CLEAN DEVELOPMENT MECHANISM AS COMPETITIVE STRATEGY: AN ALTERNATIVE APPROACH FOR SUSTAINABLE DEVELOPMENT IN THAILAND

Danai Jeanpinitnan

A Dissertation Submitted in Partial
Fulfillment of the Requirements for the Degree of
Doctor of Philosophy (Development Administration)
School of Public Administration
National Institute of Development Administration
2018

CLEAN DEVELOPMENT MECHANISM AS COMPETITIVE STRATEGY: AN ALTERNATIVE APPROACH FOR SUSTAINABLE DEVELOPMENT IN THAILAND

Danai Jeanpinitnan

School of Public Administration

Associate Professor..... Major Advisor

(Pairote Pathranarakul, Ph.D.)

The Examining Committee Approved This Dissertation Submitted in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy (Development Administration).

Associate Professor..... Committee Chairperson

(Chindalak Vadhanasindhu, Ph.D.)

Associate Professor..... Committee

(Pairote Pathranarakul, Ph.D.)

Doctor ..... Committee

(Sutinee Sinutok, Ph.D.)

Associate Professor .....Dean

(Boon-anan Phinaitrup, Ed.D.)

December 2018

ABSTRACT

Title of Dissertation	Clean Development Mechanism As Competitive Strategy: An Alternative Approach For Sustainable Development in Thailand
Author	Mr. Danai Jeanpinitnan
Degree	Doctor of Philosophy (Development Administration)
Year	2018

The Clean Development Mechanism (CDM) is one of the environmental practice projects to tackle global warming issues that offer developing countries like Thailand an opportunity to attract investment in clean technologies, promote sustainable development and gain competitive advantage. Porter (1990) mentions that a nation's competitiveness will be subject to the capacity of each country to innovate and upgrade. CDM is presumed to benefit organizations and society, which can aid organizations in achieving a sustainable development agenda and competitive advantage simultaneously. However, the number of CDM projects in Thailand is marginal despite its benefits compared to neighboring countries in Asia. This research studies a policy implementation theory by Mazmanian and Sabatier in context of CDM implementation in Thailand. Although the original theory is well established, this study argues that an integrated model offers substantial ability. The model was expanded to integrate with other variables which were derived from the insightful data of decision makers and policy actors from 108 private organizations in Thailand. The main objective of this research is to examine the organizational perspective in terms of determining the factors influencing CDM policy and investigate what obstacles prevent CDM project initiation. Primary data collected from a review of in-depth interviews, observations, and questionnaires of CDM projects for data analysis will constitute the basis of solutions presented in this research. To achieve the research

objectives, this study proposed an integrated policy implementation model as the path diagram to explicate CDM implementation in Thailand. The new model contains constructs that have origins in several theoretical models and are discussed in detail with policy implementation theory by Mazmanian and Sabatier. The new integrated model is useful to indicate which environmental policy constructs have to be registered. The constructs of performance expectancy, effort expectancy, social influence, and facilitating conditions are included in the CDM implementation model. It is the organization who makes the decision to integrate clean technology into the operation, and it is the intention that has been investigated in this research. Finally, this study provides recommendations and suggestions for government, the business sector and the academic field. This policy study will provide alternative solutions on how to create collaborations to construct a paradigm shift among government and private organizations toward eco-friendly practices, competiveness, and sustainable development objectives.

ACKNOWLEDGEMENTS

I would like to express my deep appreciation to my research advisors Associate Professor Pairote Pathranarakul, for his guidance, enthusiastic encouragement and useful critiques of this research work. I would also like to recognize Dr. Sutinee Sinutok, for her advice in environmental data and assistance in keeping my progress on schedule. Nonetheless, I would like to thank Associate Professor Chindalak Vadhanasindhu for his useful critiques of research technique.

I would also like to extend my thanks to the GSPA NIDA staffs, especially Miss Orapin Kumkaew for her help in assisting me throughout administrative and academic process in the Ph.D. program. A very special gratitude goes out to all down at executives and organizations for helping and providing the critical information for the research.

Finally, I wish to thank my parents, Thana and Pornpan for their support and motivation throughout my study. I am grateful to my siblings and wife; Pacharakamol, Thanaporn and Chalisa, who have provided me through moral and emotional support in my life. I am also grateful to my other family members and friends who have supported me along the way.

Danai Jeanpinitnan

December 2018

TABLE OF CONTENTS

LIST OF TABLES

Tables **Page**

LIST OF FIGURES

Figures **Page**

CHAPTER 1

INTRODUCTION

1.1 Background

The force of globalization and environmental degradation has impacted the way organizations operate today. Organizations cannot deny the cost of environmental and social impact. From World Bank studies, the cost of environmental activity is high, but disregarding environmental matters would be even more costly. Porter mentions that a nation's competitiveness will be subjected to the capacity of each country to innovate and upgrade. Much empirical evidence suggests that organizations achieve competitiveness when they employ strategies that implement environmentally friendly technology and incorporate social costs into its operations. According to Oliver (1997), organizations gain advantage against competitors through strategic management and sustainable practices. Many scholars have claimed that an organization's sustainable advantage relies on its capability to manage the institutional context of its resource decisions (Oliver, 1997). An organization's institutional settings include the organization's culture, impacts of the government, society, and inter-relations between the firms that outline socially acceptable economic behavior. The clean development mechanism (CDM), as the countermeasure to social duty to attack environmental issues, was a first attempt to tackle these climate change challenges, and yet it was deliberated by UNDP as one of the leading factors toward sustainable development. This is one ecological issue which entails collaboration from every nation to help solve. Under the circumstance and the impact of environmental degradation are severe situations and all nations need to accelerate their awareness to all members for CO_2 reduction resolution. If environmental issues such as Climate Change and global warming continue escalating, they will be the most urgent issue, which no one should ignore because it affects all beings in the world.

The CDM concept uses an economic mechanism of monetary value for the safeguarding of the atmosphere through a trading scheme of carbon credits. By applying the Clean Development Mechanism, Annex I countries (developed nations) will compensate for tasks that remove or evade greenhouse discharges to the atmosphere in non-Annex I countries like Thailand by earning credits of Certified Emission Reductions (CER) activity that can be applied to offset emission GHG, which is certified by UNFCCC. CDM activities like solar farms and methane avoidance allow emission-reduction in developing countries to earn CO_2eq credits, or CER, each equivalent to one ton of CO_2 emission. These CER credits can be bought and sold in the primary market and voluntary market, which are used by industrialized countries like the EU to a meet their emission reduction objectives under the agreement, and thus help tackle the high CO_2 emission rate (Kyoto Protocol). These market based solutions will promote emission reductions in practice and raise public awareness of climate change, while allowing developed countries some room to fulfill their emission limitation targets. Likewise, the recipient countries can gain benefit from the advanced clean and efficient technology. Nevertheless this investment will allow factories or energy generating plants to operate more efficiently. Besides saving abatement costs, the goal of the CDM is to promote sustainable development in many dimensions, as stated in many research studies (Olsen, 2007).

Most organizations respond to ecological and social concerns if they are being attacked by public responses to issues that the company had not previously thought about being their business responsibility (Porter & Kramer, 2006). On the same token, organizations should operate in ways that secure their long-term economic performance by avoiding short-term behavior that is socially damaging or environmentally wasteful. The environmental and social concern concept works for problems that occur with an organization's benefit as well as regulatory notices of the public. According to Porter and Kramer (2006), successful organizations will need a strong social acceptance. Utilization of efficient land usage, water conservation, energy production, and other natural resources makes business more productive and gains a competitive nature over rivals. A strong organizational strategy which shows concern over environmental and social impacts enhances value added to the firm's value chain. Finally, a healthy society constructs growing demands for business as

their individual needs are met and ambitions grow. An organization that pursues its business objective at the cost of the environment and society in which it operates will find its success to be deceptive and eventually resistance from the social body.

In parallel, a healthy society needs successful organizations. No social program can match the private sector when it comes to outcomes that can generate the jobs, wealth, and innovation that improve living standards and social conditions over time (Porter and Kramer, 2006). To put these ideal principles into the real world, an organization must incorporate a social dimension into the core business strategy which it already uses in order to understand market competition and guide its business vision. CDM is one of the answers to an alternative path for gaining that competitive advantage (Olsen, 2007). Not only corporate activity affects society, but external social conditions also influence corporations, for better and for worse (Porter & Kramer, 2006). Activities in an organizational context impact the locals that business operates with and can generate either positive or negative social consequences. Although companies are progressively conscious of the social impact of their activities, these impacts can be more elusive and variable than the organization realizes. Organizations that neglect to foresee in the environmental and social programs the magnitude of this progressing issue of research have been liquidated by the results. Without a careful process for identifying the evolving social effects of tomorrow, organizations may risk losing their competitive edge.

Many scholars, especially Porter, state that organizations' competitive advantage can be gained through innovations, which include the relevance of new technologies and new ways of processing. During the past few decades, Thailand has experienced mixed results in the development of conservative ways of organizational practices. The National Economic and Social Development Board (NESDB) of Thailand states that the country has enjoyed growth and transformation in many ways, especially in an economic aspect. The development of Thailand has relied on its natural resources and it now has degraded land and water quality, causing the loss of ecosystems, and generating high levels of GHG activities (World Bank, 2014). At the national level, the country's development has brought high rates of energy ingestion, extensive use of dangerous chemical products without proper management, natural fragmentation, and more harmful activities. At the community and individual levels,

economic progress is been a tradeoff, with consumption of more natural resources and energy, which leads to an increase of GHG emission activities.

The UN report on Climate Change mentions that Thailand is among those countries with high risk of most exposed regions to rising sea level. Additionally, the Asia-Pacific region is faced with increasingly extreme rainfall like never before from El Nino. Thailand and the surrounding region are facing uncertainty as to which country is listed among the most vulnerable to receive the impacts of environment issues like climate change. Moreover, Thailand was ranked as one of the top countries which were affected by climate-related impacts from 1994-2013. Thailand is also considered one of the countries under the UN watch list in the "high risk" category that are most vulnerable to future environmental impacts over the next three decades. According to Climate Watch Data, from 1955 to 2005, Thailand experienced an increase of 0.95° C. for mean temperature, 0.86° C. for maximum temperature and 1.45° C. for minimum temperature.

Over the last decade, the number of rainy days in Thailand has expressively declined by 0.99 days per the nation-raining-day's database, while rainfall intensity increased on a daily basis. Data projections show denser rainfalls are foreseeable in parts, with high forecasted precipitation levels, such as for the southern region, whereas for the arid northeastern region of Thailand, the precipitation level is predicted to drop even further. As a result, escalation of severe flooding and drought can be expected. Severe situations of flooding could be similar to the 2011 water flooding in Thailand, nationwide, which caused damage of as much as $40 billion US dollars to the Thai economy, and resulted in an appraised 2.5 percent drop in the industrial production index. The economic deficit due to Thailand's drought can be estimated as equivalent to 0.52 percent of the nation's GDP in 2015, with disparate impacts to the agricultural segment, and in particular to cultivators.

To progress toward a more balanced development and reduce GHG production in Thailand, a shift of conceptual thinking in organizational practices for reducing GHG emission that is on the pathway of global pressure and the climate change issue is needed. It is therefore crucial that cooperation of private and public sectors, through a CDM focus on cooperative attempts to unlock the potential of developing countries, contribute towards the global cooperation to climate change by tackling these

important barriers, making suitable solutions more affordable for non-Annex I, and strengthening the ability of CDM implementation resolutions more efficiently and more sustainably. Successful implementation of clean technology mitigation in Thailand will be subject to acceptable and predictable access to promoted means of the implementation agreement under the UNFCCC for GHG of a 20 percent reduction by 2030 (UNFCCC, 2018).

Thailand is among the leading non-Annex I countries that recognize the significance of undertaking the problem of GHG and environmental concerns. Thailand signed the agreement with UNFCCC in June 1992 and endorsed the agreement in March 1995. Understanding the significance of climate change as a high threat, Thailand has been backing international determinations to address climate change concerns as a non-Annex I country (TGO, 2014). Thailand promotes the application of CDM (Kyoto Protocol) to inspire clean and environmentally friendly technologies for greenhouse gas reduction in the country, and to encourage the country's potential by evolving sustainable development in its business practices (TGO, 2014). The CDM is among the first steps that governments took in addressing the hazards posed by the climate transformation issue. The CDM is an innovative feature under the global cooperation of the UNFCCC, which aims to alleviate the concentration of GHG in the atmosphere to prevent hazardous anthropogenic intervention with the ecosystem (UNFCCC, 1998).

Under the implementation of CDM, individual, private, and public organizations in Thailand are encouraged to reduce their CO_2 footprint activities, manage energy consumption with efficiency and generate electricity from alternative sources with low GHG release, while stabilizing the socio-economic condition. Moreover, the UNFCC framework for CDM suggests initiation, promotion, improvement and development by local actors who are stakeholders. The stakeholders and local actors, such as NGOs, must be chosen into account along with suggestions and assistance offered from various organizations in terms of funding, technology, and particularly learning processes, of their lifestyle in their own community. By implementing CDM, Thai organizations can lower costs because organizations can improve operational efficiency, reduce waste, and generate alternative energy sources. In addition, the process generates additional revenues from better products and brand

image or enables organizations to create new business with CER trading. In fact, according to Porter, these benefits are the goal of increased competitive advantage through innovation and leads to sustainability, so modern organizations now treat CDM as a sustainable business practice. However, the number of Thai organizational participants in CDM policy is marginal compared to other developing countries which promote CDM, such as, China, India, and Vietnam. Because of the potential of CDM, increasing CDM implementation could serve the multiple purposes of reducing the emissions of developing countries, increasing organizational competitive advantage, and changing their objective of development to a sustainable practice. Therefore, it is essential to study the factors contributing to current CDM implementation in Thailand.

From the literature stream, there is a gap in the literature as to why there are so few organizations implementing CDM in Thailand, what factors influence organizations to implement a CDM program, and how CDM implementation can offer suitable prospective contributions to sustainable development. In this study, the main objectives are to study the factors that influence CDM implementation and to explore the sustainable development aspect in Thailand, to explain implementation obstacles, to test the causal relationships of a policy implementation model, and to develop a practical model which offers an explanatory and predictable potential for CDM implementation and sustainable development. In fact, many scholars in policy study support the policy implementation framework, which was developed by Mazmanian and Sabatier as an effective tool in policy implementation study. However, this study argues that although the original theory provides explanations for effectiveness in the policy implementation process, a theory that integrates additional variables offers explanatory and prediction potential. As the result of this study, the modified Mazmanian and Sabatier policy implementation framework can demonstrate how an integrated theory can predict an organization’s behavioral response to CDM policy in Thailand and discover CDM implementation barriers. Therefore, the factors affecting decisions to implement CDM in Thai organizations are essential to enhance a competitive advantage and create an alternative approach for sustainable development solutions which commit to the benefit of society and are also valuable to the organization.

1.2 Statement and Significance of the Problem

At COP21 in Paris, in December 2015, nearly 200 countries agreed to hold "the increase in the global average temperature to well below 2° C. above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5° C." The purpose of alleviating temperature intensification under 2° C. was motivated by global anxiety over the immense scale of economic, social, and ecosystem damage that could result from the collapse of monitoring climate change realistically. Nonetheless, environmental policies, if appropriately designed and implemented, can be uniform with growth, development, and poverty reduction. The evolution to a low-CO_2 society or economy is potentially a robust, attractive, and sustainable approach, marked by higher flexibility, more modernization, more suitable cities, vigorous agriculture, and a stronger environment. In order to efficiently deliver and fully realize the potential benefits of climate policies, careful policy design is essential. The major accomplishment of the CDM is bringing awareness to the fact that all nations need to reduce GHG emissions and protect the global environment. Even if the goals of the mechanisms are not met, it has been a great starting point (UNEP, 2014). The CDM is helping Annex I and non-Annex I, together, to protect the earth, especially the ozone layer, which causes global warming. It shows that the global community is serious about environmental protection and shows Annex I to be less egocentric and more focused on solving climate change.

According to TGO, Thailand signed the UNFCCC in June 1992 and ratified the Convention in March 1995. Ever since, Thailand has promoted the implementation of CDM under the Kyoto Protocol in order to encourage clean and environmentally friendly technologies for greenhouse gas reduction in the country, as well as to promote the country's capability by developing sustainable business practices. CO_2 prices are envisioned to give required incentives in investment, manufacture, and consumption behaviors, and to encourage the technological transfer that can trigger a future reduction of costs. By becoming a UNFCCC member, Thailand has commitments and obligations to address global warming. The effects of global warming, alongside obligations to the UNFCCC, affect and constrain national development efforts, both at the macro and micro levels (NESDB, 2017).

Furthermore, as to constraints to monetary and social development due to international commitments, Thailand has also been affected by the use of natural resource and environmental disputes because of non-trade barriers enforced by other countries

It is essential for Thailand to integrate natural resource and environmental management, public and private cooperation, and obligations that pertain to social and environmental issues in order to achieve the nation's competitive advantage. It is similarly necessary for the country to apply intercontinental environmental treaties to enhance Thailand's national standards for environmental protection in order to safeguard its natural reserve base and biological balance and to maximize the social benefits from limited natural resources (NESDB, 2017). As well as gaining a competitive edge in the global trade arena, organizations that neglect their social and environmental impact are potentially banned by the global community, as seen in many refinery enterprises. This would require the private and public contribution and alteration of production processes and consumption to make the product or service more eco-friendly and maximize energy efficiency and conservation. Measures taken must fully consider the potential impacts to the environment, sustainability, energy safety and security, in order to achieve a balance between economic and social development and environmental protection.

Nowadays, Thailand's policy on climate change has been created. It ensures that the country's commitments and obligations to the UNFCCC and the Kyoto Protocol are fulfilled and are consistent with the national interest. An ideal environmental development approach was used to achieve a balance among the economic function, social and environmental sectors. In the planning process, a bottom-up approach and stakeholder consultation were applied (NESDB, 2017). The policy on climate change under the 11^{th} Plans has been included by the National Economic and Social Development Board (NESDB). The CDM has been continued up to the present. Under NESDB policy, Thailand articulated national policies on natural resources and energy to enhance greenhouse gas mitigation, both indirect and direct impacts (NESDB, 2017). However, the number of organizations responding to CDM is questionable, which leads to this study that attempts to answer the question of what factors affect CDM implementation in Thailand.

To progress toward sustainable development and enhance competitive advantage, there needs to be a shift in organizational strategy that is in line with the forces of globalization, while protecting both the society and the nation from adverse impacts arising from climate change. Given the forgoing observations, it is obvious that some organizations do not respond to the CDM policy. The number of CDM initiatives has gradually increased despite the urgency of the climate change issue. Moreover, there is a gap in the literature as to why there are so few organizations implementing CDM in Thailand, what factors influence an organization to participate in a CDM program, and how CDM's competitive advantage can lead to sustainable development. Consequently, CDM policy implementation must be studied to determine organizational recognition of CDM benefits and to initiate the awareness of global pressure on climate change issues. Therefore, factors affecting CDM implementation in Thai organizations are essential to develop a practical model and to create sustainable solutions for a balanced and sufficient development practice which commits to global demand for GHG reduction. The significance of this study will enhance organizations' and perhaps the nation's competitive advantage, public consciousness of climate change issues, and decisions on all institutional levels to implement CDM.

1.3 Objective of the Study

This study intends to discover factors that affect the implementation of a CDM program in Thailand. It seems that public policy problems arise out of the interaction between government and implementers because there are so few CDM implementers, despite the promotion campaign. Central government can only indirectly influence organizations to participate in a CDM program (TGO, 2014). Responding to the above aspects, the main objectives are:

1) To study factors that influence CDM implementation in Thailand.

