NEMA)

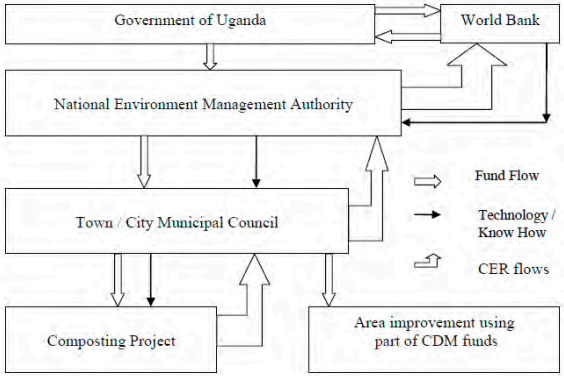
Project participants:

- NEMA (Uganda)/IBRD-CDCF (Netherlands)

Estimated GHG emission reductions:

- **83,700 t-CO_2/y**

Registered PoAs: Uganda -2



- The Government of Uganda has taken a Loan from the World Bank under the "Environment Management and Capacity Building Project-II" and intends to use part of this loan to improve municipal solid waste management in cities and municipalities through the proposed municipal waste compost program.

- The program aims to promote composting as an alternative means of solid waste processing and disposal in Uganda.

Registered PoAs: India -1

Goal of the PoA:

- **CFLs** will be distributed by SSC-CPA implementer(s) to grid-connected residential households in exchange of an incandescent lamp (ICL). Approximately **600,000 CFLs** can be distributed within a single SSC-CPA.

Coordinating/managing entity:

- Bureau of Energy Efficiency (BEE)

Project participants:

- BEE (unilateral)

Estimated GHG emission reductions:

- **34,892 t-CO_2/y**

Registered PoAs: India -2

a.) Three Tube CFL b.) Two Tube CFL c.) Spiral Tube CFL

Figure 1: Examples of self-ballasted CFLs with plug in Type base

- It is estimated that there are over 400 million light points in India lighted using ICLs. ICLs are extremely energy in-efficient, with just 5% of the electricity input converted to light. The remaining is lost as heat. In recent years the CFL has emerged as an energy efficient alternative, as a CFL uses only one-fifth as much electricity as an ICL to provide the same amount of illumination.

Registered PoAs: Honduras -1

Goal of the PoA:

- The Masca Small Hydro Programme aims at developing a series of **small hydroelectric projects** in Honduras.

Coordinating/managing entity:

- Hidroeléctrica de Masca S.A. de C.V. (Hidromasca)

Project participants:

- Hidromasca (Honduras) / OneCarbon International BV (Netherlands)

Estimated GHG emission reductions:

- **4,395 t-CO_2/y**

Registered PoAs: Honduras -2

Table 7. Activities similar to the proposed project activity. Source CDM Pipeline October 2008

Recent hydro power projects in Honduras	Start of operation year	Capacity MW	CDM status
Peña Blanca	2008	0.7	Seeking registration, supported by board minutes. Also see PoA DD, A.4.3, Sub-step 4a
Cortecito	2007	3.2	Registered, No. 51
Cuyamapa	2007	12.2	Registered, No. 45
Cuyamel	2007	7.8	Registered, No. 83
La Gloria	2007	5.8	Registered, No. 154
San Carlos	2007	2.3	Registered, No. 51
La Esperanza	2006	12.7	Registered, No. 9
Cececapa	2005	2.9	Registered, No. 156
Yojoa	2005	0.6	Registered, No. 157
Zacapa	2005 rehabilitation	0.5	Registered, No.235

Honduras already has many SSC-hydropower projects.

