

Conceptual Frameworks of Carbon Credit Registry System for Thailand

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Abstract—This research explores on the development of the structure of Carbon Credit Registry System those accords to the need of future events in Thailand. This research also explores the big picture of every connected system by referring to the design of each system, the Data Flow Diagram, and the design in term of the system's data using DES standard. The purpose of this paper is to show how to design the model of each system. Furthermore, this paper can serve as guideline for designing an appropriate Carbon Credit Registry System.

Keywords—CDM, CDM BE, Annex I Country, Non-Annex I country, CERs, Kyoto Protocol.

I. INTRODUCTION

THE current situation and the affect in the climate change and global warming is the main thrust for various countries to work together in order to prevent and amend the damage. Moreover, they work together in order to increase capability in facing with the changes that will happen both at local level and international level. As a result, the effort in amending the situations and their affects in the climate change and global warming became successful for the first time at the meeting of United Nations in 1992 in the form of the United Nations Framework Convention on Climate Change: UNFCCC.

In this framework, the countries are separated in groups: Annex 1 and Non-Annex 1. Each group has stated their intention and their realization on the issues of climate change which resulted from the amount of a gas called Green House Gases (GHGs) in the atmosphere. Therefore, it is necessary to maintain the stability of the GHGs' density in the atmosphere to be at a non-dangerous level to the climate and the ecosystem. In 1997, UNFCCC held another meeting in Kyoto. From this meeting, a treaty known as Kyoto Protocol was draft. The treaty states the obligation and mechanism for each country to come together and proceed to decrease the level of GHGs. In Kyoto Protocol, the countries are separate into Annex 1, which refers to 41 developed countries that has the obligation to decrease 5% of the GHGs in 1990 between the years 2008-2012. And the Non-Annex 1, 150 third world countries, has no obligation in reducing GHGs.

Thailand is one of the countries who realized the importance in solving global warming issues. Therefore, she

has agreed to cooperate in solving climate change issues by signing ratification with the United Nations regarding to climate change on December 28, 1994 as well as ratification of Kyoto Protocol on August 28, 2002 as one of the countries in Non-Annex 1 that has no obligation in reducing GHGs.

Even though, Thailand has no obligation in reducing GHGs but the approach of Kyoto Protocol does open the opportunity for developed countries, such as Thailand, to be part of the reducing GHGs under the Clean Development Mechanism project (CDM). This project was built in order to help the developed countries to fulfill their obligation to reduce GHGs through the investment in projects that contribute to the reducing of GHGs. This project is used to prove that the GHGs level has been reduced and the countries will receive Certified Emission Reductions (CERs) [1]. This CERs acts as a type of carbon credit that can be used in carbon market but the merchandise is in the form of certificate of ownership of the reduction in GHGs. Then, it can be used in calculating the level of released GHGs. Hence, Thailand realized the importance in developing the data storage system in support of the trading of carbon credit that would happen in the future.

II. BACKGROUND

From the guidelines in conducting the Clean Development Mechanism (CDM) under the Kyoto Protocol, it is stated that the projects involve need to assist in developing the sustainability of the host countries. Therefore, the developers of CDM must draw up a Letter of Approval (LoA) from the Designated National Authority (DNA) of the host countries in accordance to Sustainable Development Criteria (SD-Criteria). This is done in order to use as a criteria for consideration by CDM. Moreover, the approved project by CDM in Thailand must also pass the standard of Thailand Greenhouse Gas Management Organization (TGO) as well.

Not only the TGO has a duty in considering the approval of CDM projects, it also has a mission in monitoring, verifying, and evaluate the projects in order to make sure that such projects assist in reducing GHGs and support the sustainability of Thailand. The data relating to such procedures and CDM projects regarding to certification, monitor, verify, and evaluation are very important; such information can be used in determining measure in limitation of releasing the gas as well as determining the support policies in reducing the release of the gas.

For Thailand [2], Thailand Greenhouse Gas Management Organization or TGO acts as the DNA. Its duties are to consider the certification of CDM projects using Sustainable Development Criteria (SD-Criteria) as the standard in

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certifying CDM projects. Moreover, the projects need to pass the standard set up by TGO as well.