2) To explain implementation obstacles which decrease the number of organizations implementing CDM.

3) To test the causal relationship of CDM implementation and sustainable development, which will help explain the impact of CDM towards sustainable development.

4) To develop a practical solution that offers an alternative approach for sustainable development in Thailand.

As a result, factors affecting CDM policy implementation, for instance, benefits, relevant regulations, conditions and procedures for project implementation, will identify major factors affecting the decision process and illustrate indicators for assessing project selection for greater success in implementing CDM policy. Hence, this study will benefit government agencies and organizations with a practical approach to promote CDM implementation, enhance competitive advantage, and aid the country to reduce GHG emission as committed to by global agreement under the United Nations Framework Convention on Climate Change (UNFCCC).

1.4 Scope of the Study

The scope of this research study is confined in terms of three aspects: specific CDM activities, specific organizations, and specific populations.

1) The Thailand Greenhouse Gas Management Organization (TGO) outlines several areas of CDM activities. This study will focus only on two main project activities, the Methane avoidance project, and the Biomass to energy project. These two CDM activities have occupied a majority of CDM projects in Thailand.

2) A number of organizations carry out CDM activities under the supervision of TGO and UNFCCC. The study will focus on the evaluation of CDM activities in the projects carried out by private organization only.

3) CDM disseminated by TGO may involve many groups of people. This study, however, will evaluate with respect to specific populations of individuals directly involved in policy implementation and decision making authority, such as officials who carry out authoritative power and can influence organizations in CDM implementation.

1.5 Limitation of the Study

Due to the time limitation, this study concentrates on CDM projects which were approved by TGO and UNFCCC. The registered organization is trading CERs in the mandatory market only. Typically, CDM activities and projects are traded in the

mandatory and voluntary market. However, time does not allow this study to collect data with organizations that are not approved by the UNFCCC to trade in the voluntary market, which has a different market mechanism and unit of analysis.

Moreover, because of resource limitation, it is not possible to investigate all CDM implementers that trade CERs in the mandatory market. The study therefore uses a purposive sampling technique to collect data from private organizations that obtain certification from TGO and UNFCCC and contribute more than 10,000 tCO_2e. These organizations meet both TGO and international standards (UNFCCC) for CER trading and successfully implemented CDM technology, who thus far are leaders in this field in terms of GHG reduction and CER trading. Therefore, significant factors can be extracted from this population. There are 163 CDM projects that have received CERs and meet the requirements for this study.

1.6 Benefits of the Study

This research study generates the following benefits:

1) The study contributes to an understanding of organizational behavior, particularly in the field of policy implementation. This also is a parameter in development of the study for CDM implementation obstacles in Thailand and development of a practical policy implementation model towards a sustainable development paradigm.

2) The study will lead to the enhancing of competitive advantage for Thai organizations and create added value, which is a benefit for society and the organization’s practice.

3) The study contributes to an understanding of direct and indirect factors relating to the organization’s decision process in CDM implementation.

4) The study demonstrates how the integrated model can explain the organization’s behavioral response to CDM policy in Thailand, which delivers new knowledge to academic society.

5) The study contributes to the learning of policy implementation in the field of public policy.

CHAPTER 2

LITERATURE REVIEW

2.1 Background

This chapter consists of three main parts, which are: the history and objectives of how the global community can help resolve the climate change issue, theoretical backgrounds, and proposed conceptual framework. The first part elaborates on the foundation of the United Nations Framework Convention on Climate Change (UNFCCC), Kyoto Protocol, and Clean Development Mechanism (CDM) in non-Annex I countries, including China, India, Vietnam, and Thailand. The second part in this chapter uses Mazmanian and Sabatier's policy implementation framework for evaluating a policy to support the policy evaluation under study. As the policies are interpreted in terms of project implementation, the output is the dissemination of significant factors which lead to implementation. In order to study whether an implementation factor affects the target population in their decision for CDM projects, additional factors are used to support the study. Mazmanian & Sabatier's Implementation Framework, incorporated with globalization, transparency, environmental benefits, and socio-economic benefits, can give a better explanatory potential which supports CDM implementation and sustainable development with empirical evidence from related literature. The last section illustrates the proposed conceptual framework, which presents a path diagram showing the causal relationship between variables.

2.2 United Nations Framework Convention on Climate Change (UNFCCC)

The impact of climate change and global warming as a global pressure is facing significant tension for cooperation and solutions from all disciplines and fields of research and development. This tension has urged both developed and developing

countries to resolve climate change, as it is no longer a local problem but is now on a global scale, which will affect every living being on earth. The situation and the impact of climate change and global warming is a serious enough situation for the United Nations to escalate the awareness of it to all its members.

The United Nations Framework Convention on Climate Change (signed in Rio in 1992, and implemented in 24 March 1994) sets an overall framework for intergovernmental efforts to tackle the challenge posed by climate change. The climate change issue either impacts on-- or is impacted by-- global issues, including poverty, economic development, population growth, sustainable development and resource management (UNFCCC, 1998). The impact of climate change and global warming has escalated to a global issue, with pressure for collaboration and resolution from all members.

This tension has urged both developed and developing countries to resolve these climate changes, as it is no longer a local problem but now on a global scale, which will affect every being on earth, for example, the increasing of global temperature, the melting of glaciers, drought in the Amazon river, and the rising of sea level. All nations must come to agreement that the world's ecosystem is a shared resource whose permanence can be influenced by all nations. The increased emissions rate of GHG and other greenhouse gases is a global issue which needs prompt solutions. The UNFCCC possesses near permanent membership, with 189 countries having consented to the Kyoto Protocol (UNFCCC, 1998).

2.2.1 Kyoto Protocol

The Kyoto Protocol bonds the common objective, principles and institutions, but expressively strengthens the agreement by committing 35 industrialized countries, called Annex I Parties, legally-compulsory targets to limit or reduce their GHG emissions. Developing countries (non-Annex I parties) do not have such a legal obligation to reduce their emissions in the first commitment period 2008-2012. After several years of political log rolling, the protocol was finally implemented on the 16th of February 2005 and ratified by 170 parties representing 61.6% of total GHG emissions (Benecke, Friberg, Lederer, and Schröder, 2008).

While the Kyoto Protocol is clearly inadequate to reach the ultimate objective of the Framework Convention, avoiding dangerous climate change, it has already had an important impact. Most actors (state and non-state) now take climate politics seriously and are starting to take action. Business, industry associations, lobby groups and NGOs have emerged that aim to influence policy making in this field. Forerunners such as the EU and its member states have developed policies trying to curb their emissions, and from them policy innovations such as emissions trading for CO_2 and renewable energy policies are starting to diffuse to other countries. The steps taken so far, while being important first ones, are wholly insufficient, and it is clear that the majority of industrialized states with Kyoto targets (so called Annex I countries) will reach their modest reductions by 2012 only if there is a dramatic strengthening of efforts as well as a broad use of the Kyoto flexible mechanisms (UNEP, 2014). Therefore, the most effective and efficient emission reductions have begun. This has led to both a broader use of new technologies as well as development of the so-called flexible mechanisms of the Kyoto Protocol.

According to UNFCCC, Kyoto protocol, Article 2 states that each Party included in Annex I, in achieving its quantified emission limitation and reduction commitments under Article 3, in order to promote sustainable development, shall: Implement and/or further elaborate policies and measures in accordance with its national circumstances, such as:

1) Enhancement of energy efficiency in relevant sectors of the national economy;

2) Protection and enhancement of sinks and reservoirs of greenhouse gases not controlled by the Montreal Protocol, taking into account its commitments under relevant international environmental agreements; promotion of sustainable forest management practices, afforestation and reforestation;

3) Promotion of sustainable forms of agriculture in light of climate change considerations;

4) Research on, and promotion, development and increased use of, new and renewable forms of energy, of carbon dioxide sequestration technologies and of advanced and innovative environmentally sound technologies;

5) Progressive reduction or phasing out of market imperfections, fiscal incentives, tax and duty exemptions and subsidies in all greenhouse gas emitting sectors that run counter to the objective of the Convention and application of market instruments;

6) Encouragement of appropriate reforms in relevant sectors aimed at promoting policies and measures which limit or reduce emissions of greenhouse gases not controlled by the Montreal Protocol;

7) Measures to limit and/or reduce emissions of greenhouse gases not controlled by the Montreal Protocol in the transport sector;

8) Limitation and/or reduction of methane emissions through recovery and use in waste management, as well as in the production, transport and distribution of energy.

In the Kyoto Protocol three flexible mechanisms were included. These consist of international emission trading (IET); the Joint Implementation (JI) project mechanism for former communist transition countries; and the Clean Development Mechanism (CDM) for emission reduction projects based in developing countries (RISO UNEP, 2014). The main rationale behind these policy innovations was to allow Annex I countries cost effective climate change mitigation. The CDM is by far the most prominent of the flexible mechanisms. In 2006, 522 Mt CO2e of CDM credits where traded, with additional secondary trading of 40 Mt. Together these transactions came at an estimated value of €3.9 billion. Joint Implementation (JI) reached just 21 Mt, €95 million in 2006, whereas the IET has yet to be implemented (Benecke, Friberg, Lederer, & Schröder, 2008). The environmental mechanism has created the first internationally bartered commodity ever established by a multilateral conservational agreement (certified emission reductions (CERs)), and consequently it seems to be of curiosity for policy study as much as for academic exploration on how CERs come about and what impact they have. The CDM as a market instrument is one of the most important building blocks in the developing carbon market, and thus we take it as our starting point. This is of particular interest as the governance of the mechanism has lately become a “hot topic” (Streck, 2007).

2.2.2 COP21 Paris Agreement

According to the U.N. Framework Convention on Climate Change (UNFCCC), it reached a breakthrough settlement on December 12th, 2017 in Paris, following an essentially new sequence in the Kyoto Protocol, a global climate effort. Concluding years of negotiating series, the new agreement ends the strict variation between Annex I and non-Annex I countries that categorized earlier efforts, exchanging it with a common framework of commitment from all countries to move forward with their best efforts and to support all nations in the upcoming target years. This embraces requirements that all nations report regularly on their GHG emissions and reduction implementation efforts, and endure international review from UNFCCC.

The convention and an escort decision by nations were the key consequences of the COP conference. This event is known as the 21st session of the UNFCCC Conference of the Parties) or COP 21. The Paris agreement and the COP decision's details are included in Appendix B.

Thailand attended COP21 in December, 2015. Following COP21, Thailand's Prime Minister, General Prayut Chan-o-cha, said that Thailand had adopted the Philosophy of Sufficiency Economy as a way to carry out sustainable development in the country, as part of his speech delivered in Paris at the 21st session of the Conference of the Parties to the United Nations Framework on Climate Change.

Prime Minister Prayut pointed out that changes in climate have caused impacts on all sectors, especially in developing countries. The global temperatures and sea level have increased and droughts have become severe. As a result, many people are not able to have access to clean water, while the agricultural sector has insufficient water for cultivation. This will affect food security, and already more natural disasters are being seen all over the world. The Prime Minister urged all countries to cooperate and provide assistance in the form of finance, technology transfer, and capacity-building in order to protect global natural resources. Efforts to limit global temperature rise to 1.5 degrees Celsius or 2 degrees Celsius, should take into account the differences of each country, as well.

With Thailand's reduction emission target, Thailand pledged a 20 to 25 percent reduction in its emission of greenhouse gases by 2030 (UNFCCC, 2018). The

country has launched several environmental campaigns, especially those concerning garbage disposal and reforestation in ASEAN. It also promotes the use of eco-cars and electric trains and has a roadmap to reduce haze pollution.

2.2.3 Clean Development Mechanism (CDM) and the Carbon Market

Greenhouse gas emission is a process that occurs from economic activity in the manufacturing process, transportation sector and agricultural activity, which has led to the commandments for global warming that impact human life and various organisms. The Act for greenhouse gas emissions that occurs in the country was signed at the UN Convention. Under the UNFCCC, Annex I countries, or developed countries, must lead in reducing greenhouse gases and help developing countries tackle climate change, which should occur with the following principles:

1) Precautionary principle
2) Common but differentiated responsibility
3) Communication, information exchange
4) Assistance to vulnerable groups

The Kyoto Protocol requires countries to jointly reduce greenhouse gases of six types which are the main causes global warming. Sulfur hexafluoride (SF_6) has the potential to cause the most. SF_6 can stay over the atmosphere for up to 3,200 years to decompose (TGO, 2014).

As the debate on climate change moves from the scientific field to the realm of policy and economics, the question of how to address “the biggest long-term threat facing our world” is arguably the greatest public policy issue of our time (Blair, 2007). In this emerging policy discussion one of the prominent questions is cost, or what the most cost efficient ways to curb emissions are. Economists agree that climate change will be expensive, but ignoring it could be ruinous. A review of the economics of climate change by the World Bank calls it “the greatest and widest-ranging market failure ever seen,” but also indicates that one of the solutions is “to create carbon prices and markets, to accelerate innovation and deployment of low-carbon technologies” (Stern, 2006). The most important market mechanism created within the United Nations Framework Convention on Climate Change (UNFCCC) and its Kyoto Protocol is the Clean Development Mechanism (CDM).

In the late 1980s under the Reagan administration in the United States there was a growing neoliberal sentiment that saw inadequacies with the traditional "command and control" regulation, and argued in favor of using market instruments to tackle policy problems. This notion was taken up in environmental policy making. For example, in the 1990 Clean Air Act such a market approach was taken to tackle Sulfur Dioxide (SO_2) emissions causing acid rain, a previously unregulated problem in the US. Given the difference in abatement costs for the covered power plants, this proved to be a much more cost-efficient regulatory approach that was able to achieve greater emission reductions than traditional technical regulations (Stavins, 1998). The idea of using a market approach for setting up efficient mechanisms was again included in the Montreal Protocol on Substances to deplete the Ozone Layer in 1987, and then later in the Kyoto Protocol in 1997.

The CDM in particular arose out of a Brazilian proposal for a Clean Development Fund at negotiations in the late 1990s. The United States changed this proposal into something quite different. It sought to establish a protocol that would have as much flexibility in achieving emission reductions as possible, and one with the possibility of international emissions trading to achieve cost-effective emission reductions. At that point the creation of emission markets was considered a controversial element and was opposed throughout the Kyoto negotiations by environmental NGOs and also, initially, by developing countries, who complained that Annex I should first rearrange the commitment structure. Ultimately, and mainly on US determination, CDM and the other flexible mechanisms were recorded into the Kyoto Protocol. It is the great paradox of the climate solution, that the concept of a trading scheme later became the foundation of the EU policy to attack the climate change issue, despite the fact that the EU was initially quite skeptical about this approach, and that the US, who championed this approach, later decided to leave the Kyoto Protocol anyway. There are still critical views of the use of market mechanisms in the climate regime, but as the concept has advanced into the mainstream, they are no longer as widely held (Lohmann, 2006).

The CDM is one of the flexible mechanisms set up by the Kyoto Protocol to reduce GHG emissions through investments in projects that reduce or avoid emissions in developing countries. Figure one shows how this works in detail. Each CDM

project is set up by a project developer who receives CERs for the amount of GHG avoided (Benecke, Friberg, Lederer, and Schröder, 2008). The demand for CERs derives from Annex I, who can count these credits towards their GHG reduction compliance. There are more than 12,000 organizations covered by the EU emission trading system (EU ETS). CERs can also be used to credit for a partial quota of their emission reduction conformity within this internal EU system for GHG reductions. Japanese firms buy CERs to meet their voluntary targets. The CDM has the dual goal of providing cost-efficient GHG emission reductions and local sustainable development benefits. Carbon Credit is a byproduct or Emission Reduction (Commodity) that will be traded in the market, especially the so-called carbon market, with a product that is in the nature of the document. The amount of greenhouse gas reduction and greenhouse gas emissions are expressed in the tone of carbon dioxide equivalent/year. (TCO2e/year) and the amount of greenhouse gases can be reduced through the certification called CERs, or Emission Reduction. According to UNFCC, the management of Clean Development Mechanism projects is based on four major aspects.

1) Voluntary: The activities of the project are operating voluntarily. no regulations.

2) Additionality: As an activity that cannot be carried out normally. But it must be done on incentives based from CDM projects.

3) Sustainable Development: The project is in line with the principles of sustainable development and is transparent.

4) Certified by UNFCCC through the Commission's Clean Development Mechanism (CDM Executive Board), which has its headquarters in Bonn, Germany and has been certified by the UN.

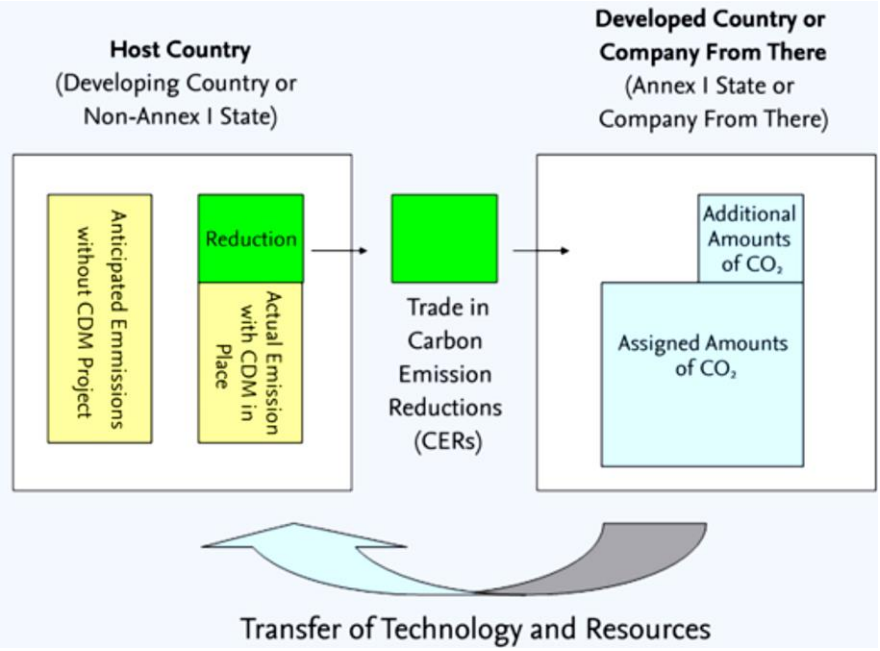


Figure 2.1 CDM Framework

Source: Benecke, Friberg, Lederer and Schröder, 2008.

2.2.4 Carbon Market

The Carbon market refers to a market for the purchase of permits to release greenhouse gases by members. The market will determine the amount of greenhouse gas emissions and the allocation of quotas or licenses to its members. If the market is allowed to emit more or buy carbon permits from other members, a cumulative amount of carbon will be sold. The amount is equivalent to reducing carbon emissions. The GHG reduction is called carbon credits (CERs). The Carbon market consists of two main markets.

1) The market's response to the agreement (Compliance Market) is divided into several markets.

A market which is established to operate under the Kyoto Protocol. Or, a carbon credit must have been certified by government agencies to care for CER and ERU implementation of the project, including:

(1) The amount of greenhouse gas emissions allowed for countries that are bound to control their emissions, or Annex I countries if they cannot reduce greenhouse gases. Sales are measured as the amount of greenhouse gases, or AAUs (Assigned Amount Unit).

(2) Greenhouse gas emission reduction of non-Annex I countries, or in the pipeline of CERs.

(3) Emissions of greenhouse gases in the Annex I countries under the program. JI cooperation with units measuring greenhouse gas reduction are called ERUs (Emission Reduction Unit).

(4) The amount of greenhouse gases absorbed from the atmosphere of the Annex I countries. The types of land use, land use change and forestry.

(5) EU market: the measured amount of greenhouse gas reduction is called EUA.

(6) Marketing New South Welsh: the measured amount of greenhouse gas reduction is called NGAC.