Procedures of PoA -1

Preparation of a PoA

- Preparation of a CDM-POA-DD

-Identification of the coordinating/managing entity;
-Host Party(ies) and PoA participants;
-Definition of the boundary for the PoA in terms of a geographical area (e.g., municipality, region within a country, country or **several countries**);
-Description of the policy/measure or stated goal that the PoA seeks to promote;
-Demonstration that in the absence of the CDM either:
(i) the proposed voluntary measure would not be implemented, or
(ii) the mandatory policy/regulation would be systematically not enforced and that non-compliance with those requirements is widespread in the country/region, or
(iii) that the PoA will lead to a greater level of enforcement of the existing mandatory policy/regulation. This shall constitute the demonstration of additionality of the PoA as a whole;

Procedures of PoA -1

Preparation of a PoA

- Preparation of a CDM-POA-DD (continued)

-Definition of eligibility criteria for inclusion of a project activity as a CPA under the PoA;
-Starting date and length of the PoA not exceeding **28 years** (**60 years for A/R**);
-Description of the operational and management arrangements;
-Description of a monitoring plan for a CPA;
etc...

- Preparation of the CDM-CPA-DD

Procedures of PoA -2

Validation of a PoA

- The coordinating/managing entity shall submit to a DOE the following documentation:

(a) A completed CDM-POA-DD;
(b) A PoA generic CDM-CPA-DD, which specifies the generic information relevant to all CPAs that may be included in the PoA;
(c) A completed CDM-CPA-DD which is to be based on the application of the PoA to one real case.

- The validation by the DOE shall address the following issues:

Additionality; eligibility criteria for inclusion of a proposed CPA; operational and management arrangements; consistency between CDM-POA-DD and the PoA generic CDM-CPA-DD; etc.

Procedures of PoA -3

Inclusion of CPAs

- A CPA can be included in a registered PoA at any time during the duration of the PoA.
- To include an additional CPA in a registered PoA, the coordinating/ managing entity shall forward the completed specific CDM-CPA-DD form to any DOE, after having ensured that the CPA and the specific CDM-CPA-DD meets the requirements determined in the POA and its generic CDM-CPA-DD. The coordinating/managing entity may forward more than one specific CDM-CPA-DD at one time.

Procedures of PoA -4

Inclusion (continued)

- The DOE shall scrutinize the CPA and the specific CDM-CPA-DD against the latest version the POA. If the DOE confirms that the CPA meets the requirements of the POA, it shall include the CPA in the registered PoA by forwarding the specific CDM-CPA-DD to the Board via uploading it through a dedicated interface on the UNFCCC CDM website.
- The CPA identified in the specific CDM-CPA-DD uploaded by the DOE will be automatically included in the registered PoA and displayed on the view page of that PoA. The DOE, the coordinating/managing entity and the DNA shall be automatically notified of the change in the status of the PoA.

Issues of PoA

- Who will be the best 'coordinating/ managing entity'?
- What is the best methodology to verify GHG emissions from a large number of CPAs?
- Should we simplify the procedure of the present PoA to speed up realization of them?

Possible PoAs in Thailand

- Renewable energy including waste to energy
- Energy efficiency improvement in industry and in household
- Transport
- A/R

CDM08:
Exercise: programmatic CDM (PoA)

- Introduction of Thailand PoA under validation and discussion for possible PoAs in Thailand -

21, September, 2010

JICA Expert Team
Mariko FUJIMORI

A1-46

PoA in Thailand

Project title:

- Thailand Small Scale Livestock Waste Management Program

Current condition:

- Under validation

PDD submission date:

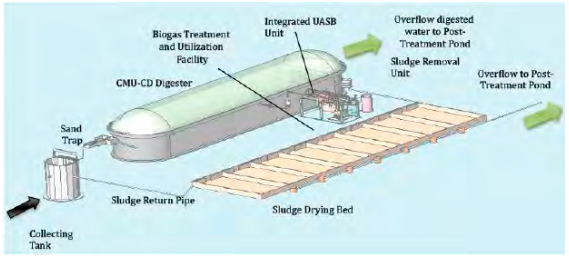
- 27 October 2009

Starting date:

- June 2009

Length of the PoA:

- 28 years



PoA in Thailand

Coordinating/managing entity:

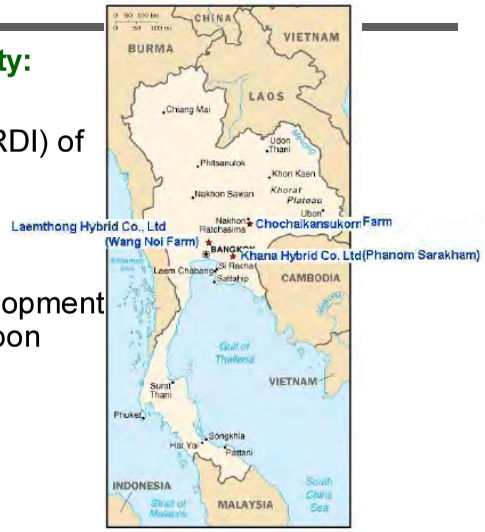
- Energy Research and Development Institute (ERDI) of Chiang Mai University

Project participants:

- International Bank for Reconstruction and Development as the Trustee of the Carbon Fund for Europe

Estimated GHG emission reductions:

- 55,774 t-CO_2/y



PoA in Thailand

Applied methodology:

- AMS-III.D: Methane recovery in animal manure management systems, ver. 15

Technology to be employed:

- Anaerobic digestion technology designed by ERDI
- Targeted system size: 300 - 19,000 m^3/farm or 2,000 - 150,000 pig heads/farm
- Not only pig farms but also cattle and chicken farms can be included

Baseline scenario:

- Anaerobic lagoon treatment systems, causing odor and water pollution

PoA in Thailand

Structure of CPA:

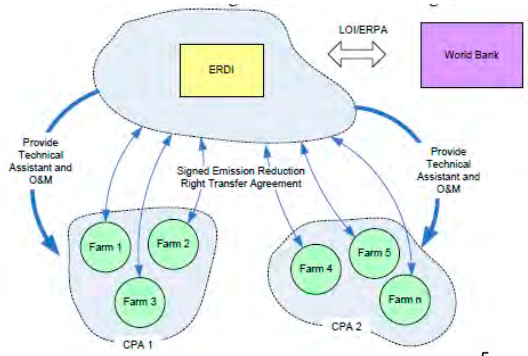
- Group of farms or individual farm will implement the project activity.

Project management:

- ERDI will manage the whole PoA, transfer technology to each CPA farmers and control monitoring.

Estimated GHG emission reductions by the specific CPA (=three farms):

55,774 t-CO_2/y



Possible PoAs in Thailand

- What is the **rationale**? - Why this particular PoA should be promoted/prioritized?
- What kind of **benefits** can be expected by the possible PoA?
- What kind of **issues** will we face to develop the possible PoA?

The Project for Capacity Development and Institutional Strengthening for GHG Mitigation in the Kingdom of Thailand