In Thailand have done special research analysis on the establishment of domestic carbon trading market in those years. We review research other such as LiuWeiping and DaiYongwu gave a detailed elaboration on the research progress of domestic carbon trading, analyzed the formation and significance of the international carbon trading, and comprehensively reviewed research situation of these important issues such as the initial reasonable allocation of carbon credits, the impact of carbon trading on the economy[3]. In addition, Zhang Dongsheng qualitatively divided the basic structure of the international carbon markets and then emphatically launched a thorough analysis of the project market in aspects of the trading entities, trading volumes, and trading types volumes, and trading types to the development of international carbon markets.[4] Zhou Yichen and Xue Huifeng considered that legal mechanism of China's carbon market must be built on the basis of international commitments, subjected to the position and principle that our country treated with global climate change, in order to add advantages in international carbon financial competition.[5]

A. Information System

Thailand has developed a CDM Project Management System and Monitoring System. Both of these systems have link to each other's data and both have a complete implementation through the designing in two parts in order to connect them to Carbon Credit Trading System.

1. CSM Project Management System

There are three types of CDM projects as followed:

- CDM Project as POA or Programme of Activities (CDM-POA)
- CDM Project as Bundle which is the projects using methodology in calculating small size projects and merged projects. This kind of projects can have more than one site.
- CDM projects as in general. The general projects that have one site or more.

After the project developer fed the basic data of the project and choose the project's type as mentioned above in Project Information System, the system will lead the project developer on to feed in information for TGO as specified by TGO itself. Afterwards, the calculation will separate indicator into four categories: 1.) Natural resource and environment indicators; 2.) Social indicators; 3.) Development and/or transfer of technology indicators; and 4.) Economic indicators. Furthermore, the data also goes through SD-Criteria Review System in order to get graded in each topic as indicate by TGO. Then, the data will go through Project Conclusion and Reporting System in order to get the summary and report of the projects.

2. Monitoring System

The Monitoring System is the system designed to follow up and evaluate the project after it has been approved through the CDM Project Management System by pulling some of the data from CDM Project Management System and link them in real time to the Monitoring System. The data will be used as reference in evaluation and follow up. In Fig. 1, it is shown the link in data and the link in systems for Carbon Credit Registry for Thailand:

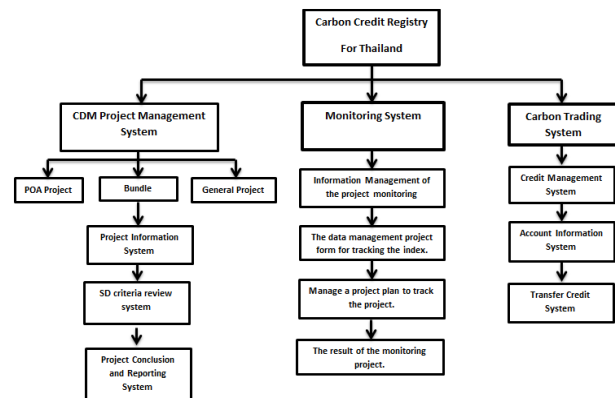


Fig. 1 Carbon Credit Registry for Thailand Framework

3. General Requirement for Mechanism Specification

Thailand has plan in the future to develop the Carbon Credit Registry System to connect with ITL. Therefore, the communications systems must be linked through internet system which has the need in specific technics as followed:

- Web service system using standards from Simple object Access Protocol (SOAP)
- Hardware in connecting Registry systems together through Virtual Private Network (VPN)
- Standard XML Formats in sending date
- The need to have security system in the part of digital signature authentication
- Network Time Protocol (NTP) system

4. Technologies and Standards Used to Develop the System

The development of the system uses technology in Web Service Base through php language. The database used is My SQL Server. For the standard in data reference, the type of data is from the standard of Data Exchange Standard (DES) which set the standard in exchanging data in Registry System under Kyoto Protocol.