(7) UK market: the measured amount of greenhouse gas reduction is called CCLA.

(8) Market managed by Chicago.

2) A market caused by the voluntary (Voluntary Market) market is a buyer-seller. They operate by agreement among themselves without the need to be certified by the government. A measured amount of greenhouse gas reduction is called VERs (Voluntary Market).

(1) Market with the amount of greenhouse gas emissions. A measured amount of greenhouse gas. The CDM allows the release CFI (Carbon Financial Instrument) as the market of Carbon managed by Chicago, or CCX (Chicago Climate Exchange).

(2) Market with bilateral trade agreement. Between buyers and sellers, or OTC (Over the counter market) can be traded among themselves, either directly or through a broker.

According to UNFCCC, there are 12,924 projects by host countries. Most CDM projects are located in two main regions of non-Annex I, which are 10,364 projects in the Asia & Pacific region, and 1,935 projects in Latin America. In 2012, CDM projects contributed more than 2 million tons of GHG reduction. Asia & Pacific occupied most CDM projects, with 4,172 participating, and thus contributed more than 80 percent of GHG emission reduction.

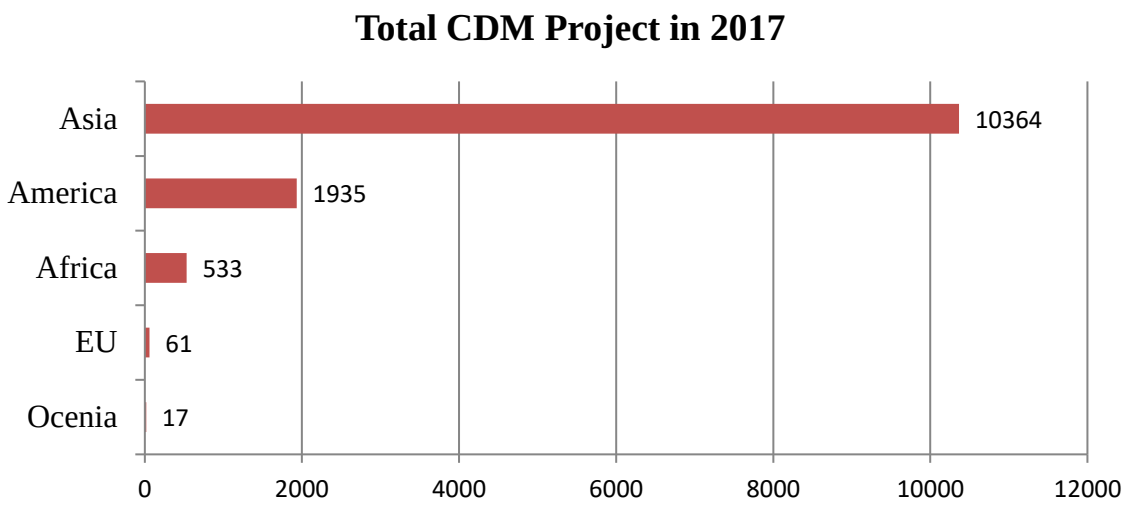


Figure 2.2 CDM Projects by Host Country in 2017

Source: UNFCCC, 2017.

2.2.5 Clean Development Mechanisms in China

China is home to 49 percent of the issued CDM credits. The Chinese government has successfully put in place a facilitating framework for CDM investors. Meanwhile, the government has also used the CDM as a means to raise public funds and to influence project selection through differential tax rates on various types of projects (The World Bank, 2013). CDM has five local designated operating entities to perform project assessments and issue certifications. CDM participation has improved the financial viability of renewable energy (RE) projects in China. RE producers in China generally can count on two sources of revenue, one from electricity sales and the other from the generation and sale of Certified Emission Reductions (CERs) through the CDM. The latter can account for as much as 20 percent of a developer's total revenue.

Table 2.1 Number and Distribution of CDM Projects in China

Country/Region	Number of Registered Projects	China's Contribution
China	5,033	-
Asia Pacific	10,362	49%
World	**12,924**	**39%**

Source: UNFCCC, 2017.

The CDM offers important opportunities for sustainable development in China. The energy sector, in particular, could benefit through new approaches in energy efficiency and renewable energies. Emissions reduction options can be transferred to industrialized countries to meet their obligations under the Kyoto Protocol (World Bank, 2004). China signed the UN Framework Convention on Climate Change in 1992, but climate policies have not been high on the agenda of government decision makers, and no explicit climate mitigation or adaptation policies are in place. China's pursuit of sustainable development, however, has in many respects been consistent with climate protection after an embargo from global communities over environmental degradation and social impacts from Chinese corporations. China takes an active part in international and domestic activities regarding global climate change. Furthermore, China ratified the Kyoto Protocol in August 2002, making the country eligible for CDM participation in competition with other developing countries. China's initial national communication was approved by the central government in 2004. This will provide official greenhouse gas emission inventory data, which are important for assessing priority areas for CDM projects.

Sustainable development is a national strategy, and related policies and measures also generate climate benefits (World Bank, 2004). During the past few decades, China has declared lots of laws and regulations that stimulate sustainable development of the country, with progressive impacts on environmental improvement, including laws on environmental protection, energy conservation, development of new and renewable energy, reforestation, soil and water conservation, and social impact assessment. From 1998 to 2002, a total of 1.29 percent of GDP,

approximately 580 billion Yuan, was invested in improvement of ecology and preservation of the environment. Efforts are being made to prepare protocols or detailed policies to execute the China Energy Conservation Law (World Bank, 2004). Forest cover has increased from 13 percent in 1988 to 16.7 percent, which contributes to carbon sequestration. International cooperation has been strengthened to assist with building capacity to address global climate change.

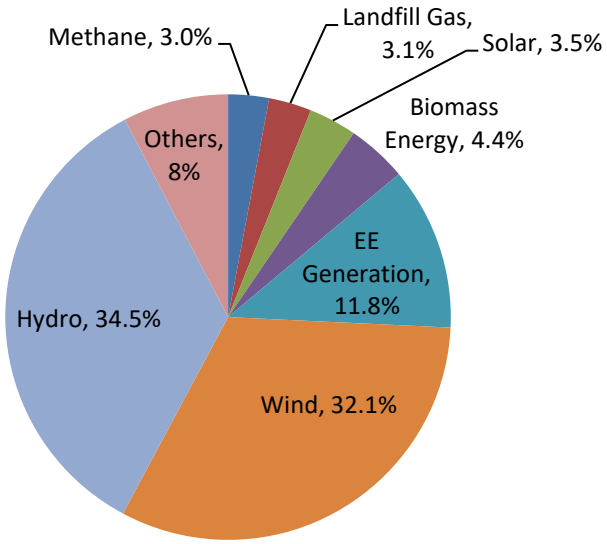


Figure 2.3 CDM Projects by Type in China
Source: UNFCCC, 2017.

Many factors could possibly cause a change in GHG emissions in CDM project activity. Most factors will make the GHG emissions decline with time and lead to sustainable development in economic, social, and environmental aspects (Schneider, Holzer & Hoffmann, 2008). Therefore, the emission reduction benefits of CDM project activity, when measured against a dynamic GHG, usually shrink with time (World Bank, 2004). Technologies evolve continuously in their own way and are not necessarily associated with GHG mitigation considerations. However, in most cases, autonomous technology development could improve the energy efficiency and thus reduce the carbon intensity of some technologies, installations, sectors, and/or industries (Schneider et al., 2008). This will inevitably make GHG emissions change

with time. For example, during the lifetime of a CDM project's activity, the old equipment or technology, which is used in the current operation, could be replaced by new equipment or technology with or even without the incentives from CDM. Therefore, the corporation will not only enjoy the benefit of efficiency, but from CER trading, as well, to compensate for their capital investment. Moreover, the Chinese organizations can gain competitive advantage and brand reputation with CDM implementation.

Energy efficiency improvements could happen autonomously with time and thus reduce the GHG emission intensity of related products or services. This is not necessarily associated with technology development. Improvements in management and the optimization of load and operation could also result in higher energy efficiency. Energy efficiency improvements will reduce the emissions in a baseline scenario; a dynamic baseline is necessary, especially in case of a high changing rate. Otherwise, excess credits will be issued and environmental integrity undermined. A change in the regulatory or legal environment, such as a renewable energy development plan, a new environmental policy, or new environmental standards could lead to a sustainable development scenario, and thus make dynamic baselines a necessity (UNFCCC, 1998).

Subsequently, CDM implementation in China should become a baseline project for sustainable practice. In most cases, project operators could choose the most suitable fuel type from several available types. Cost is always an important consideration. Changing fuel prices in the global market could change the economic competitiveness of different types of fuels and thus the decision of project operators on alternative fuel types. In the same manner, it could possibly cause the change of energy consumption structure in certain industries/sectors, especially the energy intensive industries/sectors. Different fuels could obviously be different in GHG emissions intensity, so the baseline or emissions benchmark could also change with fuel price and increased competiveness. Fuel switching always means additional equipment or retrofit investment, so little energy price fluctuations may not cause significant fuel switching. However, when fuel price changes happen, which will happen due to limited supply of crude oil, the organization which relied less on conventional energy will post great advantage among competitors in all aspects. Thus,

CDM implementation in China could potentially increase competitive advantage and sustainable development practice in all dimensions.

2.2.6 Clean Development Mechanisms in India

India considers CDM as one of the keys to sustainable development. India signed the UNFCCC on 10 June 1992 and ratified it on 1 November 1993. Under the UNFCCC, non- Annex I countries like India do not have obligatory GHG mitigation commitments. But in acknowledgment of India's small influence to the GHG problem, low financial, and technical capacities, it has constituted working groups on the UNFCCC and Kyoto Protocol (Ministry of Environment & Forests, 2014). India acceded to the Kyoto Protocol on 26 August 2002 to comply with global pressure to be environmentally-friendly. India's initiative to improve their understanding of climate issues and conform to the requirements of the UNFCCC include arrangement of India's initial plan to the UNFCCC. All Parties are required to communicate a national inventory of GHGs, and a general description of steps taken for the implementation of the CDM projects. The GHG inventory for the country is being prepared for the national CER inventory, and will cover five sectors: energy, industrial processes, agriculture, forestry, and waste. This exercise involves detailed work on the reduction of GHG emissions and identification of strategic factors for adding competitive advantage to the nation.

India is expected to capture between 20 and 30 per cent of the CDM market, bringing in up to $300 million in revenue. Several positive enabling factors have contributed to India's high position in the world CDM market (Gonsalves, 2006). Considering India's CDM development in terms of organizational participation, research evidence finds that the energy proficiency project, including HFC, is generating the maximum CERs. Big corporations who officially emit millions of CO_2eqt into the atmosphere can earn substantial returns under the concept of CDM (Ghosh & Sahu, 2011).

An extensive methane measurement campaign coordinated by the National Physical Laboratory is the main CDM project in India. Observations were undertaken in major agriculture growing regions of India under different types for the whole cropping period. Several measures being undertaken in the country contribute to GHG

mitigation and lead to the country's sustainable practices, for example, establishment of the Technology Information, Forecasting and Assessment Council under the Department of Science and Technology, which facilitates the transfer of environmentally sound technology. Extensive efforts in conservation of forests and biodiversity are also being promoted in India. The Government of India secures rehabilitation of damaged areas, conservation of ecology, along with benefit sharing with local communities by using a Participatory Forest Management Strategy. According to Ghosh and Sahu 2011, Indian conservation is undertaken through a system of protected areas. For example, 75 national parks in situ with 421 wildlife sanctuaries, covering 146,000 square km can benefit from CDM.

According to the Ministry of Environment & Forests, India values sustainable development as one of national strategic management. It is the prerogative of India to promote a clean development mechanism project that facilitates sustainable development in its country. Correspondingly, India's government views the CDM concept towards humanizing the quality of living of very poor communities from a biological needs standpoint. The following aspects should be considered when designing CDM project activity:

1) Social well-being.
2) Economic well-being.
3) Environmental well-being.
4) Technological well-being.

Table 2.2 Number and Distribution of CDM Projects in India

Country/Region	**Number of Registered Projects**	**India's Contribution**
India	3,384	
Asia Pacific	10,364	33%
World	**12,924**	**26%**

Source: UNFCCC, 2017.

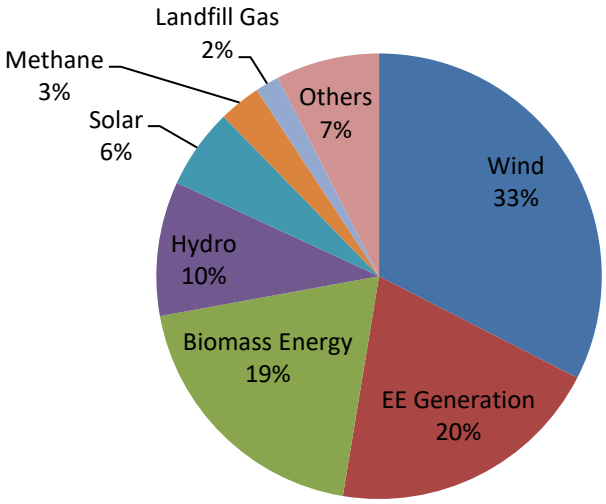


Figure 2.4 CDM Projects by Type in India

Source: UNFCCC, 2017.

In summary, India has undertaken numerous responsible CDM activities that are contributing to the objectives of the United Nations Framework Convention on Climate Change (UNFCCC). India's development plans balance its economic development and environmental concerns. The CDM planning process is guided by the principles of sustainable development and competitive advantage. Reforms in the energy and power sectors have accelerated economic growth and enhanced its efficiency of energy use. These have been complemented by notable initiatives taken by the private sector.

In the last few years several CDM activities relating to environmental issues have been introduced. Indian organizations have significantly targeted an increasing national competitiveness in the capacity of renewable energy installations, improving the air quality in major cities (the world's largest fleet of vehicles fueled by compressed natural gas has been introduced in New Delhi); and enhancing re-forestation (Gonsalves, 2006). CDM has been implemented by many other developing countries, not only India. CDM is dedicating surplus resources and attracting new investment, therefore CDM is putting economic development on a sustainable development path.

2.2.7 Clean Development Mechanisms in Vietnam

Vietnam embraced sustainability as one of the key pillars of its long-term economic development in the early 1990s, with the government initiating a "greening" expansion strategy (The World Bank, 2012). Vietnam's government has increased its focus on the development of the nation's competitive advantage to stabilize its economy since the Vietnam War. CDM, through the establishment of ambitious targets for on- and off-grid clean power generation, is one of the vital keys in sustaining economic, environmental, and social stability. The country's first environmental legislation, the Vietnam Law on Environmental Protection, was introduced in 1995. Revised in 2005, the Law provides the legal basis for green fiscal and financial instruments, but does not specify any targets. Approved in 2011, the Vietnam Power Development Plan VII (PDP VII) is the foundation for the development of the power sector between 2011 and 2020, with a higher-level vision to 2030 for clean energy and a CDM framework. Specifically, it sets four targets:

1) Meeting the country's increasing power demands through a mix of energy production and imports.

2) Prioritizing the development of RE.

3) Reducing the average energy elasticity ratio from the current 2.0 to 1.5 by 2015 and to 1.0 by 2020 through the implementation of energy efficiency (EE) measures.

4) Improving rural electrification so that most rural households will have access to electricity by 2020.

Along with RE targets for on- and off-grid RE generation, PDP VII also introduced targets for coal, which is set to remain the mainstay of the country's power sector. By 2030, Vietnam's coal-fired thermal power capacity is expected to reach 75,000 MW, or roughly half of the country's total installed power capacity. This would force Vietnam to import coal to meet its energy plans from 2015 on. Due to fluctuating prices in the energy market, the imported sources may threaten Vietnam's energy security level and nation economy. While the PDP VII has set targets for RE development, it does not accompany these with commensurate financial incentives that would be needed in order to realistically accelerate investments in clean technologies. Such incentives would also be required to decrease greenhouse gas

(GHG) emission by eight to 10 percent in the period from 2011 to 2020, as presented in their recently approved Green Growth Strategy (GGS).

Vietnam has also made use of the Clean Development Mechanism (CDM), with the majority of these projects targeting small-scale hydropower plants (The World Bank, 2012). Vietnam's CDM activities have consisted of 27 (2010), 58 (2011), and 270 (2012) registered projects. In the past, the availability of incentives linked to CDM financing was also considered an important factor for hydro development. However, according to Vietnam's Chamber of Commerce and Industry, CDM administrative procedures are bureaucratic, complex and unspecific. Moreover, potential project investors have experienced difficulties in proving a project's viability. However, Vietnam uses financial mechanisms and policies for their CDM implementation to overcome implementation obstacles as follows:

1) Exemptions for land rents and levies
2) Accelerated depreciation
3) Access to state investment credits
4) Subsidies for CDM project outputs
5) Priority consumption of CDM project outputs over conventional outputs produced by non-CDM projects

Table 2.3 Number and Distribution of CDM Projects Vietnam

Country/Region	**Number of Registered Projects**	**Vietnam's Contribution**
Vietnam	314	
Asia Pacific	10,364	3.0%
World	**12,924**	**2.4%**

Source: UNFCCC, 2017.

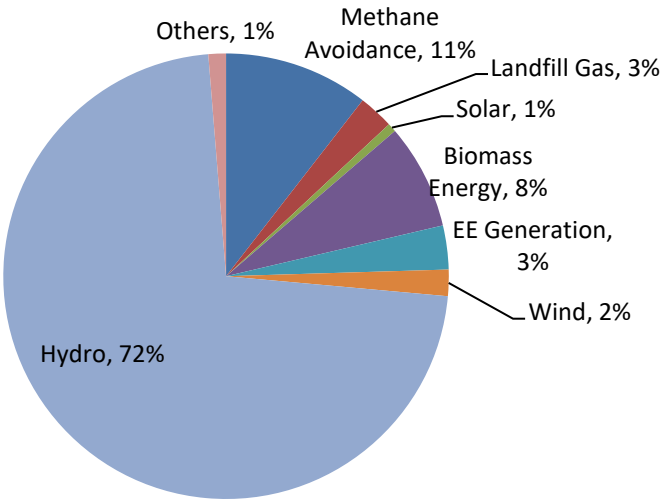


Figure 2.5 CDM Projects by Type in Vietnam
Source: UNCFFF, 2017.

In summary, the ongoing reform of Vietnam's energy pricing system, the institutionalization of a comprehensive set of financial and fiscal incentives for the development of CDM, and the establishment of a robust framework for environmental protections are key elements for attracting investment and improving the capital flow of CDM projects. According to the World Bank (2012), further deepening of the country's financial sector is also required in order to provide investors with adequate options for project implementation. Similarly, transparency of government operations should be enhanced in order to facilitate Vietnam's transition from a centralized to a market-oriented economy.

2.2.8 Clean Development Mechanisms in Thailand

Thailand signed the UNFCCC in June 1992 and ratified the Convention in March 1995. Realizing the seriousness of climate change as a global threat, the country has been contributing to international efforts to address climate change issues as a non-Annex I country. In February 1999, Thailand signed the Kyoto Protocol, and ratified it on 28th August 2002 (TGO, 2014). According to TGO, Thailand was one of the first non-Annex I countries to recognize the importance of resolving the problem of global warming. Participating countries have agreed to cooperate in solving the

problem of global climate change. As a non-Annex I country, Thailand promotes the implementation of Clean Development Mechanisms (CDM) under the Kyoto Protocol in order to encourage clean and environmentally friendly technologies for greenhouse gas reduction in the country, as well as promotes the country's capability by developing sustainable business practices (TGO, 2014).