- Biogas generation using food waste in Bangkok -

JICA Expert Team

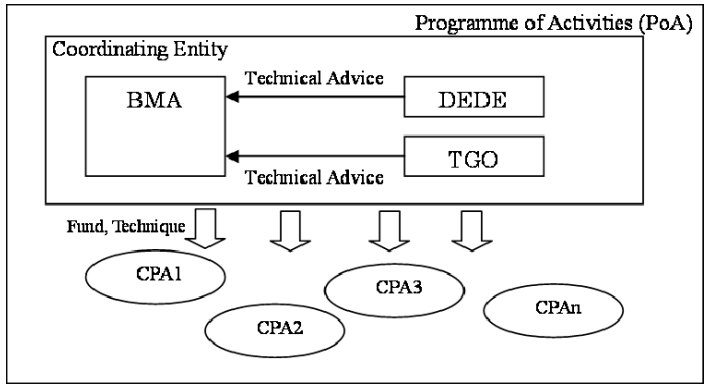
Yoshihiro MIZUNO

Description of the PoA project

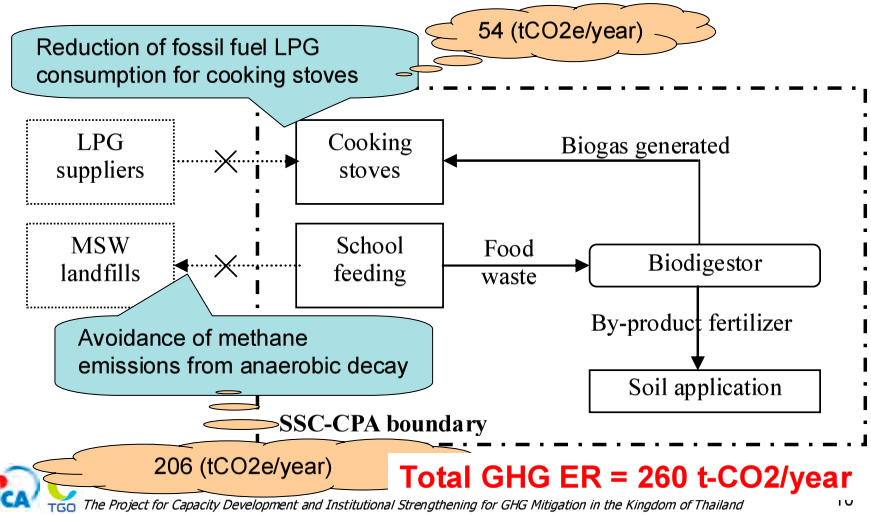
- Install bio digesters at elementary schools in Bangkok
- Organic waste from human feeding will be used as material input to generate biogas
- Generated biogas will be used for cooking fuel at schools

the parties involved in the PoA

・Number of candidates (elementary school) in the programme activities: 84 (school)



Benefit of the Project (GHG Emission Reductions)



CDM 09: Development of CDM Project Activity

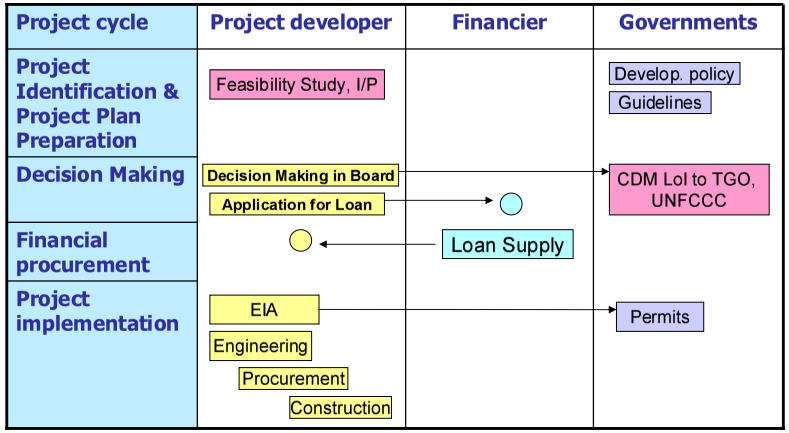
28th September 2010

Chief Advisor of JICA Expert Team
Masahiko FUJIMOTO

Agenda

- Project implementation flow
- What is feasibility study?
- Steps of Feasibility Study
- Project implementation structure
- For example: Small Hydro Power Generation
- For example: Biomass Power Generation
- Present value and internal rate of return
- Starting Date of Project Activity
- Prior consideration of the CDM
- Conclusion
- Practice

Project Implementation Flow



EIA: Environmental Impact Assessment, LoI: Letter of Interest

What is feasibility study?

- Feasibility study
  - is **valuable tool** for developing a winning business plan.
  - can **answer the essential question** of "Should we proceed with the proposed project idea?",
    - identifying what potential problems are
    - identifying how, where the business should be operated, and to whom to sell a service or product
    - figuring out how much money you need

Necessity of feasibility study

- Feasibility study
  - **outlines some business alternatives** and **clarifies strengths and limitations** of them.
  - **enhances the possibility of success** by addressing and mitigating factors early on that could affect the project.
  - **provides quality information for decision making**, including reasons not to proceed.
  - **helps in securing funding** from lending institutions and other financial sources.
  - helps to attract equity investment.

Steps of Feasibility Study

Review of available data and information and of major policy issues

↓

Analysis of the need for the Project, including supply-and-demand analysis and determination of the relative priority of the Project in the country's national/regional economic development or sector program

↓

Design of the project concept (**purpose, scope, site**, etc.)