III. INTEGRATED SYSTEM

The connectivity of Carbon Credit Registry for Thailand comprised of three systems. The first is CDM Project Management System which is a system used in the beginning of project's data collection. The projects are divided into three types: POA Project, Bundle Project, and General Project. All the three types will have basic data collected in sub-system's

module as Project Information System stores the project data such as project location, detail of project activities, contact names, map, SD criteria review system in comprised of Analyst System, Scoring System and Evaluation System that assist in considering the CDM Project to be Sustainable Development Project in Thailand in terms of natural resources and environment, social, technology development/ transfer and economic, Project Conclusion and Reporting System that present the results of consideration. Some of the data from CDM Project Management System is sent to Monitoring System to use as reference for evaluation.

For Carbon Trading System, the developer has designed three system modules: Credit Management System, Account Information System, and Transfer Credit System.

IV. CARBON TRADING SYSTEM DESIGN

The preliminary design of Carbon Trading System is comprised of three sub-systems: Credit Management System, Account Information System, and Transfer Credit System.

A. Credit Management System

Credit Management System collect data on country or region code, unit type, project number, and serial block number; the data is kept in Unit Serial Block Start and Unit Serial Block End. There is also a detailed data collection on Original Commitment Period, Applicable Commitment Period, and Track in order to convert to Carbon Credit in ERU. The data collection will also have the expiry date for the expiration of Carbon Credit using ICERs and tCERs in accordance to the standard set by DES (Data Exchange Standard) [6].

Project Identifier or determining the project number is done in accordance to National Registry System of each country; or in the case of it being CDM Project, it is determined by CDM Executive Board but still using DES standard.

B. Account Information System

In Account Information System, it is necessary to design specific data. The number of Account No. must not be repeated; the numbers that are used must be terminated and never bring back to use again. The designing of Account Information is done using standard from DES. The design comprised of Registry Identifier, Account Type, Account Identifier, and Applicable Commitment Period.

C. Transfer Credit System

Transfer Credit System comprised of Transaction Numbers. The condition of Transaction Numbers is to never repeat the number and after the Transaction Numbers have been terminated, it cannot be used again.

V. CONCEPT OF CARBON CREDIT TRADING SYSTEM PROCESS

From the design of Topic 4, the system and its process can be shown below:

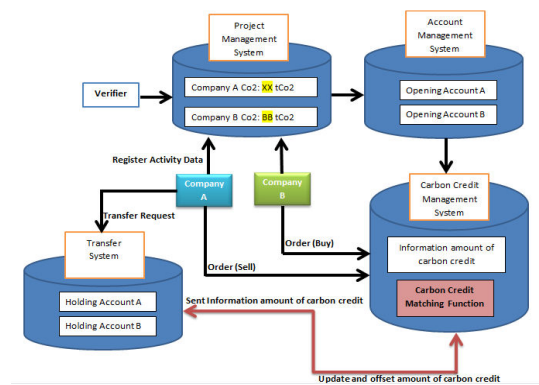


Fig 2 The process of Carbon Credit Registry

The picture shows the Carbon Credit Trading System and shows the example of transfer carbon credit process between company A and Company B. It shows the process of Company A and Company B register activity data to Project Management System. The Project Management System shows the amount of emission reduction of Company A as XX ton CO₂ and B BB ton CO₂ and then Company A and B will open account A and account B in Account Management System. The scenario 1, Company A would like to sell Carbon Credit and Company B would like to buy Carbon Credit, Company A and B sent request to Carbon Credit Management System as the system has Carbon Credit Matching Function to match information of Company A and Company B after they have sent transfer request to the Transfer System. After Carbon Credit has been transferred, the information will be updated and offset the amount of Carbon Credit on Carbon Credit Management system.

VI. CONCLUSION

This paper has shown the big picture of the overall relationship of the systems in order to build Carbon Credit Registry for Thailand. The paper also mentioned the connection between data. Moreover, this paper also examines and suggests information regarding to Carbon Trading System in Thailand that has not been implemented. This system designed data in accordance to DES standard. This paper presented the preliminary examination and design process in developing Carbon Trading System for Thailand in the future.

ACKNOWLEDGMENT

We are grateful for Thailand Greenhouse Gas Organization (TGO) who supported the significant amount of information for this publication. This publication is funded by Bangchak Scholarship, Sirindhorn International Institute of Technology (SIIT).

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