The CDM is one of the first steps that governments took in addressing the threats posed by global warming and global pressure for clean technology. The CDM is an innovative feature under the Kyoto Protocol to the UNFCCC, which aims to stabilize the concentration of greenhouse gas in the atmosphere to prevent dangerous anthropogenic (human induced) interference with the climate system (UNFCCC, 1998). The CDM allows emission-reduction projects in developing countries to earn certified emission reduction (CER) credits, each equivalent to one ton of CO_2. These CER credits can be traded and sold in the CDM market, and used by industrialized countries (Annex I) to meet a part of their emission reduction targets under the Kyoto Protocol. The market mechanisms will stimulate emission reductions and raise public awareness of climate change, while giving industrialized countries some flexibility in how they meet their emission reduction limitation targets.

The Thai Ministry of Natural Resources and Environment (MNRE) is the responsible agency for the implementation of the UNFCCC and the Kyoto Protocol in Thailand. In 2007, Thailand restructured the established framework for its country's implementation to the UNFCCC and the Kyoto Protocol, which directed the establishment of Thailand Greenhouse Gas Management Organization (Public Organization) (TGO, 2014). TGO is an established independent governmental organization with its main purpose as an executing agency on GHG emission reduction in Thailand.

Nonetheless, TGO is responsible for promoting: low carbon (CO_2) activities; investment and marketing on GHG emission reductions; establishing a CO_2 information center; reviewing CDM projects for approval; providing capability development, and being a center for CDM stakeholders to promote low carbon activities. TGO, in particular, performs the role of the Designated National Authority for CDM (DNA-CDM) office in Thailand. Therefore, CERs from certified activities

in CDM will be traded over the mandatory or compliance market and voluntary market.

According to TGO, individual, private, and public organizations are encouraged to reduce their carbon footprint activities, manage energy consumption with efficiency, generate electricity from alternative sources with low GHG release, while stabilizing the socio-economic condition. Moreover, the UNFCC framework for CDM suggests initiation, promotion, improvement and development by local actors who are stakeholders. The country's policy on climate variation issues has been created to ensure that Thailand's pledges and obligations to the UN and the Kyoto Protocol are met. Thailand's duties have been fulfilled and are consistent with the national interest. The country's development approach was used to achieve equilibrium among the economic, social and environmental sectors. In the planning process, a bottom-up approach and stakeholder consultation were applied (NESDB, 2017). The policy on climate change under the 11th Plans has been included by the National Economic and Social Development Board (NESDB). The CDM is being continued up to the present. Under the NESDB 11th Plan, policy is formulated for national strategies on energy, forest, and water resources. In order to enhance GHG mitigation directly and indirectly, public awareness through formal education and information campaigns was developed to improve adaptation to environmental policy, especially regarding agriculture and water supplies. However, public response to CDM is questionable, which leads to this study that attempts to answer the question of what factors affect CDM implementation in Thailand.

Table 2.4 Number and Distribution of CDM Projects in Thailand

Country/Region	Number of Registered Projects	Thailand's Contribution
Thailand	279	
Asia Pacific	10,364	2.7%
World	**12,924**	**2.2%**

Source: UNFCCC, 2017.

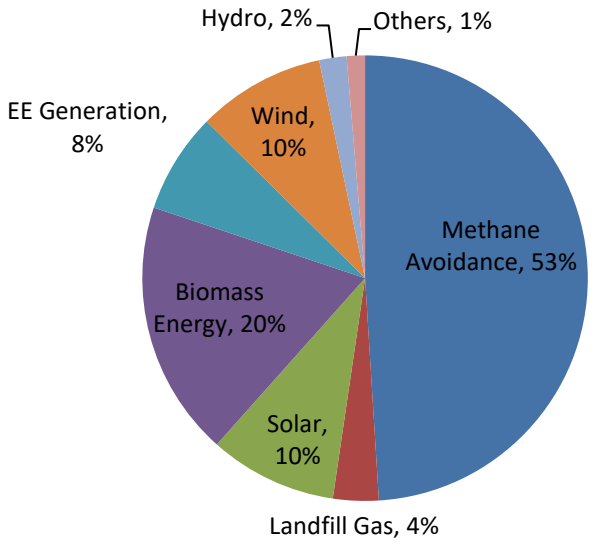


Figure 2.6 CDM Projects by Type in Thailand

Source: UNFCCC, 2017.

To progress toward sustainable development and become compliant with the Kyoto Protocol, there needs to be a shift of conceptual thinking that is in line with the forces of globalization, while protecting both the public and private sectors from adverse impacts arising from climate change. According to NESDB, a self-reliance approach away from energy dependency on fossil fuels, which produces high GHG emissions, is strategically important for future development and social stability in Thailand. In fact, it is inevitable to consume energy, but alternative energy is an option which includes UNFCCC and is one that Thailand is obligated to.

Although Thailand has no obligation to reduce greenhouse gas (GHG) emissions, developed countries currently have begun to pressure and want to distribute the responsibilities of reducing GHG to developing countries. In the future, developing countries may have a role in controlling GHG emissions.

According to TGO, the Thailand Climate Change Master Plan (2013–2050) aims to support participation in every sector and level to reduce greenhouse gas emissions and enhance the carbon sink, to support energy efficiency and energy savings according to the policy of ME and to support usage of domestic resources in the perspective of greenhouse gas emission reduction and enhanced carbon reduction.

MNRE, Office of Climate Change Coordination, states the strategies for the Thailand Climate Change Master Plan (TCCMP) as follows:

1) Adaptation
2) Migration and Carbon Reduction Enhancement
3) Capacity Building, (Research & Development, Technology transfer, Rules, Finance and International cooperation)

Regarding the industry, trade and services sectors, TCCMP's objectives are to develop and promote clean and environment friendly technology for production in the industrial and relevant sectors, to promote and support private sectors in order to change the production or operation in the organization to significantly reduce greenhouse gas emissions, to launch promoting and supporting measures for private sectors in order to change or modify any operations in an organization leading to actual greenhouse gas emission reduction, and to promote the tourism industry in such as aspects environmentally friendly tourism, Green tourism, and eco-tourism.

For the Energy sector, TCCMP plans to promote renewable energy and clean alternative energy with low pollution and high safety as options for consumers, operators and communities, to promote the potential of communities and municipalities in their local energy planning and renewable energy consumption with full potential and with the planning participation of the communities in each area, to promote the potential of energy efficiency and reduce the dependence of imported fuel, and to promote the highest energy efficiency consumption and accessibility of energy efficient technology on every level.

The Designated National Authority for CDM (DNA-CDM) office in Thailand provides capacity development and outreach for CDM stakeholders and promotes low carbon activities while particularly performing its role to comply with UNFCCC rules and regulation. All CDM activities that were approved can earn CERs credit, the CERs from certified activities in CDM can then be traded over the mandatory or compliance market and voluntary market.

TGO aims to promote individual, private, and public organizations to reduce their carbon footprint activities, manage energy consumption with efficiency, and generate electricity from alternative sources with low GHG release, while stabilizing the socio-economic condition.

2.3 Theoretical Background

This section consists of ground theories that identify benefits, problems and barriers of CDM implementation and sustainable development. The first theory is by Mazmanian and Sabatier (1983). These scholars developed the policy implementation framework of how public policy is being used, which illustrates several policy mechanisms that must be in place. Transparency theory by Etzioni (2010) for policy implementation in public administration fields is also being used to test the causal relationships for transparency and CDM projects in Thailand. Moreover, the impacts of globalization, socio-economics, and environmental benefits have pressured many organizations to adapt to the changing environment as global demands for environmentally friendly organizations. Last but not least, Porter's competitive advantage theory displays the benefits of social responsibility in business operations, which increase both the organizations' and nation's competitiveness and linkage to sustainable business practices.

2.3.1 Mazmanian & Sabatier's Implementation Framework

Policy implementation consists of a basic policy decision which is incorporated into a statute. The starting point is the authoritative decision. It implies centrally located actors, such as politicians, top-level bureaucrats and others, who are seen as most relevant to producing the desired effects (Mazmanian & Sabatier, 1989).

The study of policy implementation has caught wide interest since the 1970s and a growing dissatisfaction on theories' practicality and predictive power for the attainment of policy outcomes (Goggin, Bowman, Lester & O'Toole, 1990). The field has mainly been focused on top-down and bottom-up analytic approaches to understand the realization and non-realization of policy objectives (DeLeon, 1999). As implementation study evolved, two disciplines of theory developed as to the most effective method for examining and defining policy implementation, called the top-down and bottom-up approaches (Matland, 1995). Top-down academics perceive policy designers as the dominant actors and concentrate their attention on elements that can be controlled at the central level. Bottom-up theorists emphasize target groups and service deliverers, arguing policy really is made at the local level. According to Matland (1995), most reviewers now agree that some convergence of these two perspectives, tying the macro-level variables of the top-down models to the micro-level variables of the bottom-uppers, is necessary for the field to develop.

The top-down approach has exhibited a strong desire to create generalizable policy guidance. This requires consistent, identifiable patterns in behavior across distinctive policy areas. Top-down practitioners believe that such patterns endure and the appeal to giving advice has given the top-down view a highly inflexible determination and has led to a concentration on variables that can be manipulated at the central level. According to Matland (1995), common top-down practice is making policy goals clear and consistent, minimizing the number of players, limiting the level of change necessary, and placing implementation obligations in an agency concerned with the policy's objectives.

Bottom-uppers argue that a more realistic understanding of policy implementation can be gained by looking at a policy from the view of the target population and the service deliverers (Matland, 1995). Policy implementation occurs on two levels (Mazmanian and Sabatier, 1989). For the macro implementation level, focal located actors formulate a government program. For the micro implementation level, local organizations react to the macro level plans, acquire their own programs, and employ them. Mazmanian and Sabatier (1989) argue that most implementation problems stem from the interaction of a policy in the micro level institutional setting. Central planners only indirectly can influence micro level factors. Therefore, there is

wide variation in how the same national policy is implemented at the local level. Contextual factors within the policy employing environment can entirely dominate instructions created at the top of the implementing layer, and policy formulators will be incapable of controlling the process. Under these conditions, according to the bottom-uppers, if local level implementers are not given the freedom to adapt the program to local conditions it is likely to fail (Benecke et al., 2008).

The top-down approach gets interested in documenting counter influences of experiences on policy formulation. While top-down approaches are concerned mainly with how organizations get to execute political directions in a minimizing error perspective and following a prescriptive anticipated path, the bottom-up studies view implementation from the street-level administrator and center on factorial freedom to adapt and initiate policy changes. Both traditions of implementation science elicit drawbacks (O'Toole, 2004). The bottom-up approach sets its emphasis on the target groups and service deliverers and states that policy is made at this level. Bottom-up models are more descriptive in nature and state that implementation can be better understood by looking at the policy from the viewpoint of target groups and service deliverers (Goggin et al., 1990).

Policy implementation is assumed to occur at two levels (Matland 1995):

1) Macro implementation, where the centrally located actors devise a government program.

2) Micro implementation, where local level actors react to these plans and develop their own plans and implement them.

According to Mazmanian and Sabatier (1989), implementation is the carrying out of a basic policy decision, usually made in a statute (although also possible through important executive orders or court decisions). Fundamentally, a decision identifies the problems to be concentrated, demands the objectives to be tracked, and, in many ways, assembles the implementation process. In the case of a statute regulating private economic behavior, the implementation process normally runs through a number of stages, beginning with passage of the basic statute, followed by the policy output decisions of the implementing agencies Mazmanian and Sabatier state the essential role of policy implementation analysis is to identify the variables

which concern the accomplishment of statutory objectives thru this entire process. These can be divided into three categories:

1) Tractability of the problem(s) being addressed by the statute.

2) Ability of the statute to favorably structure the implementation process.

3) Net effect of a variety of non-legislative variables on the balance of support for statutory objectives.

The entire framework is presented in very skeletal form in Figure 5. It distinguishes the three categories of (independent) variables from the stages of implementation, which constitute the dependent variables (Sabatier & Mazmanian, 1989). It should be noted, however, that each of the stages can affect subsequent ones; for example, the degree of target group compliance with the policy decisions of implementing agencies certainly affects the actual impacts of those decisions.

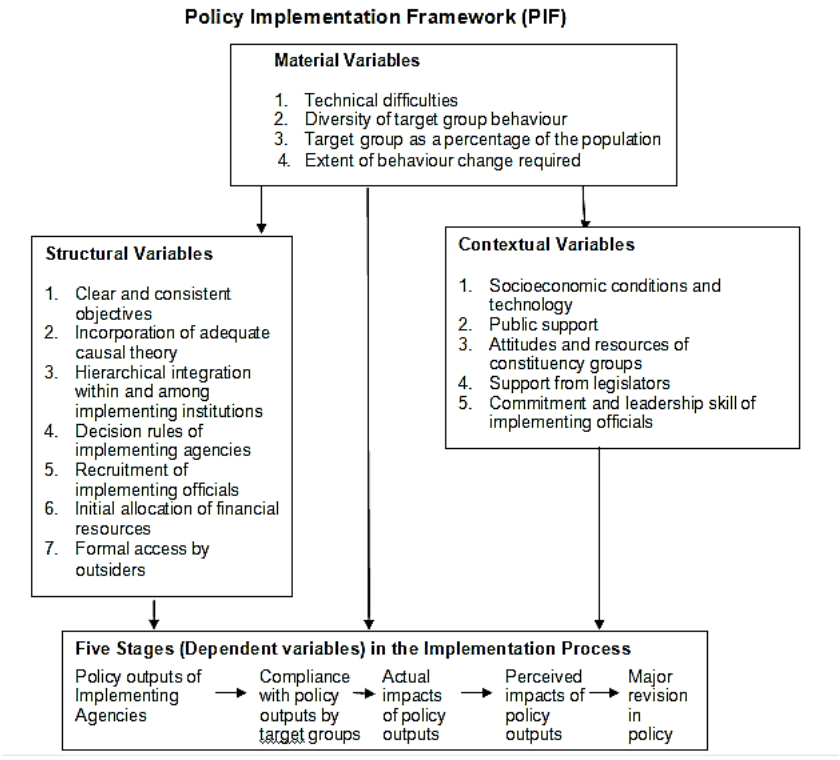


Figure 2.7 Mazmanian and Sabatier's Implementation Framework

Source: Sabatier and Mazmanian, 1989.

Mazmanian and Sabatier identify three major concepts: problem tractability, structuring of policy implementation, and other factors. The tractability of the problem refers to the idea that the technology available to deal with the problem situation and the severity of the problem will have an effect on how the policy is designed, what non-policy factors also affect implementation success, and the effectiveness of any policy intervention. The structure of the policy refers to its goals, an implicit causal theory about how to impact the problem situation, financial resources, the decision rules of the implementing agency, ability of outside actors to influence implementation, and the selection of implementers. Generally, programs are more likely to be effective it goals are clearly understood, there is a sound understanding of the causes of the problem, sufficient financial resources are provided, the agency has effective decision rules, supporters outside are given the ability to influence while opponents are blocked, and supportive implementers are selected. Major elements of non-policy factors include socioeconomic conditions, attitudes and resources of external groups, and the commitment of implementing officials.

Implementation problems arise out of the interaction between policy and micro level institutions. Central actors can only indirectly influence micro level factors and autonomy at the local level is necessary to allow adaptation of policy to suit contextual factors. Policy effect is a function of its effect on street level bureaucrats and their ability to suit local conditions. Studies under this approach have attempted to identify and describe the goals, activities, problems and contacts of the local level implementers and are predominantly case studies (O'Toole, 2004).

Top-down and bottom up approaches are used in policy implementation to identify appropriate conditions for use of either of the approaches and is based on the parameters describing the policy context. A top-down or bottom-up approach can be used to prepare the implementation plan as indicated below (DeLeon and DeLeon, 2002).

Moreover, Bondand and Gebo (2014) states policy changes, advocates for the introduction of policy dynamics, the advancement of future research, and needed help for organizational managers to deal with the complexity of implementation. In the study of policy implementation, including such phenomena as positive and negative

feedback loops, O'toole (2004) states that to understand policy implementation requires recognition of the following:

1) A process involving multiple actors.
2) A process involving multiple organizations.
3) The important role of clients or recipients.

These characteristics necessitate the need to look at issues of coordination across institutions in the absence of operational authority. Research is still plagued by a lack of consensus and parsimonious explanations (O'Toole, 2004).

In responding to the criticism of the early framework, Mazmanian and Sabatier (1989) argue that several policy mechanisms must be in place for a policy to be properly implemented. They suggest that material variables (i.e. technical difficulties, target group behavior, amount of behavior change required), structural variables (i.e. well-defined and consistent objectives, incorporation of ample causal theory, hierarchical integration within and among embedded institutions, decisions and rules of implementing agencies, recruitment of implementing officials, initial allocation of financial resources, and formal access by outsiders), and contextual variables (i.e. public support, socioeconomic variables, support from legislators, and commitment from implementing officials) are important conditions that need to be established. They claim that a problem at any of these many points could potentially derail the implementation of a policy. If these factors are not carefully considered during adoption and implementation, then a policy may not be effective at achieving its goals. However, a policy implementation framework provides a practical overview of policy-making in terms of its complication and the variety of variables that can either assure or impede successful implementation. In solving global issues such as climate change, relative factors within the implementing environment can have completely different natures in the implementing organization, and the policy formulator will have to respond with the use of an ecological perspective and support the use of Mazmanian and Sabatier's framework in a collaborative and comparative public policy context.

2.3.2 Globalization

Responding to increasing public demand, globally, for more transparency and accountability in business operations, this factor is critical for policy implementation. Globalization is defined as increasing and exaggerated flows between nations of goods, services, wealth, opinions, information and people, which produce national cross-border integration of a number of economic, social and cultural activities. It is the greatest driver of change today. It demands complex decision making processes to take place at sub-national, national and trans-national levels, leading to a multi-layered system of governance. Governance, or the exercise of economic, political and administrative authority to manage a country's affairs at all levels, in this context needs to adapt to these new realities. Progressively, the situation is called upon to act as a connection of processes of planning, discussions, negotiation and decision-making, involving many players, public and private, at different levels of governance. Good governance, then, is a participatory, transparent and accountable exercise of authority that is based on the rule of law and a broad consensus in society (UNDP, 2004).

Whereas globalization has the ability of bringing advances for humanity by offering new chances to countries around the planet through business, foreign investments and capital flows, technological change and information flows, markets alone have shown to be insufficient in ensuring that these progresses justifiably benefit all members of the international community. This observation could be more promptly applied to developing nations trying to achieve sustainable development (UNEP, 2014).

The collective vision of sustainable human development, as expressed by the international community in the United Nations Millennium Declaration, becomes more difficult for those countries not adequately equipped to face the challenges of globalization. Consequently, its contrary effects have to be arbitrated by governments with suitable reforms to governance administrations. A main step in this globalization path is the better establishment of a transparent and responsible organization.

Intergovernmental organizations are increasingly recognizing that globalization offers great opportunities for human advancement but only with good governance. Therefore, globalization requires tighter monitoring and faster policy

responses at the country, regional and global levels. National governments play a central role in ensuring economic competitiveness and growth, good governance and sustainable human development. However to be responsive to a nation's specific needs, governments are learning that they are required to work better with the private sector and society. Cooperation can be best enhanced when the government and other public entities activate on principles of transparency by making information accessible, and accountable by being responsible for their decisions and actions.

Transparency and accountability are mutually supporting concepts. Without transparency, that is, unconstrained access to appropriate and dependable information on decisions and their execution, it would be challenging to call the public sector to account for its actions (UNDP, 2004). And if there is no accountability, which is an instrument to report on the management of public resources and outcomes, transparency would be of little value. The continuation of both conditions is a precondition to an effective, efficient and justifiable management in public institutions. And as such, both conditions are also necessary in trying to achieve sustainable human development through better governance in an era of globalization.