↓

Preliminary facility design and related engineering of potentially viable alternatives (including **preliminary layout**, **selection of plant capacity**, logistics study, and CDM), taking into account **natural and site conditions**, **availability of materials and labor, possible construction methods**

↓

Cost estimate of potentially viable alternatives

↓

Source: Operational guidance on the preparation for Japan's ODA loan projects

Steps of Feasibility Study

Evaluation of technical soundness, economic and financial viability of potentially viable alternatives

↓

Selection of most viable alternative

↓

Implementation schedule

↓

Project implementation and **operation and maintenance** scheme

↓

Financial plan

↓

Evaluation of environmental and social impacts, possible project risks

↓

Project Implementation Plan: **Recommendations and procedures**

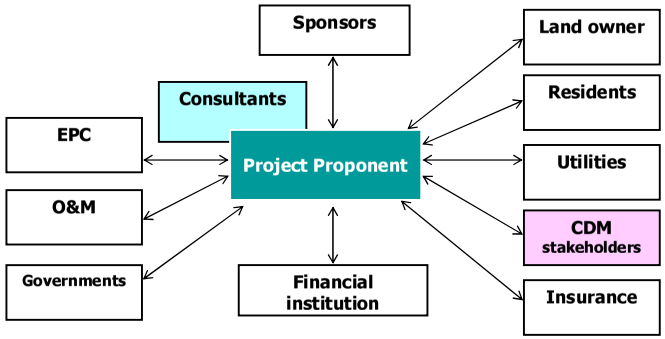
Source: Operational guidance on the preparation for Japan's ODA loan projects

Project Implementation Plan

- **Priority and necessity** of the project
- **Investment and financing plans** consistent with the project cost, including the cost of operation, maintenance and staff training program
- Details of the **items and components of the project**
- **Clear statement of the intention** of the project developer to undertake the project
- **Steps and procedures** necessary to undertake the project (e.g. government approval for the project or EIA, acceptance by the project affected people)

Source: Operational guidance on the preparation for Japan's ODA loan projects

Project Implementation Structure

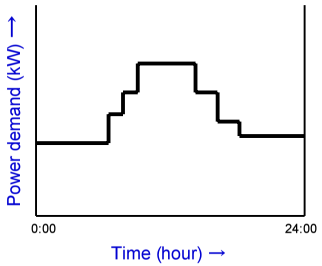


EPC: Engineering, Procurement and Construction
O&M: Operation and Maintenance

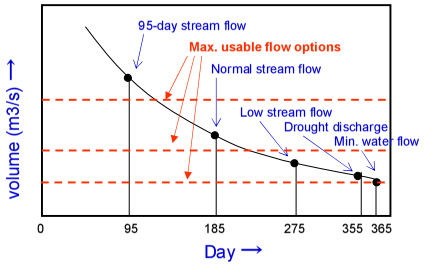
Example 1: Small Hydro Power Generation Project Planning Steps

- Power demand study
  - Selection of demands
  - Survey of demand variation patterns and scale
- Power generation planning
  - Power generation plant layout
  - Study on effective head
  - Study on water flow volume
  - Setting of max. available water flow volume
- Optimum power generation capacity
  - Power demand and supply balance
  - Review of optimum capacity
- Preliminary design of power plant
- Preliminary cost estimate
- Feasibility study

Demand Variation and Water Flow - Duration



Daily demand variation pattern



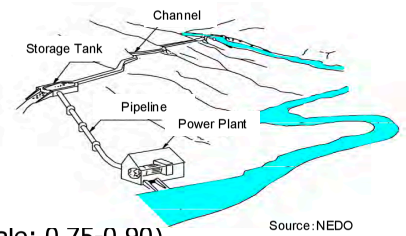
Flow-duration curve and selection of max. usable flow

Power Output Capacity and Generated Energy

- Power output capacity (kW)