2.3.3 Transparency

In answer to the emerging international consensus on the modern essence of the private and public sectors on the transparency and accountability issue, many international organizations have undertaken specific ideas to promote these concepts. The UN has been establishing international agreements and implementing specific actions, highlighting public sector transparency and accountability, especially under the classification of good governance and sustainable development.

At the global level, the UN has recently organized a number of meetings, conducted research and published reports on the topic. The United Nations Department of Economic and Social Affairs promotes a multi-disciplinary approach to sustainable development. It is the Division for Public Administration and Development Management, which supports the United Nations intergovernmental deliberations on the role of governance and public administration on sustainable development. In addition, the Division has, for over fifty years, been assisting United Nations Member States, upon request, to implement reforms in their administrative

and financial systems, through capacity-building and technical cooperation. Through its United Nations Online Network on Public Administration and Finance the Division promotes sharing knowledge and best practices throughout the world.

For specialized funds and agencies, the United Nations Development Program (UNDP) developed the Program for Accountability and Transparency (PACT) in 1997. It represents an international initiative supporting recipient countries through technical support for improving procedures of financial accountability and management. In 2001 PACT created the Country Assessment in Accountability and Transparency (CONTACT). Its guidelines are aimed at supporting governments in conducting self-assessment of their monetary management and corruption activity. This tool was developed jointly with UNDESA and the World Bank. In addition, the UNDP has established a Democratic Governance Thematic Trust Fund through which it supports technical cooperation in accountability, transparency and integrity. Since 2003 UNDP has identified over 80 projects started by CONTACT in accountability, transparency and integrity.

Globalization has played a key role in the international movement to promote access-to-information (ATI) legislation and institutions, which, in theory, are designed to advance government information flow and governmental accountability (Armstrong, 2005). Transparency is generally defined as the principle of enabling the public to gain information about the operations and structures of a given entity. Transparency is often considered synonymous with openness and disclosure, although one can find some subtle differences among these terms. In public discourse, transparency is widely considered a “good” on the face of it, similar to privacy and free speech (Etzioni, 2010). The rise in the international focus on governmental transparency has been linked (in part) to global media growth, the technology boom, national security issues, and the third-wave democratization movement at the end of the cold war, all of which have allowed various publics to learn about their governments' activities like no other time in the past (Relly & Sabharwal, 2009). Governmental openness about policies and regulations has become a prerequisite for investment in the current neo-liberal trade environment as transnational corporations establish operations globally and aim to minimize the cost of doing business. According to the literature stream, ingenuousness about official information could

boost the economic potential for a country, as the private sector examines a host of indicators such as the availability of information on policies, programs, official rules, and the distribution of resources before making investments (Etzioni, 2010). The largest users of access-to-information laws in the United States and Canada are businesses seeking to determine the corporate climate for regulatory policy or seeking procurement contracts with the public sector. Many scholars agree that the consideration and adoption of an access-to-information law, and the implementation of it, largely involves decision-making in the political realm (Etzioni, 2010).

However, because a number of countries have adopted access-to-information laws to demonstrate efficiency in government for the purpose of attracting investment critical to economic development, our study examines whether the presence of the law impacts business executives' perceptions of a nation's transparency in government policymaking. Previous cross-national empirical research in this area related to ATI legislation has been limited in the academic literature (Relly and Sabharwal, 2009). The cross national study examines whether an access-to-information law, and several other indicators cited in the literature as instruments that advance communication and openness in a nation, influencing perceptions of transparency of government policymaking. In the following sections, we review the literature that examines factors such as ATI laws (which have been associated with governmental transparency) (Relly and Sabharwal, 2009). Transparency is viewed as a self-evident good in Western society to the point that "we might almost say that 'more transparent-than-thou' has become the secular equivalent of 'holier-than-thou' in modern debates over matters of organization and governance" (Etzioni, 2010).

2.3.4 Environmental Benefits

CDM has reduced the compliance costs for developed countries to meet their commitments under the UNFCCC agreement, the prospect of diminished costs due to the CDM does not appear to have been a factor in defining the ambition of these quantitative emission reduction commitments. But the byproduct of CDM is benefits to the ecosystem. The complexity of the CDM benefits the concentration on climate change issues and the potential of a better living environment. The CDM was intended as a zero-sum instrument, allowing increased emissions in developed

countries in exchange for corresponding decreased emissions in developing countries, with no net impact on global GHG emissions. In practice, to the extent benefits to the ecosystem that some CDM projects may have been, like clean energy, or may have been awarded more credits than the actual emission reductions achieved (e.g. due to overly high baselines, leakage or perverse incentives), the CDM could lead to a net decrease in global GHG emissions. CDM projects have caused more emission reductions to occur than the number of credits issued and used, which could lead to a net decrease in global GHG emissions.

The majority of CDMs rely on environmental laws and regulations and the standards set by national, provincial and local governments in deciding whether the project is contributing positively to the local environment. CDM provides an elaborate list of indicators to check the impact of projects on the environment. The environmental benefits of CDM projects expected by implementers relate to GHG emission reductions, the impact of the project on the environment and resources, and the project's contribution to the sustainability of resources. The impact of the project on the local environment and resources is the most frequently used criterion.

Many CDMs emphasize the impact of the project on the environment. Most of them further elaborate the impacts on air, water, marine and land environments and biodiversity. Several DNAs give a special mention to the sustainability of resource use through efficient resource usage, the local community's access to resources and the avoidance of resource degradation (Korea, India, Vietnam, Rwanda, Malaysia, Indonesia, Morocco, South Africa, Mauritius, Serbia, Georgia, Armenia, Uzbekistan and Thailand) (UNEP, 2014).

2.3.5 Socio-economic Benefits

An evaluation of Thailand's development over the past few decades, with the assistance of the 7th national economic and social development plans, suggests that "the Thai economy is good, the society is problematic and the development is unsustainable". Consequently, after more than three decades of proper development plans, the national well-being was deemed satisfactory, nevertheless the benefits have not been allocated equitably. The majority of the Thai people did not receive a fair share of benefits. However, a CDM core objective would give rise to socio-economic

development in the long term. The 11th National Economic and Social Development Plan shifted the development vision by recognizing environmental, social, and economic benefits mechanisms for growth, as well as its stakeholders. Economic development is considered as a tool for human development to achieve happiness and well-being for the people. This is because social capital is highly vital for providing a good way of life for society. Nonetheless, it is a key indicator for economic development of the country, specifically with regards to the private sector. Development of the social aspect, which is Thailand's strategy to a sustainable development goal, challenges the CDM vision. Declined domestic and global natural resources and environment are problems of global warming and climate shift, which requires the application of pioneering economic tools and mechanisms. CDM can effectively manage demand and supply. Social and political mechanisms are also required to strengthen the socio-economic infrastructure.

The impact that a CDM project has on the improvement of the quality of life of the local community is the most frequently used justification in the literature. However, DNAs usually specify indicators that would justify the improvement of the life of local communities by the project. These include: assisting in poverty alleviation through employment generation; ensuring no adverse effects on health; engaging in developmental activities to support society; enhancing access to public services; and promoting local industry. Among these, impact on human health and engaging in developmental activities appear most frequently. Developmental activities highlighted by DNAs include infrastructure creation, provision of healthcare, educational facilities and civic amenities.

Most DNAs require effective community participation throughout the project cycle, ranging from consultations during project design and planning to providing local resources, services and labor during project implementation (Mauritius, Zimbabwe, Indonesia, Kenya, Thailand, Serbia, Georgia, Armenia, Bolivia, Peru, El Salvador and Rwanda).

2.3.6 Competitive Advantage

Porter mentions companies who achieve competitive advantage through the act of innovation, which included implementation of new technologies and new ways

of doing things. According to Oliver (1997), organizations gain advantage against competitors through strategic management and sustainable development practices. Many scholars argue that a firm's sustainable advantage depends on its ability to manage the institutional context of its resource decisions (Oliver, 1997). An organization's institutional context includes the organization's culture as well as impacts from the government, society, and inter-firm relations that define socially acceptable economic behavior. When a company achieves competitive advantage thru an innovation of CDM, it can sustain relentless improvement. Porter (1990) demonstrates how Korean organizations have matched the ability of Japanese rivals to mass produce standard color televisions and VCRs, Brazilian companies have assembled knowledge and design equivalents to Italian contenders in casual leather footwear.

Organizations respond to environmental and social issues only after being reported by public responses to disputes. Firms which had not previously thought these were part of their business responsibilities cannot neglect this idea (Porter & Kramer, 2006). At the same time, organizations need to operate in a way that secures sustainable economic performance by avoiding unethical behavior that is socially harming or environmentally extravagant. The environmental and social concern principle works best for disputes that overlap with an organization's benefits and regulatory appeals. Porter and Kramer (2006) state that successful businesses need a healthy society. Efficient consumption of water, land, energy, and other natural resources makes corporations more dynamic and enlarges their competitive advantage. Strong organizational strategy with concern over environmental and social impact enhances value added to the firm's value chain. In the long run, a strong society creates expanding business demands as more individual needs are met and ambitions grow. Businesses that pursue their operation at the expense of society and the environment in which it operates will find its success to be ultimately deceptive and opposed from the social body.

Simultaneously, a healthy society needs successful companies. No government program can match the private sector when it comes to creating the employment, capital, and innovation that increases standards of living and social well-being over time (Porter & Kramer, 2006). This principle can be successful, but an organization

must integrate a social viewpoint into the core business strategy it already uses in order to understand business competition and guide its short and long term strategy. CDM is one of the solutions to the alternative pathway for gaining competitive advantage (Olsen, 2007). CDM not only assists GHG activity affecting society, but social conditions which impact corporations. Every activity in an organization's operation influences the society in which the organization functions, creating both negative and positive social outcomes. Now companies are gradually aware of the social effect of their business activities, these impacts can be more variable and subtle than an organization can imagine. Organizations that neglect to foresee the ecological and social programs that are outcomes of this growing issue have been liquidated by the results. Deprived of a cautious process for identifying developing social effects of the future, organizations may risk losing their competitive advantage.

2.3.7 Competitive Advantage and Sustainable Development

Sustainable development involves control over population growth, providing worldwide food security, preserving ecosystem resources, and reorienting energy use and industry in ecologically sustainable directions. Sustainability involves encountering human needs without exposing the capacity of imminent generations to meet theirs. SD involves regulating consumption of resources so that it can be renewed and maintained within a natural symmetry (Shrivastava, 1995).

For the global economy to become ecologically sustainable, it will be necessary to organize business and industry along ecologically sound principles. This will require transformation of corporations, their products, production systems, and management practices. If the global economy moves towards an environmental orientation, it will change the competitive condition of industries in terms of consumer preferences and demands, industrial guidelines, and competitive opportunities. The competitive setting is also being formed by numerous environmental regulations and standards that change the effort of doing business. These regulatory impacts are promptly apparent in natural resource and energy concentrated industries and pollution emitting companies, although they affect other companies as well. These external influences are strategic factors that impact the organization, including buyer and supplier power, the intensity of competition, and

industry and product market structure. According to Porter and Kramer (2006), organizations should operate in ways that secure long-term economic performance by avoiding short-term behavior that is socially damaging or environmentally wasteful. Porter (1990) focused on the expanded concept of competitive advantage, which, simply put, is the idea that some forms of competitive advantage are very difficult to imitate and can therefore lead to persistent superior economic performance that can lead to sustainable development.

Porter (1990) suggests that innovation and change are inextricably tied together. However, change is an abnormal act, exceptionally in successful organizations; powerful forces are at play to avoid a downfall. Past methods become institutionalized in typical procedures and management controls. Competitive advantage highlights the one accurate way to do anything; the creation of specialized, devoted facilities coagulates past practices into expensive operations. The existing strategy takes on an appearance of invulnerability and becomes entrenched in the company culture. Successful businesses tend to progress a bias for stability and predictability. Change is tempered by the fear that there is much to lose. The company at all levels screens out information that would advocate new approaches, modifications, or retreats from the norm. The internal setting operates like an immune system to expel or isolate adverse individuals who defy current, established or direct judgment. Competitiveness ceases; the company becomes immobile; it is only a matter of time before hostile competitors overwhelm it.

2.3.8 Volkswagen Case Study in the EU and USA

In 2015, the US Environmental Protection Agency (EPA) declared that Volkswagen (VW) had installed illegitimate software to deceive emissions tests, allowing its diesel vehicles to emit up to 40 times more NOx than allowed, and ordered the company to recall around 482,000 VW and Audi cars sold in the US since 2008. On 22 September 2015, VW revealed the software may have been installed in 11 million diesel vehicles globally. Volkswagen's CEO Martin Winterkorn, apologized for losing trust over the issue and left the position 3 days later. The EPA spokesperson stated VW could confront a fine of up to US$18 billion, legal action from customers and shareholders, and criminal charges if found guilty by the U.S.

supreme court. In two days of VW stock trading after the scandal erupted, the company had lost a third of its stock market value.

Meanwhile, other nations including Germany, France, Italy and South Korea allegedly opened inspections into VW cars sold in each country. On 24 September 2015, the German Transport Minister said that automobiles sold by the VW group in Europe were also involved in the falsification practice. When the news came out it stunned the world community. It is this kind of unfaithfulness in business practices this should not appear in Germany's biggest automobile manufacturer. The confidence of worldwide investors plunged. Company stock fell instantaneously over 30 percent and destroyed the company's automobile market shares by more than 20 billion US dollars. This incident has cost VW huge financial damage, but the greatest damage is customers' confidence in the VW brand.

2.3.8.1 Transparency Issue

In terms of corporate governance or good governance, it is a big issue to conduct business and gain competitive advantage. Volkswagen failed to have good merit in its business practices, the Board did not supervise the work of management adequately. This led to the cheating that happened, which is very serious in terms of business. VW is socially damaged and environmentally wasteful. It is not right doing business in a way that destroys the trust of customers. Regulators and the automotive industry worldwide are disappointed with Volkswagen. Everyone knows that global warming is caused by lack of environmental legislation in many countries. The car should not pollute the air more than needed. In the US Clean Air Act (Clean Air Act), car manufacturers need to limit toxins. The exhaust from cars has to be produced to the level required by law, which is applicable to all car companies.

American consumers like using medium to big sized engines. The company aims to expand the Volkswagen car (midsize) in the US that uses diesel as fuel. It has a high cost in terms of pollution-care legislation. The company must design engine control systems with no emissions beyond the legal limit. The company also understands that the company has to develop its own technology to take care of this problem. This has led to the rapid expansion of the market for Volkswagen in the US, and it has now sold more than five hundred thousand units of production since 2009 and sold 11 million units worldwide.

This is a problem when US regulators have doubts. In the results of the monitoring of exhaust emissions from Volkswagen cars the emission figures came out above a certain threshold. The valet ran tests in normal road conditions. With higher pollution showing up from vehicle testing laboratories (Treadmill) to the minimal pollution limits, this difference led to further investigation. The inspectors from the independent agency finally found an internal control in Volkswagen's applications were available at the sub-set of pollution control systems when fully operational. When the car was in this "state" as it was tested in the laboratory, it made the pollution monitoring laboratory think it was at the lower level, as when the vehicle is in normal use on the road. The pollution control systems did not work. Volkswagen will make both the fuel and (apparently) the environmental criteria according to a procedure that has now been put in the car. All cars produced by the company from 2008 to 2015, will likely have this device installed.

The company had a liability as soon as it was accused. It is wrong to demonstrate a serious lack of ethics in business. Last, VW's CEO resigned and verified that he was not responsible for what happened. The consequence of negative impact will come, as the company is still under investigation. The fines from regulators and a criminal investigation are yet to come. Whether or not the company had intended to cheat, it deceived purchasers and regulators. The trust from creditors, employees, customers and partners are gone. Volkswagen will take a long time to heal. The latest bad news for the company is it has withdrawn from the index DJSI (Dow Jones Sustainability Index) on October 6, 2015; the company will lose its status as a leader in sustainability in the global auto industry. When something like this happens, it is clear that transparency when conducting business is critical.

2.3.8.2 Impacts on Health and the Environment

In the VW case, the vehicle not only cheated on CO_2 emission. Nitrogen oxides (NOx) are gases emitted during fuel combustion, in particular from VW diesel engines. In 2014, diesel vehicles accounted for about half of new cars sold in the EU and claimed to have clean technology. NOx is associated with hostile effects on health, particularly on the liver, lungs, spleen and blood. Not only that, NOx also impacts the environment, in particular acidification and eutrophication. NOx also contributes to the pattern of major air pollutants, ozone and particulate

matter. Discharges of air pollutants, including NOx in the EU, have decreased significantly in recent decades from various policies, including CDM. However, VW's unethical practice may cause CO_2 and NOx concentrations in Europe to regularly exceed EU air quality standards, and the 2010 National emission ceilings targets for NOx have not been met now in six Member States. According to the EU Commission, particulate matter and ozone absorptions are accountable for over 400,000 premature deaths annually in the EU, and the total health-related costs of air pollution in the EU are in the series of €330–940 billion yearly. Thus, the VW incident has cost tremendous destruction to the environment which no financial cost can account for.

2.3.8.3 Controls on Emissions of Air Pollutants

In the European Union, controls on air pollutant emissions from automobiles are determined in the 2007 Pollution Framework Decree according to vehicle type approval, which mandates testing and approval of vehicle types by a national technical service to limit and eliminate possible GHG emission from motorists in the EU. The standard for CO_2 and NOx emissions applies to new vehicles, which is part of the Euro 6 standards, enforced as of September 2014. The EU has set the NOx emission rate for new vehicles at 0.08 g/km. In the US, air pollution emissions tests are carried out in three steps, which is a bit different than the EU:

1) Self-certification by manufacturers
2) Production checks by the EPA
3) 'In-use surveillance testing' by the EPA

Moreover, the US norm for NOx emissions is only 0.031 g/km. Defeating the devices or software manipulation like that which was revealed to be used by VW in US tests, or enabling the cheating of emission tests, are illegal under both US and EU law, and their use is subject to penalties.

2.3.8.4 Fuel Consumption and CO_2 Emissions

Besides air pollutant emissions from diesel cars, the VW case has also further exposed discrepancies between type-approval (under laboratory conditions) and on-road CO_2 emissions from cars and light vehicles. A 2009 regulation on emission performance standards sets CO_2 emissions targets for cars (95 g/km, to be

met by 2021) and light-duty vehicles (147g/km, to be met by 2020). Expressive progress seems to have been altered, as the carbon emission target of 130g/km for cars was met 2 years ahead of schedule. However, research by the International Council on Clean Transportation (ICCT) suggests that the average gap between type-approval and on-road CO_2 emissions increased from approximately 8% in 2001 to 38% in 2013. ICCT states that the discrepancy translates into amplified fuel charges of about €450 per year for an average consumer usage of VW. Lower carbon-emission reductions than expected under climate policies have caused a loss of tax revenues for authorities which base their vehicle-taxation schemes on type-approval CO_2 emissions.

Type-approval tests for CO_2 emissions are based on the New European Driving Cycle (NEDC), which has been used for decades and is seen as outdated. New standards, known as the worldwide harmonized light duty test procedure (WLTP), have been developed under the aegis of the United Nations Economic Commission for Europe (UNECE). The European Commission suggested implementing part of the WLTP in September 2017, with full implementation from September 2018 for CO_2 in current and future developed vehicles.

2.3.8.5 European Parliament

In the GHG position of the EU adopted in February 2014 on the CO_2 emissions reduction targets for automobiles, the EU Parliament agreed that the NEDC be replaced by the WLTP at the earliest opportunity in order to ensure that the CO_2 emissions quota for new passenger vehicles was brought more narrowly in line with the actual emissions rate. The first reading of the report on the reduction of contaminant emissions from road vehicles was adopted on 23 September 2015. The EU Parliament for Environment, Public Health and Food Safety Committee supported in favor of real driving emissions tests to be employed as of 2017. On the same day, the EU Committee also embraced an exchange of opinions among the Commission on the VW case, at which committees expressed their concerns over accountability and transparency issues.

2.3.8.6 Summary of the VW Case

This case study highlights that automobile manufacturers have been using tractability in laboratory type-approval tests in order to accomplish lower

emissions rates, which are not reflected in real driving situations. Other brands besides VW are now suspected of tampering with devices in other regions as well. The EU advocates strict real driving emissions tests, a system of random conformity of production checks and in-service testing overseen by an independent EU type-approval authority. In the near future, a proposal for Euro 7 standards harmonizing limits for diesel, petrol and natural gas vehicles is expected. BEUC, the European Consumer Organization, calls for a full investigation into EU vehicle emissions and fuel consumption testing of all brands. It encourages a robust actual driving situation vehicle test procedure, similar to EU regulation in force in the US, and an observation system of this on-road testing in order to restore consumer trust in emissions and fuel consumption tests. In Italy, on behalf of consumers, an Italian consumer protection organization started a class action lawsuit against Volkswagen and Fiat in 2015 for unfair business practices over the variance between actual performance and the fuel consumption advertised by the automobile manufacturers. The European Automobile Manufacturers' Association (ACEA) recognizes the gravity of the situation and emphasizes that there is no indication that this is an industry-wide issue. It is fully reassuring of the new 'real driving emissions' assessment targeted at more robust checking of emissions of pollutants. By neglecting the cost to the environment, VW's business has been interrupted with angry consumers and numerous lawsuits. But most of all, the damage to the environment and atmosphere is regrettable. This is an example of a disaster of customer confidence in VW which will obviously affect vehicle sales and the company's competitive condition.

2.4 Related Literature

The empirical study has shown the benefits of CDM in many developed and developing countries. Moreover, it has shown the statistics of CDM investment and technology transfer in the last 5 years which shows that many countries are putting their emphasis on CDM projects. Nonetheless, the 11th National Development Plan has included the CDM as a national necessity for social stability.

In a report by the Advisory Group to the UN, one of the recommendations was for low-income countries to expand access to modern energy services. In order to

meet the basic necessities of the several billion people who experience severe energy shortages in terms of insufficient and unpredictable access to energy services and dependence on traditional biomass, they need to do so in a way that is economically viable, sustainable, affordable and efficient, and that releases the least amount of greenhouse gases." (UNDP, 2014)

In a growing number of cases, CDM clean energy is not just one of the easiest non-grid-connected options to establish, but also more cost-effective than the fossil fuel alternatives. This trend has led to speculation that developing economies may be able to advance faster than developed countries in their use of renewable energy over the coming decade on CER trading.

Various studies have provided evidence for an increasing international emphasis on the production of bioenergy. The profitability of bioenergy production by CDM projects is largely determined by the price of competing outputs, primarily fossil fuel products, and the cost of its feedstock, mostly cereal grains and oilseed. Nevertheless, relatively high oil prices have provided a good opportunity for bioenergy producers to sell their products in a high priced market (UNEP, 2014).

As a result of economic growth, energy consumption in Thailand has also increased significantly. According to NESBD (2012), Thailand consumes energy at relatively 70,000 Ktoe. However, RE energy can be produced at only 5,000 Ktoe, which impacts the reduction of GHG emission according to the Kyoto Protocol. As we can see in the number of registered CDM projects worldwide in the last decade, Thailand's CDM projects are the lowest in the region, with registered projects numbering less than 300, including primary and voluntary projects.

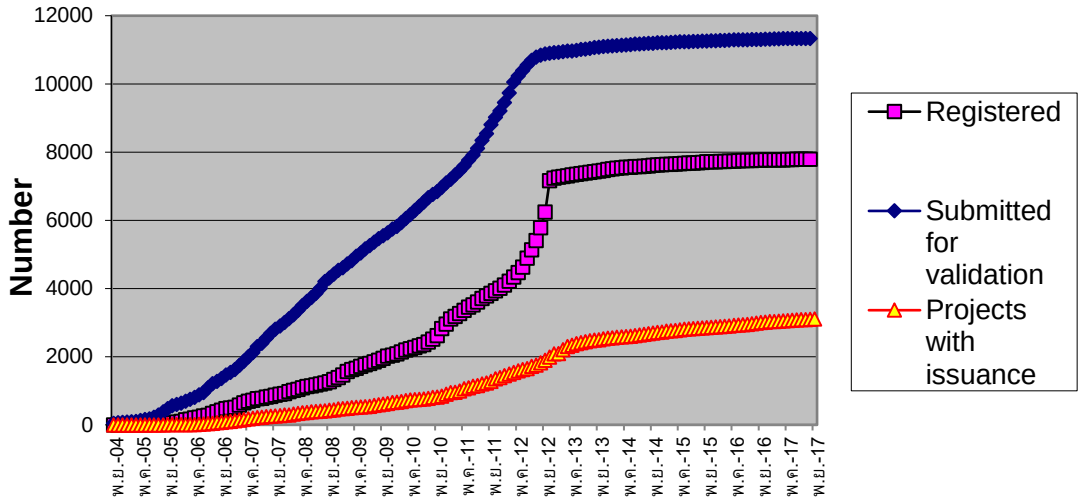


Figure 2.8 Accumulated CDM Projects Submitted for Validation and Registered Projects

Source: UNFCCC, 2017.

Many developed countries have adopted cleaner energy technologies and benefited economically. To promote the dissemination of clean energy in selected Asian countries, a regional research program was coordinated by the Asian Institute of Technology (AIT) in countries such as Vietnam, India, Philippines, Sri Lanka, Thailand, and China (UNEP, 2011).

According to UNEP RISO 2014, several factors that affect the implementation of clean energy technology in many developing countries are as follows:

1) Lack of awareness and education
2) Financial and economic factors
3) Lack of coordination and slackness
4) Lack of infrastructure

According to UNDP (2014), it is necessary for the government in developing countries to use policy tools to promote RE. The alternative energy policy framework comes under three categories: 1) regulation; 2) fiscal incentives; and 3) public financing.

One of CDM's main appropriate impact frameworks to promote sustainable development benefit is alternative energy, which is at least as important as subsidies

for environmental and economic indicators. Two main types of monitoring CDM policies have been used internationally to promote alternative energy.

One is to guarantee price; the other is to ensure market share through government-mandated targets or quotas. They are applied in order to give renewable energy a considerable role in electricity generation. In segregated partial markets, competitive bidding for alternative energy concessions and energy tradable certificates also constitute mandated market policies. In some cases (e.g. rural or off-grid areas where previously no market existed), government policy must actually organize markets and the necessary institutional development.

Second, fiscal incentives constitute policies that are focused on cost reductions and improvement of the relative competitiveness of alternative energy technologies in given markets. These incentives include capital grants, third-party finance, investment tax credits, property tax exemptions, production tax credits, sales tax rebates, excise tax exemptions, etc. Some of these measures can be well applied to alternative energy technology invested in by the users themselves. Taxes on fossil fuels also improve the competitive position of renewable energy and are particularly appropriate to internalize negative external effects on environmental or energy security.

Finally, the availability of funding for alternative energy development is essential for the continued growth of these technologies. Two main methods of public financing are the ways in which governments assist in allocating the necessary capital to the alternative energy sector. The government can assist in the distribution of funding for implementation of alternative energy projects. Financial support from national and sub-national governments helps to fund infrastructure development and facilitate private-sector participation in the alternative energy sector.

According to UNEP (2014), almost 1.5 billion people in the world do not have access to electricity. The unmet energy needs of these people, many at the bottom of the pyramid, are increasingly being met by off-grid power from renewable sources. In many instances, renewable power is the first choice, since it is the most cost-competitive. In some instances, renewable power provides the only option for energy, especially in regions that are off the grid map.

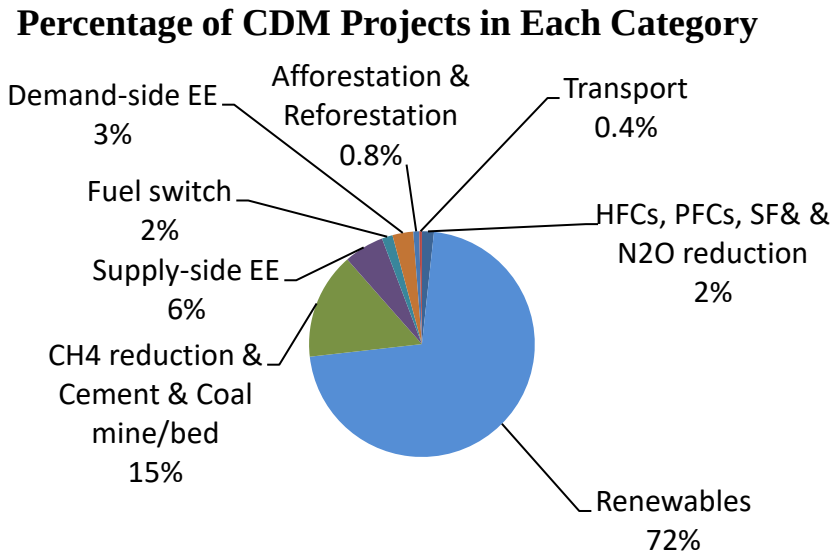


Figure 2.9 Total Growth of CDM Projects

Source: UNEP, 2017.

Many CDM project are being used for irrigation, water detoxification, or just to provide basic lighting. In some regions, they are being used to replace diesel-fired plants simply because they are more cost-competitive, and easier to maintain. The commercial opportunity in providing such affordable clean energy could run into hundreds of billions of dollars in both private and public sectors (UNEP, 2011).

2.4.1 Barriers of CDM Implementation in Thailand

According to UNFCCC, Thailand is located in a venerable geo-location that will experience direct and indirect results from climate change. At COP21 in Paris, in December 2015, nearly 200 countries decided to hold the increase in the worldwide average temperature to well under 2° C. above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5° C. The goal of stabilizing the temperature increase well under 2° C. is largely motivated by concerns over the immense potential scale of ecological, social, and economic damage that could be a consequence from the failure to manage climate change effectively.

Thailand has pledged to reduce 1.5% of its CO_2 emissions. This target compels a large-scale transformation in the array of economic activity, including a major

change in energy systems, especially renewable power generation, industrial processes, building heating and cooling systems, transport and public transportation systems, urban forms, and land use, including forests, grasslands, and agricultural land, as well as the behaviors of households (Hallegatte, 2017). According to the Carbon Pricing Leadership Coalition by the World Bank, climate policies are consistent with growth, development, and poverty reduction. The conversion to a low-carbon economy is hypothetically a powerful, appealing, and sustainable growth pathway, marked by higher resilience, more innovation, more livable cities, robust agriculture, and stronger ecosystems. To succeed in its 1.5% CO_2 reduction target, deliver efficiently and fully realize the potential benefits of climate policies, careful policy design is essential.

According to UNFCCC, Thailand needs technical know-how and technologies in different areas of climate change to enable it to effectively address climate change. These needs are in broad areas and fall under different categories and may require more detailed and systematic assessment, especially in the case of climate-friendly technologies. Below are some areas where technical and financial support is needed.

Thailand needs recognition of areas that need further technical support to improve GHG reduction activities. Below are Thailand's priority needs concerning the greenhouse gas inventory.

1) Develop native emission factors in major sectors and people sectors that are necessary to economic development. The priority sectors are agriculture and biology.

2) Develop applicable activity information to support the estimation of gas inventories. The priority sectors are energy, agriculture, biology and waste management.

3) Develop an estimation technique for key sectors to higher tiers. These are the energy, agriculture, and biology sectors.

4) Train relevant officers and agencies to perform the estimations often.

5) Develop technical personnel in specific areas to develop applicable estimation methodologies or techniques for each Asian country.

6) Develop techniques in gas emission forecasts.

UNFCCC studies on impact, vulnerability and adaptation to climate change and climate vulnerability and extreme events have evolved rapidly. Nevertheless, research has so far not been able to reach the policy making level in a meaningful way. There are various constraints, problems, and gaps that need to be adequately addressed. Problems in and constraints to research and development on climate change can be described as follows:

1) Uncertainties of climate scenarios from GCMs. Despite recently refined regional models, some models remain problematic in assessing uncertainties in climate scenarios. High uncertainties are difficult to work with and to bring about meaningful policy development.

2) Lack of comparable socio-economic scenarios.

3) Lack of new impact assessment techniques in different sectors, e.g. annual and perennial crops, water resources and public health.

4) New and innovative approaches to adaptation analysis.

5) Integration of climate change factors into the development process.

Thailand needs to enhance the capacity of a large number of scholars, especially in applying new techniques to assess the vulnerability of cash crops and water resources. At present, international support to developing countries, including Thailand, has been very limited (ONRE, 2010).

In Thailand, research on vulnerability and adaptation to climate variability and extreme events is in its early stages. The main problems and constraints are associated with the following: 1) research techniques to prioritize key sectors and analyze best alternatives for adaptation; 2) integration of adaptation options into the socio-economic development of risk-prone communities; and 3) technology options for villages in disaster-prone areas. In addition to prioritization and integration into inherent development, support, insurance, and technology transfer are also extremely necessary.

Nonetheless, Thailand has adopted strategies to conserve energy and to use renewable energy, with a view to achieving ambitious targets. To meet such targets, advanced and economically sound technologies are vital. Under the existing market system, many technologies that contribute to greenhouse gas mitigation, such as solar and wind technologies, are technically possible but are not economically viable.

Improving their economic viability is critical for Thailand, in order to effectively mitigate GHGs and to fulfill its commitments to the Convention. Obligations to support and facilitate technology transfer in the public sector of Annex I countries, as stated in Article 4.5 of the Convention, are key to the mitigation capacity of Thailand. Techniques, know-how and technologies to mitigate GHGs are needed.

The establishment of a carbon market in Thailand, whether compulsory or voluntary, will create opportunities and restrictions (Niramon Sutummakid; Supawat Sukhaparamate & Sarun Pravitrangul, 2009). These scholars have analyzed this according to five related factors, as follows:

1) Preparing for a global warming factor: The carbon market in Thailand may have at least three threats, which are: 1) the market may not have domestic buyers because most of the firms are only willing to sell credits, 2) the amount of permits in the market may be too high, and 3) the market might be too small, which may establish diseconomies of scale.

2) Environmental quality factor: the carbon market in Thailand may have at least three threats which are: 1) the quality of Thailand's carbon credit may not be as high as those of other markets, 2) the number of market participants may be too small and too specific to some large industries, and many small emitters may not be included in the market, and 3) public participation may be too small because final consumers are not directly included in the market (although production of goods and services are derived from their demand).

3) Investment factor: when the market is set up, it will generate many investment opportunities, such as capital investment in cleaner technologies and specialized investment in education and MRV-related issues. However, there is a major concern, which is the very high cost of acquiring cleaner technologies or improving energy efficiency. Because most of the technologies have to be purchased from abroad, this may be a disincentive for firms to participate in the market. On the other hand, the carbon market may create an opportunity to increase afforestation and reforestation activities by using funds from carbon credits, which could lead to investment in the forestry sector.

4) International trade factor: Thailand may get some pressure from trade counterparts over non-tariff measurements such as a carbon tax, border carbon

adjustments and environmental regulation (in order to level the cost of GHG reduction). The carbon market may be able to relieve this problem as it reduces domestic GHG emissions; however, the Thai carbon market may face difficulties to gain international recognition. This is because of transaction costs and the time-consuming negotiation process of convincing trade counterparts to accept the Thai market as an effective program for GHG reduction. Regarding the issue of recognition, this study believes that the compulsory carbon market will have an edge over the voluntary one.

5) Multilateral agreement factor: It would be a good opportunity for Thailand's carbon market to share some responsibility in global GHG reduction. On the world stage, Thailand is classified as an advanced developing country. We believe that in the very near future, every developing country will face a commitment to reduce GHG emissions, so Thailand can prepare for that commitment by setting up a domestic carbon market. An early setup of the market will let domestic industries prepare and become familiar with the market and the reduction target before the real commitments begin. However Thailand still faces limitations due to an insufficient database of industrial emissions in order to set up a target for emission reductions.

Even though the establishment of a Thailand carbon market may face many threats, the opportunities to relieve the environmental problems and pressure from the international community may be greater than the threats (Niramon Sutummakid et al., 2009). Nevertheless, a carbon market is a very new issue to Thailand and there are many matters to be considered in order to make a successful market. It is necessary to educate and give information to Small and Medium size Enterprises (SMEs), as well as raise awareness among households about the pros and cons of the carbon market.

Government must achieve CDM through information dissemination and encouraging behavioral modification towards production and consumption of environmentally friendly products and services; support for volunteer networks; cooperation between public and private agencies and organizations; and compliance with international obligations, leading to increased efficiency and effectiveness in natural resources and energy security (Benecke et al., 2008). Many people have considered how seeking alternative methods of fueling their residences, vehicles, and businesses, substantial conservation and transitioning toward using renewable energy

may aid in GHG reduction. When executing CDM sufficiently well, the use of this mechanism can hinder any economic crises that could come from accelerated demand of scarce fossil fuels in times of uncertainty (Streck, 2007).

Although CDM projects will bring benefits to society as a whole, in the past Thailand's CDM projects have not succeeded as hoped. Due to lack of personnel with expertise in the technology and the environment, many projects have failed because of the high risk in manufacturing and trading carbon credits, investment and operating costs are also high. As well, CDM policy provides for other policies, such as providing benefits to cover any resulting shortfall. (Adith Itslangkul Na Ayudhaya, Chaiyasit Anuchitworawon & Prarinyarath Lengchareon, 2011).

The project also has a small amount of CERs that are traded more when the government takes measures to promote CDM projects in the areas conducted through the mechanism of a corporate income tax exemption. But there are still restrictions. There is a need to amend tax laws so CDM implementers will not have frustrations over delays in providing benefits.

By providing BOI privileges, there are investment advantages which should be done quickly. The BOI tax measure cannot be exempted from corporate income tax for the sale of CERs, although in practice the BOI shall be deemed a waiver from other income. In addition to the main event, a "by-product" of the project can be exempted from corporate income tax.

The project was originally intended as a CDM project with revenues already from the sale of CERs. It is not considered a "by-product", it’s interpreted to include the earnings of other companies that are organized into one. It can be said that this is promoting and pushing for the project. CDM also has drawbacks in that the public sector problem should be solved urgently because the financial measures it uses are likely to result in a distortion of market mechanisms.

2.5 Good Practices of CDM Projects in Thailand

2.5.1 Bangkok Kamphaeng Saen East: Landfill Gas to Electricity Project

Bangkok Kamphaeng Saen East Landfill was established in 2014. It is a fully integrated lowland Gas (LFG) assortment system, put in and operated for CER generation. The extracted gas is going to be used to generate electricity. Once the yield of gas is too poor to produce for the generators, or a surplus of LFG happens because of engine maintenance or different web site factors, LFG will be sent to an internal ground flare, wherever the gas is going to be increasing, therefore minimizing methane emissions and increasing carbon abatement. The emission reduction is going to be achieved by LFG utilization that would otherwise be freed into the atmosphere and instead connected to the Thai grid for LFG electricity. Indirectly, it's going to bring a new perspective to domestic waste handling in Asian countries. This is expected to achieve emission reduction of 703,770 tCO2 over the next 7 year crediting period, which will generate more than 30 million US dollars in foreign investment and average 1 million US dollars additional income to the company (UNEP, 2014).