  $Pe = 9.8\ Q\ He\ \eta_t\ \eta_g$

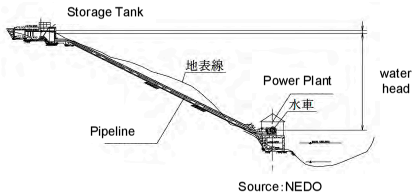
  Where,
  Pe: power output (kW)
  Q: flow (m^3/s)
  He: water head (m)
  η_t: efficiency of turbine (small-scale: 0.75-0.90)
  η_g: efficiency of generator (small-scale: 0.82-0.93)



- Generated energy (kWh/yr)

  $Ee = Pe\ T$

  Where,
  Ee: generated energy (kWh/yr)
  T: time (h/yr)



Example 2: Biomass
Power Generation Project Planning Steps

- Project site survey
  - Preliminary selection of potential sites
  - Collection of biomass potential data, natural and social conditions
- Preliminary sizing of biomass plant/facilities
- Preliminary selection of collection/transport methods for biomass resources
- Preliminary study on the amount and utilization of heat and power generated by biomass plants/facilities (including matching of demand and supply)
- Preliminary study on disposal of by-products (ex. ashes)
- Preliminary cost estimate
- Feasibility study

Energy Generation – Direct Combustion

Heat	[Heat generated (GJ/year)] = [Possible **biomass quantity** (t/year)] x [**Heating value** (GJ/t] x [**Heat efficiency**]
Power	[Power generated (kWh/year)] = [Possible **biomass quantity** (t/year)] x [**Heating value** (GJ/t)] x [**Power efficiency**] / **0.0036** (GJ/kWh)

Biomass	Major items	Heating value (GJ/ton,Dry base)	Heat efficiency	Power efficiency
Sugar cane mill residues	Bagasse	14.40	0.85	0.10 (Wet base) ~ 0.22 (Dry base)
	Top &Trashier	17.39		
Rice mill residues	Rice husks	14.27		
	Rice straws	10.24		
Palm oil mill residues	EFB	17.86		
	Fiber	17.62		
	Shell	18.46		
	Frond	9.83		

Source: Biomass energy, Department of alternative Energy Development and Efficiency

Energy Generation – Direct Combustion

Biomass	Major items	Heating value (GJ/ton)	Heat efficiency	Power efficiency
Coconut industry residues	Husk	16.23	0.85	0.10 (Wet base) ~ 0.22 (Dry base)
	Shell	17.93		
	EFB	15.40		
	Frond	16.00		
Cassava starch industry residues	Stalk	18.42		
Maize	corncob	18.04		
Woody biomass[2]	Disposed trees (coniferous trees)	19.78		
	Disposed trees (broad leaf trees)	18.8		
	Sawmill chips	15.6		

Source: Biomass energy, Department of alternative Energy Development and Efficiency
[2] : NEDO

Energy Generation – Methane Fermentation

Heat	[Heat generated (GJ/year)] = [Possible **biomass quantity** (t/year)] x **1,000** x [**Gas generation factor** (m^3/kg)] x [**Methane content** (60%)] x [**Methane heating value** (kJ/m^3)] x [**Heat efficiency**] x 10^{-3}
Power	[Power generated (kWh/year)] = [Possible **biomass quantity** (t/year)] x **1,000** x [**Gas generation factor** (m^3/kg)] x [**Methane content** (60%)] x [**Methane heating value** (kJ/m^3)] x [**Power efficiency**] / **3,600** (kJ/kWh)

Biomass	Major items	Gas generation factor (m^3/kg)	Methane content (%)	Methane heating value (kJ/m^3)	Heat efficiency	Power efficiency
Cattle manure	Dairy cattle	0.025	60	37,180	0.90	0.25
	Beef cattle	0.030	60			
Swine manure	-	0.024	60			
Food biomass	Kitchen wastes	0.740	62			
Sewage	Sewage (sludge)	0.550	62			

Source: NEDO

Indicator for financial analysis : NPV & IRR

✓ Present value analysis: value evaluation of various cash flow

Net present value : NPV = $\sum_{i=1}^{n}$ (value$_i$)/(1 + rate)^i - investment cost

value: future cash flow, rate: discount rate, i: year (1 ~ n)

✓ **Internal rate of return (IRR):** the discount rate where NPV equals to ZERO.