The landfills consist of a combination of two adjacent landfill sites (West and East), they receive approximately 5,000 metric tons of municipal solid waste daily. The landfills were only recently closed and had been generating power since 2010. The landfill gas extracted, after pre-treatment, is sent to 16 units of 1 MW gas engines which can generate up to 16 MW of electricity. This is sufficient to power up to 100,000 homes, which is quite extraordinary for landfill gas power generation.

Figure 2.10 Bangkok Kamphaeng Saen East Landfill
Source: Carbon Neutra Life, 2018.

The landfill gas project has achieved approximately 2 million tons of CO2eq emission reduction under the Clean Development Mechanism (CDM). The design takes into account the different waste composition, climatic conditions and tipping practices of landfill sites in the Asian region when compared with more conventional systems and designs (Warnecke, et al., 2017). The LFG system will form an integral part of the overall landfill operation and modifications will be made to the current tipping practice to enhance gas generation and recovery by improving surface water and leachate management.

The performance of the LFG design will be continually assessed to ensure optimum LFG recovery, and where required, modified to reflect actual site conditions and changes in waste composition and/or daily tipping rates.

Figure 2.11 Landfill Gas to Energy Process

Source: Wangyao, 2018.

Environmental benefits:

1) The project significantly improves local air quality.

2) The project creates global benefits through reduced impact upon climate change thru CDM.

The project activity will also ensure that correct management of the landfill is carried out so as to optimize landfill gas recovery.

Social impacts:

1) Improved air quality, through the reduction of odors, will have a marked impact upon the quality of life for the neighboring communities.

2) The utilization of a renewable source of energy to generate electricity will contribute to Thailand's sustainable development.

3) Collection of the landfill gas will improve the safety aspects of the landfill, reducing the dangers of combustion and explosion of methane from trash composite.

Economic impacts:

1) Benefit from an additional source of revenue from sales of electricity and sales of CERs, which provide reserve funds to secure the future and the continued provision of sanitary waste disposal.

2) An additional source of revenue (CER) will help to secure the future and the continued provision of sanitary waste disposal.

Technology transfer:

The project introduces new technology to the landfill management sector in Thailand, demonstrating how improved gas capture techniques can improve the capture of methane, resulting in more power generation. The project will utilize Carbon Capital proprietary LFG collection technology currently installed at similar landfill sites in China. This project is the first landfill to use this technology on a Thailand landfill, and may be replicated for other landfills in Thailand. Transfer of know-how will be performed directly by training or indirectly through the visibility of the project and its interest as a successful local environmental initiative.

2.5.2 Organic Waste Composting at Vichitbhan Plantation, Chumporn Province

VG Energy Co., Ltd., an affiliate of Vichitbhan Plantation Co. Ltd., generates electricity from biogas under the sales contract of Very Small Power Producers (VSPP, power producers generating no more than 10 Megawatts of electricity) with the Provincial Electricity Authority (PEA.) The company has two biogas power plants in Chumphon province, with a total generation capacity of 8.4 megawatts. The Thung-Kha power plant has a capacity of 2.8 megawatts and the Tha-Sae power plant has a capacity of 5.6 megawatts. The biofuel generated from biogas is produced from treating waste water and utilizing sludge secreted from crude palm oil production (Wangyao, 2018). This CDM project serves to add value to waste products of crude palm oil mills while reducing environmental impacts to neighboring communities, such as minimizing odor pollution from waste water. This biogas power plant also reduces greenhouse gas emissions and was registered as a CDM Project under the United Nations Framework Convention on Climate Change (UNFCCC) in October 2011 and April 2012.

The project comprises the design of a co-composting plant for waste from palm oil mills, comprised of the Empty Fruit Bunches (EFB) and the Palm Oil Mill Effluent (POME) from the mill residue, with an initial maximum annual input capacity of 36,000 tons/annum EFB and 16,200 m3/month of POME. Apart from compost fertilizer, the project will realize methane reductions by diverting POME from the treatment ponds at the mill and high organic waste from dumping at landfills (where an anaerobic process occurs) to a composting plant (aerobic process) (Vichitbhan Plantation, 2018).

Figure 2.12 Empty Fruit Bunches and the Palm Oil Mill Effluent
Source: Vichitbhan Plantation, 2018.

According to UNFCCC 2017, most palm oil mills in Thailand are generating a lot of produce waste with no proper disposal or recycling. This project increases the capacity of the composting plant by 43,200 tons of EFB in 2018, coinciding with the achievement of a maximum capacity of 60 tons/hour FFB processing in the palm oil mill. All the EFB and POME waste going to the composting plant are from two palm oil mills owned by Vichitbhan, and the only alternative for the mills is to continue piling the solid wastes in a landfill and utilizing the anaerobic ponding system to treat POME.

Figure 2.13 Empty Fruit Bunches and the Palm Oil Mill Effluent Treatment
Source: Vichitbhan Plantation, 2018.

Based on investigations and calculations from Vichitbhan Plantation 2018, the CDM project will realize 3,180,003 tons of CO_2 equivalents over the 7 year period 2007–2014 (first crediting period). The investments were realized during the period 2006 till 2008. This project contributed more than 10 million US dollars in foreign funding (UNEP, 2014).

The EFB has a high moisture content, making them heavy and unsuitable for incineration or long-distance transport, and it also contains a substantial amount of degradable organic carbon (DOC). This carbon-nitrogen is optimum for aerobic composting. As such, composting of this waste is an attractive option for resource recovery and environmental improvement (Wangyao, 2018). Generally, the EFB that are produced in abundance in the area were generally incinerated or openly burned, but now the EFB is piled to decompose for biogas, since open burning has been prohibited as a disposal option. Uncontrolled land filling of palm produce is prevented by the CDM activity and highly demanded compost is generated instead, this combats the soil degradation that is a severe problem in palm oil plantations. The biogas project therefore contributes to sustainable development of the agricultural sector in the region.

The plant is semi-mechanized, but will still create a large number of jobs, in particular for less educated workers (Vichitbhan Plantation, 2018). Composting might cause some local environmental impact, mainly odor emission. The composting plant

is located near the existing milling operations. Odor filters may be applied, if necessary, using bio-filters that need to be replaced twice per year and can contribute to the compost generation.

VG Energy Co., Ltd. uses waste water and decanter cake from crude palm oil production to create biogas, serving as fuel for generating electricity. The company has strategies to effectively seek raw materials for producing crude palm oil all year, utilizing the raw materials with optimal efficiency (Vichitbhan Plantation, 2018). The Bio-power plants were also designed to correspond to the production capacity of the company group's crude palm oil refineries. It provides energy stability in addition to increased company income. Thus, there are numerous benefits of the CDM project.

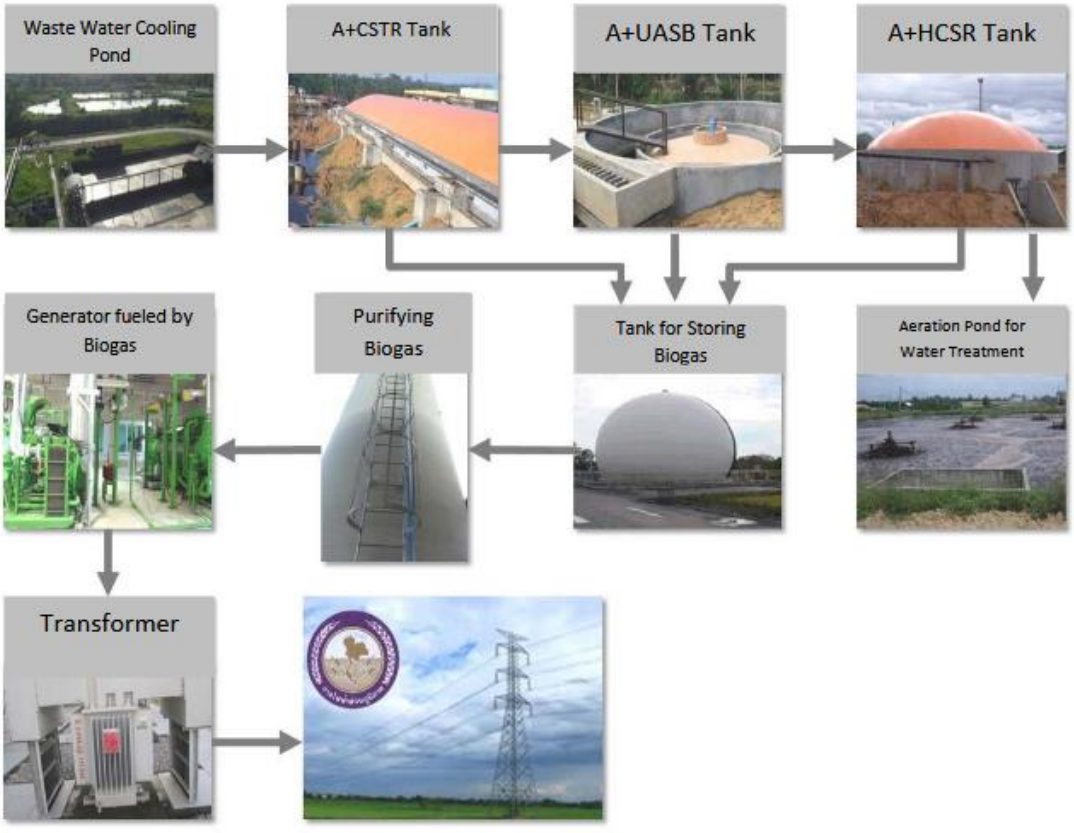


Figure 2.14 Electricity Generation Process from Waste Water of Crude Palm Oil Refining

Source: Vichitbhan Plantation, 2018.

Environmental benefits:

1) The process uses waste water and decanter cake from crude palm oil production to create biogas, serving as fuel for generating electricity.

2) The company has strategies to effectively seek raw materials for producing crude palm oil all year, utilizing the raw materials with optimal efficiency.

3) The power plants were also designed to correspond to the production capacity of the company group's crude palm oil refineries.

4) The project will create global benefits through reduced impact upon climate change.

The CDM project activity will also ensure that correct management of the CDM is carried out so as to optimize social benefits to society.

Social impacts:

1) Improved air quality, through the reduction of odors, with investment in air pollution filter systems and oxygen analyzers to minimize environmental impacts and social impacts upon the quality of life for the neighboring communities.

2) The utilization of a renewable source of energy to generate electricity will contribute to Thailand's sustainable development.

3) Investments also include water management technologies that utilize waste water and other wastes from production to create biogas.

4) The company considers waste recycling and pollution prevention during the establishment of its crude palm oil mills.

5) The company started using organic fertilizer to reduce pollution, including air pollution from processing oil palm fruit bunches and water pollutants secreted from palm fruit bunches exposed to the rain.

Economic impacts:

1) The remaining dregs after treatment will have value, capable of being used as fertilizers for oil palm plantations.

2) The biogas produced will pass through water and hydrogen sulfide (H_2S). The biogas will undergo a combustion reaction in a tube, converting to heat energy to mechanical energy to operate generators for electricity to PEA.

Technology transfer:

The CDM project will introduce new technology to the crude palm oil industry and has significant importance in Thailand and potential for sustainable growth. The additional CDM technology can be used for industrial purposes and serves in the creation of raw materials for other key industries such as Biodiesel, soap, detergent, cosmetics, chemicals, and animal feed. The crude palm oil industry is also supported by the government as a strategy to support renewable energy and the stability of the nation's food industry (Vichitbhan Plantation, 2018). The company utilizes advanced technology such as an automation and monitoring system to support production and boost effectiveness, evaluating results and analyzing data at high speeds. Also, the clean technology supports prompt analysis and fixing of operational flaws, reducing risks from loss and production stoppages. Effective and continuous production processes from advanced technological systems and CDM lead to products with quality surpassing Thai industrial standards, being accepted in both the local and international markets.

2.6 Comparative of Top CDM Implementers in Asia

According to World Bank 2012, after implementing the CDM project under the Kyoto Protocol, there are more than 1,600 carbon credit trading projects registered in Asia. For projects on electricity and energy, China is the country where the projects are mostly located (39%), followed by India (26%), and Vietnam (2.4%). The CERs were the highest in the CDM.

This section explores the concept of promoting and supporting the CDM projects in organizations across Asia. The concept from the World Bank is presented, and additional concepts gathered from academic works, as follows.

2.6.1 Promoting and Supporting CDM Projects in Developed Countries

The World Bank is the main sponsor of CDM projects and is a central funding agency to non-Annex I countries. The focus is on funding, knowledge, evaluation of performance controls and the registration process. In 2009, 36 projects had been approved by the World Bank (Renewable energy). In addition, the World Bank and

UNFCCC are the main organizations in defining the prototype for non-Annex I countries supporting CDM funds to buy carbon credits. Also known as the Prototype Carbon Fund (PCF), it has been established as a fund to support small projects that affect development.

According to UNFCCC 2014, Japan also has a commitment to reduce greenhouse gas emissions - 6% of greenhouse gas emissions in 1990. By 2012, the Japanese government had supported investment in CDM/JI projects in host countries to reduce greenhouse gas and lead to development under the cooperation of the Japanese government and non-Annex I countries like Thailand (TGO, 2014).

In support of developing countries, Annex I is providing CDM project-related skills, capacity building of personnel and established technology to related agencies in the host country, as well as project planning assistance and financial support.

2.6.2 Measures of Various Developing Countries to Promote and Develop CDM Projects

UNFCCC and many scholars have suggested that governments in developing countries who are CER sellers develop guidelines for promoting and supporting CDM projects through fiscal measures, they can be summarized as follows:

1) Tax collection from carbon dioxide (CO_2 tax).

2) Exemption of corporate income tax and personal income tax.

3) Improve the tax structure by having a reduction or exclusion for certain types of energy conservation equipment.

4) Provide assistance funds, including gratuities, low interest loans and invest in energy saving projects.

5) Motivate production, by paying for organizations that produce electricity from renewable sources.

6) Accelerated deduction measures, promoting lower costs of machinery and equipment to encourage more investment.

7) Through policy, for improving the country's development structure and environmental policy.

2.6.3 Promoting CDM in China

According to UNFCCC 2014, China is the second largest producer of carbon dioxide in the world. Because of its rapid economic growth, energy demand has been increasing (The World Bank, 2013). Because of continuously higher energy prices, the Chinese government has actively promoted CDM projects. After signing the Kyoto Protocol China responded by establishing a central agency for CDM project management. China supports international organizations that buy CERs, such as funding and technical support by the World Bank for assistance for small and medium sized projects.

From the literature stream, the Chinese government's major fiscal measures are related to development. CDM projects include:

1) Reducing and exempting import taxes on equipment and machinery for the environment.

2) VAT reductions for CDM projects for electricity generation from Renewable Energy.

3) Allow the bringing of profits from the Renewable Energy Development Fund to financial institutions in order to provide loans to entrepreneurs at low interest rates, and sets the interest rates.

4) Renewable energy prices vary from location to location.

In addition, the Chinese Ministry of Finance has issued a corporate income tax law (effective January 1, 2007), to provide a corporate income tax reduction for CDM projects, including the imposition of income tax on the sale of CERs, which the Ministry of Finance and the Chinese government's Tax Administration Bureau receives when carrying out tax collection (UNEP RISO, 2014). The tax rates vary with the type of greenhouse gases and lower emission rates. Generally, corporate income tax will be contributed to the CDM. In addition, CDM funds are also funded by the Ministry of Finance. Foreign donations from local financial institutions, including low interest loans, are a main driver for CDM projects in China. The money is used to support the CDM projects through state measures, as mentioned above.

2.6.4 Promoting CDM in India

According to the World Bank 2018, India is another country that promotes and develops CDM projects. In 2009, there were 438 registered projects with the CDM Commission by UNFCCC (33% was biomass power generation). The National Clean Development Mechanism Authority (NCDMA) was established to evaluate and certify CDM projects and coordinate with state agencies. There are also other promotional measures, such as the development of an energy development strategy to select and collaborate with countries such as Germany and the United States to develop clean energy (UNDP, 2014). India is a developing country, but with high greenhouse gas emissions, India receives many financial and technological supports from international organizations. Therefore, there are numerous foreign funds to develop CDM projects in the country.

The Indian carbon market is largely driven by small and medium enterprises (SMEs), which is not surprising, as India has nearly three million SMEs which constitute more than 80 percent of the total number of industrial enterprises in the country (Gonsalves, 2006). According to recent estimates by the Indian Institute of Foreign Trade, approximately 60 percent of the country's GDP comes directly or indirectly from SMEs (The World Bank, 2013). In the absence of price transparency, it is not clear that project developers from SMEs have the necessary information about market fundamentals to develop sophisticated risk-hedging strategies in a highly volatile market. Although there are a number of brokers and consultants available in the Indian carbon market, price projections vary widely. Hence small projects and SMEs are largely disadvantaged in the current carbon market.

In order to promote CDM, the Indian government exempts the income tax from CDM income (Ghosh and Sahu, 2011). Regarding the CDM revenue, in the early stages no specific and uniform regulation and no national taxation on CER income exists. This implies that the state (i.e., the DNA) officially does not claim ownership of CERs. Promotional activities are carried out by local offices to disperse information to project developers. For instance, information with links and contacts has been established, and relevant technical and applied information is maintained. Promotional functions with respect to encouraging CDM activity and engagement are adopted by different government departments and units. In addition to those roles and

responsibilities, the CDM projects conjointly consult and interact with public and personal stakeholders and take up setting and property development-related problems from the central government. Then, government makes recommendations on pointers and principles for CDM host-country approval, which is ultimately determined by the central government.

The concentration of CDM projects in India comes within industrialized states, providing the commercial sector is especially amenable to mitigation of GHG. However, the lack of performance of the CDM within the less industrialized states implies that the Indian government is not totally exploiting the CDM´s potential to contribute to property development. In distinction to China, wherever the central and provincial government supplies institutional support to CDM project developers, India´s liberal approach to the CDM prevents the less industrialized states from taking advantage of the investment opportunities that the CDM creates (Beneke, 2009). A capability building initiative might be hosted by the Indian government, as an example. India´s huge economy offers several opportunities for efficient carbon abatement, however exploiting these opportunities is characteristically tough within the present mechanisms. This can be a result of a scarcity of data, and also from the high price of implementing any schemes, this mix is especially severe in those less developed states that have very little expertise with such schemes. By facilitating investment within the CDM within the areas that require it most, the Indian government may reap the double advantage of climate mitigation and economic development.

2.6.5 Promoting CDM in Vietnam

According to World Bank 2018, with growing energy desires and inefficient energy use at associated degrees, Vietnam’s CDM projects could offer monumental opportunities for developing schemes underneath the UNFCCC system. The foremost potential sectors for developing CDM comes squarely from renewables (dominated by hydropower, wind energy), biomass and biogas (residues from sugar, rice, agriculture, wood production), waste (landfills, animal farms, food product starch) and waste water treatment, fuel switch (food, beverage, steel, iron, paper, pulp, rubber, wood), and eventually energy potency in each from trade and buildings (UNFCCC, 2018).

Greater CDM potential exists within Vietnam as demand for energy has been soaring. Over the last decade, demand for electricity increased by 14.9% per year from 1996-2000, 15.3% from 2001-2005, and 14.1% from 2006-2007 (World Bank, 2018). It is predicted to grow at about twice the growth rate of the GDP, by 15% in a low scenario and 18% in a high scenario over 2010-2030 (The World Bank , 2012). In addition, heavy industry is on the rise to satisfy the country's rapid economic growth. The Vietnamese power system capacity needs to basically double, based on the addition of thermal coal-fired energy generation sources in just five years to meet the demand. Vietnam's carbon emissions will more than double in the period 2000 to 2020, increasing from 102.6 million tons in 2000 to an estimated 233.3 million tons in 2020 (UNFCCC, 2018).