-a reference indicator for the profitability of the project to pay interest;

✓ **General criteria for investment : NPV > 0**

IRR > Bank interest rate

NPV & IRR Calculation

Year (i)	Investment Cost	Income	Benefit (B)	(1+rate)^i	Present Value (PV)	Net Present Value (NPV)
0	300		-300	0	-300	-300
1		100	100	1.13	88	-212
2		100	100	1.28	78	-133
3		100	100	1.44	69	-64
4		100	100	1.63	61	-3
5		100	100	1.84	54	52

Investment cost	300
Total income	100 x 5 = 500
Discount Rate (rate)	13%
Internal rate of Return IRR in 5 year	19.9%, =IRR(B0:B5) using benefit value
Net present value (NPV) in 5 year	52

"Starting Date" of CDM Project Activity

- Starting Date : "the earliest date at which either the implementation or construction or real action of a project activity begins"
  - "the date on which the PP has committed to expenditures related to the implementation or related to the construction of the project activity"
- If starting date is before the date of publication of the PDD for global stakeholder consultation
  - Need to show how the benefits of the CDM were seriously considered prior to the starting date

Guidance on the demonstration and assessment of prior consideration of the CDM

- New Project (starting date, on or after 2 August 2008)
  - Inform the start of the project activity and their intention to seek CDM status to a Host party DNA and the UNFCCC secretariat in writing within 6 months of starting date
- Existing Project (starting date, before 2 August 2008 and before the date of validation)
  - Indicate awareness of the CDM prior to starting date
  - Indicate that the benefits of the CDM were a decisive factor in the decision to proceed with the project
    - (e.g. minutes or notes of the decision by the Board of Directors)

Conclusions

- Feasibility study serves as an decision-making tool for the management whether to go ahead with the proposed project
- It is essential to understand feasibility and potential risks of the proposed project objectively and quantitatively.
- When decision-making was done, if you intend to implement your Project as CDM, you need to send LOI to TGO and UNFCCC for CDM.

Practice 1

1) Please calculate maximum capacity of Small Hydro Power Generation and annual expected electricity generation.

Assumption)

- ✓ Water volume : 11 (m^3/s)
- ✓ Water head : 74 (m)
- ✓ Efficiency of turbine : 0.9
- ✓ Efficiency of generator : 0.9
- ✓ Annual working time : 3600 (h) = 24 hours * 150 days
- ✓ Source: Suoi Sap 3 Hydro Power Project in Son La Province in Vietnam

Answer) _____ kW _____ kWh/year

Practice 2

2) Please calculate expected amount of electricity generated from Biomass Electricity Generation Plant.

Assumption)

- ✓ Rice Husk volume : 14,307 (tons/ 6 months), dry base
- ✓ source: Monitoring report of A.T Biopower Rice Husk Power Project in Pichit, Thailand

Answer) _____ kWh/ 6months

Practice 3 (a)

3a) Please calculate IRR of 10 years without CDM

Assumption)

- ✓ Investment cost: 1,500 million TBH
  - For Year 1
- ✓ O/M cost : 5% of investment cost
  - Operation starts from Year 2
- ✓ Annual electricity generation:210,000 MWh/year
- ✓ Electricity Tariff: 2.1 TBH/ kWh
- ✓ Biomass cost: 142,500,500 TBH/ year
- ✓ source: Phu Khieo Bio-Energy Cogeneration project (PKBC)

Answer) _____ % (IRR) without CER

Practice 3 (b)

3b) Please calculate IRR of 10 years with CDM.

Assumption)

- ✓ Cost and revenue items are same as in the previous slide
- ✓ Annual emission reduction is 100,000 t-CO_2/ year
- ✓ CER price: $10/ ton, or 300 Baht/ ton
- ✓ Source: Phu Khieo Bio-Energy Cogeneration project (PKBC)
  - Figures and contents are modified from the original PDD for simplification

Answer) _____ % (IRR) wit CER