The aim of the Vietnamese CDM policy is to narrow gaps and to create a favorable environment to facilitate the implementation of wind power by providing tax benefits and other incentives to renewable power investors. It will also contribute to the process of changing the structure of energy production with a growing proportion of clean energy and renewable energy and reducing greenhouse gas emissions and pollution from power generation. The mechanism encouraging wind power development will provide an opportunity to reduce greenhouse gas emissions while contributing to Vietnam's sustainable development. It can therefore aspire to receive international support through the CDM instrument.

Vietnam cooperates with many partners from Austria, Japan, Germany, Denmark, and other countries on climate change issues. For example, Vietnam signed a cooperation agreement with Denmark in December 2008 with a financial framework of EUR 40 million (Germany Trade and Invest, 2009) and has cooperated with the Japan International Cooperation Agency to implement a development program for an afforestation and reforestation Clean Development Mechanism (Nhan, Ha-Duong, Sandra, and Michael, 2011). The potential for GHG reduction projects in Vietnam' s energy sector is very high, in which plenty of cleaner technological electricity supply and demand side options are available that could be effectively exploited under climate protection activities. The country's natural conditions for these kinds of activities such as the CDM are exceptionally good with large hydropower resources, 3 000 km of windswept coast for wind turbine development, over 300 hot-stream

sources ranging from 30° C. to 148° C., which can be used for geothermal power generating, 2,400 hours of sunshine per year for solar energy development, plentiful agriculture residues for energy usage, etc. (RISO, 2014).

According to UNFCCC, there were 314 of projects registered with the UNFCCC Commission in 2017. Most are small and medium sized projects for power generation. According to the Ministry of Natural Resources and Environment of Vietnam, CDM projects are promoted through tax exemption measures. Equipment, machinery and raw materials used in CDM operations are subjected to a 70% deduction of business income. Moreover, taxation of land rent, fixed depreciation sales subsidy, CDM project financing for investment in the project, and fee collection of selling CERs to fund environmental and conservation funds, are all subjected to tax benefits. The revenue from carbon credits varies with the type of greenhouse gas. Though these are proven technologies that are implemented successfully and a dominant CDM category in many countries, barriers clearly exist that prevent small scale renewable technologies from being more widely implemented in the country, especially when projects are developed without intervention or investment from an Annex I party.

2.6.6 Comparative Tax Benefits of CDM Income in Asia

In summary, many countries in Asia focus on project support. CDM measures encourage entrepreneurs to invest in CDM. Financial support from international organizations and tax benefit measures are taken to promote CDM. Exemption of corporate income tax at different levels can be summarized in Table 2.5.

Table 2.5 Tax Benefits of CDM Income in Asia

Country	Corporate Income Tax (Normal Rate)	Corporate Tax Benefit (Income from CERs)
China	33%	Taxes are classified by type of greenhouse gas and brought to the fund. Renewable energy and CDM Projects are supported by Government 2%.
India	30%	Exemption of corporate income tax on CER trading
Vietnam	25%	Collection of fees/sales income tax CERs classified by type of greenhouse gas. - Carbon dioxide: 1.5%, and methane 2%. - Other greenhouse gas reduction programs, more than 20 percent.
Thailand	20%	Exemption of corporate income tax on CER trading but must pay Value-Added Tax (VAT) 7%.

2.7 The Proposed Conceptual Framework

Based on the literature stream, there is a gap in the literature as to why there are so few organizations implementing CDM programs and what factors influence organizations to participate in CDM programs. There are significant factors extracted from a theological background of effective policy implementation theory, which was developed by Mazmanian and Sabatier (1989). However, this study argues that although the original theory provides explanations for effectiveness in the policy implementation process, a theory that integrates the surrounding factors offer explanatory potential. The study relies on a modified Mazmanian and Sabatier (1989) policy implementation framework, transparency, globalization, environmental

benefits and socio-economic benefits to demonstrate how the integrated theory can explain an organization's behavioral response to CDM policy in Thailand and discover CDM implementation barriers.

Moreover, the literature findings indicate a causal relationship between the independent variables in policy implementation practice. These factors are synthesized into a conceptual framework of path analysis. The framework calls for transparency in CDM implementation, ability to statue in order to structure implementation, tractability of the problem, non-statutory variable affecting implementation, globalization impact, environmental benefits, and socio-economic benefits from CDM implementation. These factors are significant for CDM policy effectiveness and decision making processes, which promotes CDM projects as a national necessity for social stability and to a sustainable development solution in the dimension of social wellbeing.

2.7.1 Key Independent Variables and Dependent Variable

There are 7 independent variables in this study, which is supported by the ground theory for policy implementation of Mazmanian and Sabatier (1989) and Matland (1995), whose empirical studies are related to the effectiveness of policy implementation, CDM benefits, and barriers of CDM implementation in various countries, including Thailand. The independent variables can be explained as follows:

Table 2.6 Key Independent Variables (IVs)

Key Independent Variables	Ground Theory and Empirical Study
Material Variables (Tractability of the Problem)	deLeon (1999); deLeon and deLeon (2002); Goggin, Bowman, Lester, and O'Toole (1990); Mazmanian and Sabatier (1989); Matland (1995); Stavins (1998)
Structural Variables (Ability of statute to structure implementation)	deLeon (1999); deLeon and deLeon (2002); Goggin, Bowman, Lester, and O'Toole (1990); Mazmanian and Sabatier (1989); Matland (1995); Stavins (1998)

Table 2.6 (Continued)

Key Independent Variables	Ground Theory and Empirical Study
Contractual Variables (non-statutory variables affecting implementation)	deLeon (1999); deLeon and deLeon (2002); Goggin, Bowman, Lester, and O'Toole (1990); Mazmanian and Sabatier (1989); Matland (1995); Stavins (1998)
Globalization	ONRE (2010); Stern (2006); Streck (2007); UNDP, (2004); UNDP (2014); UNEP RISO (2014); NESDB, (2012); TGO (2014); UNFCCC (1998); World Bank (2004, 2012, 2013, 2014, 2017)
Transparency	deLeon and deLeon (2002); Etzioni (2010); Porter and Kramer (2006); UNDP (2014); UNEP RISO (2014); NESDB, (2012); TGO (2014); UNFCCC (1998); World Bank (2004, 2012, 2013, 2014, 2017)
Environmental Benefits	Lohmann (2006); NEDSB (2012); ONRE (2010); Stern (2006); Streck (2007); Sutummakid, Sukhaparamate, and Pravitrangul (2009); UNDP (2014); UNEP (2014); World Bank (2004, 2012, 2013, 2014, 2017)
Socio-Economic Benefits	Lohmann (2006); NEDSB (2012); ONRE (2010); Stern (2006); Streck (2007); Sutummakid, Sukhaparamate, and Pravitrangul (2009); UNDP (2014); UNEP (2014); World Bank (2004, 2012, 2013, 2014, 2017)

For the dependent variable, the study found many linkages between CDM and sustainable development, especially the work from UNDP, UNEP, and the World

Bank, which emphasizes many benefits for CDM. The literature findings indicate a causal relationship for many independent variables to CDM implementation, practice and sustainable development that are curtailed for this research.

Table 2.7 Key Dependent Variable (DV)

Key Dependent Variable	Ground Theory and Empirical Study
CDM linkages SD	NEDSB (2012); ONRE (2010); Stern (2006); Streck (2007); TGO (2014); Sutummakid, Sukhaparamate, and Pravitrangul (2009); UNFCCC (1998); UNDP (2014); UNEP RISO (2014); (Hallegatte, 2017); Oliver (1997); Porter (1990); Porter and Kramer (2006); UNFCCC (1998); UNDP (2014); UNEP RISO (2014); World Bank (2004, 2012, 2013, 2014, 2017)

Table 2.8 Abbreviations

Independent Variables		**Dependent Variables (DVs)**
TRN	= Transparency	CDMSD = CDM linkages to Sustainable Development
ASSI	= Ability of Statue to Structure Implementation	
TRAC	= Tractability of the Problem	
NAVI	= Non-statutory Variable Affecting Implementation	
GLOB	= Globalization	
ENVO	= Environmental Benefits	
SOEC	= Socio-Economic Benefits	

1 Endogenous variable

4 Exogenous variables

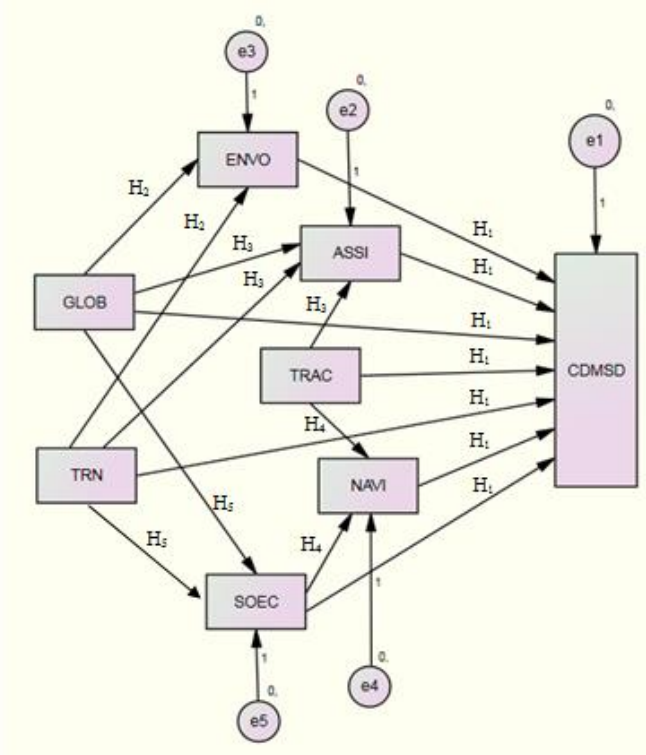


Figure 2.15 Conceptual Framework

In the aim to examine the significance of casual relationships stated in the hypotheses, independent and dependent variables are synthesized into a conceptual framework of path analysis. The framework calls for transparency in CDM implementation, ability of statue to structure implementation, tractability of the problem, non-statutory variable affecting implementation, globalization impacts, environmental benefits, and socio-economic benefits from CDM implementation. The structural equation has been drawn up as follows:

In research, hypothesis testing refers to a statistical test that determines evidence in a sample data from the entire population which is recognized by the academic community. The consequential results of a test, survey, experiment, or observation will lead to acceptance or rejection of the statistical hypotheses (Hair, Black, Babin, Anderson, and Tatham, 2006). Thus, in the way of explanation for the entire population, if one is true, the other must be false.

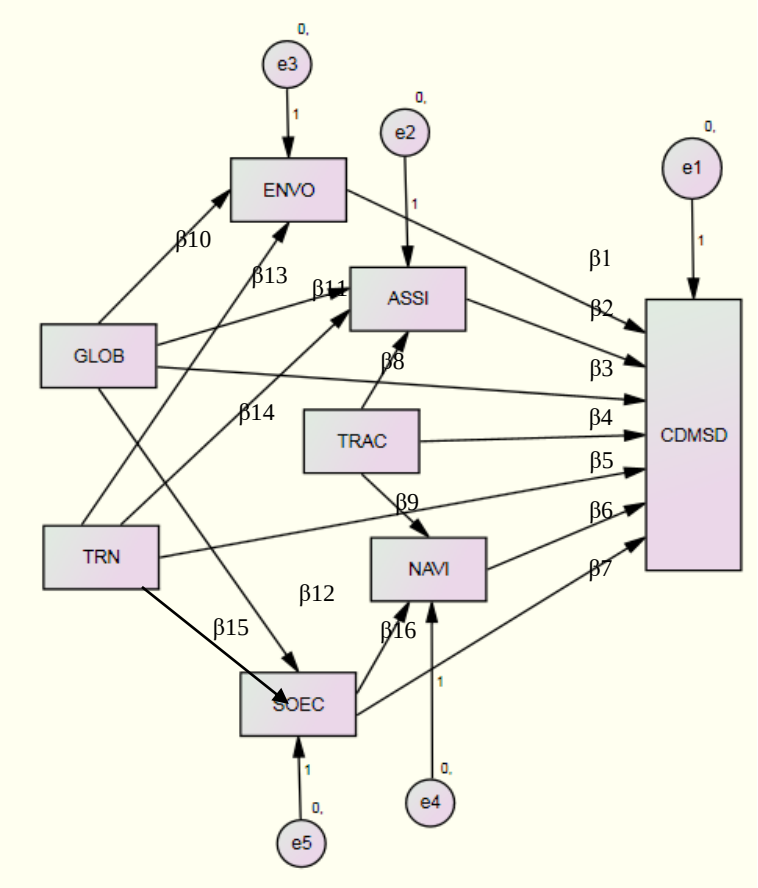


Figure 2.16 Conceptual Framework (Beta)

2.7.2 Hypothesis

Hypothesis testing mostly involves examining the construction of two opposing statements about a population. The null or idealized hypothesis and the alternative or experimental hypothesis regarding the variations or outcomes that arise in the target population. The null hypothesis, denoted by Ho, is a hypothesis that suggests that the observations are the result of pure chance, which needs to be clearly identified by using previous research (Kline, 1998). The null hypothesis is a statement of "no effect" or "no difference", that is to say, there is no variation that exists between variables or in a set of given observations, and a population parameter is equal to the value of the population parameter (Pallant, 2001). According to Kline 1998, the hypothesis testing (H_1, H_2, H_3 …), associated with a theory that is derived from observations and the literature stream show an influence combined with a component of chance variation over the independent and dependent variables. This

hypothesis states that the mean and variance of a population is different than the value of a variable in the null, and this research is trying to prove that and is assuming it to be true or expected to proven to be true (Tabachnick & Fidell, 1997). For the purpsoe of this research, the structural equations are created as follows:

Hypothesis 1 (H_1)

CDM linkages to a Sustainable Development objective of an organization relies on environmental benefits, socio-economic benefit, transparency of the operation, ability of Statue to Structure Implementation, tractability of the Problem, non-statutory Variable Affecting Implementation, and globalization.

$$= \beta 0 + \beta 1ENVO + \beta 2ASSI + \beta 3GLOB + \beta 4TRAC + \beta 5TRN + \beta 6NAVI + \beta 7SOEC + e \quad \text{----------(E1)}$$

Hypothesis 2 (H_2)

Environmental benefits depend on globalization and transparency.

$$ENVO = \beta 0 + \beta 10GLOB + \beta 13TRN \quad \text{----------(E2)}$$

Hypothesis 3 (H_3)

Ability of Statue to Structure Implementation of policy depends on globalization, tractability of the problem, and transparency.

$$ASSI = \beta 0 + \beta 11GLOB + \beta 8TRAC + \beta 14TRN \quad \text{----------(E3)}$$

Hypothesis 4 (H_4)

Non-statutory problem for policy implementation relies on tractability of the problem and socio-economic benefits.

$$NAVI = \beta 0 + \beta 9TRAC + \beta 16SOEC \quad \text{----------(E4)}$$

Hypothesis 5 (H_5)

Socio-economic benefits depend on globalization and transparency.

$$SOEC = \beta 0 + \beta 12GLOB + \beta 15TRN \quad \text{----------(E5)}$$

2.8 Summary

In this chapter, the study found that climate change is one of our greatest environmental challenges. GHG from human activities has been found to be one of the main causes. The CDM provides a route for developing/underdeveloped countries, or Annex I and non-Annex I countries, to sell certified emission reductions, or carbon credits, to industrialized countries. The CDM projects that reduce GHGs are playing a significant role in the field of renewable energy, energy efficiency improvement and specific industrial emissions. Based on the literature stream and empirical research, in many cases CDM has led to sustainable growth and competitive advantage in many non-Annex I countries. However, the implementation of CDM is varying in each country. A case study of Volkswagen illustrates a serious consequence of neglecting the environmental aspect of business practices, which led to many negative impacts in the literature. The literature stream discovered that a policy implementation framework incorporated with globalization, transparency, environmental benefits, and socio-economic benefits is given a better explanatory potential, which supports CDM implementations and sustainable development by empirical evidence from related literature. A conceptual framework is created from the gaps of literature for the effectiveness of CDM implementation in Thailand. The literature review on CDM and SD shows a number of poor fits and conflicts. By the Path Analysis technique, the hypothesis will be proven and a structural equation will be discovered for alternative solutions of CDM implementation in Thailand in order to provide direct and indirect effects of policy implement linkages to SD. Nonetheless, an illustration of comparative studies of top CDM players in Asia, such as in China, India, and Vietnam, are examined to demonstrate the foundation and promotion in each country of CDM implementation. The results from China, India and Vietnam are very impressive for CO_2 reduction targets and additional benefits of CDM. The proposed conceptual framework, which presents a path diagram for showing the causal relationships between variables, will be presented in the next chapter.

In addition, the situation of CDM policy implementation in Thailand has demonstrated the results of an organization that has fully implemented CDM. A compliance of projects under which Annex I countries defaulting on binding emission

targets could contribute to a fund to facilitate clean technology transfers to developing countries like Thailand. The scheme permits Thailand to sell tradable Certified Emission Reductions (CERs) generated from approved CDM activities, and then permit Annex I countries to use such CERs to comply with their GHG emission reduction targets under the Kyoto Protocol. In an ideological aspect, CDM is a win-win approach for all nations to help resolve the global warming issue.

If CDM technology is effectively implemented in Thailand, it has the potential to become a strong instrument for the country and its businesses to address climate change as the only mechanism of cooperation between developed and developing countries under the urgency of a climate situation watch. Today, after COP 21 in Paris, uncertainty on climate policies and market-based finance mechanisms post-2020 still remain in the future of the CDM. A variety of options have been proposed on how to reform the CDM in an abundance of literature sources, aiming to carry on its momentum for CDM benefits to the nation and society.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

A study of a policy should be conducted over a long span of time in order to comprehensively investigate its eventual long-term impacts. Due to time constraints, this research is limited to examine the implementation of CDM projects carried out by the private sector only. The two main projects approved by scale by UNFCCC, which are large and small scale projects, were selected. However, the classification of CDM technologies also has several sub-methods. This study focuses on the CDM activities occupied by the majority of CDM projects in Thailand. Therefore, this research follows a cross-sectional research design.

3.2 Research Procedure and Sampling

In this study, the research will use both a qualitative and quantitative approach to identify the factors affecting an organization's decision to implement a CDM policy in Thailand. The research structure is illustrated as follows:

1) In-depth interviews are conducted with policy formulators and policy actors to assess the significant factors for CDM implementation and potential barriers.

2) The questionnaires will be developed and distributed to an identified population which is compiled in terms of organizations that participate in CDM projects with TGO and UNFCCC.

3.3 Qualitative Approach

3.3.1 Target Population and Unit of Analysis

There are 2 target populations in this study. The first one is the responsible agency for CDM approval in Thailand, the Thailand Greenhouse Gas Management Organization (TGO). TGO acts as a public organization in accordance with the law on public organizations to analyze, scrutinize and collect views and opinions in relation to the approval of projects, as well as to pursue and appraise the authorized projects. Nevertheless, TGO furthers the project's advancement in the market of greenhouse gas quantity trading as approved by Thailand as the host country. The certified carbon credit issued by TGO is qualified for the carbon trading market approved by UNFCCC. The input from TGO members as policy actors is essential to explore the conceptual framework.

The second population is organizations which implement CDM projects. Many organizations that neglect social and environmental impacts are potentially banned by the local community (Porter and Kramer, 2006). GHG reduction is one of the activities aligned in many business mission statements for good practices in doing business in Thailand. CDM offers such opportunities to organizations which aim for ecological practices and social responsibility. Therefore, factors that can influence the decision process of CDM implementation certainly contribute a concrete relationship to the study.

This study is assigned the unit of analysis of "project" because the nature of an organization which joins a CDM is classified by the project type of CDM technology, such as Solar power generation or Biogas power. According to UNEP RISO 2014, the total number of projects which qualify for this study is 163 projects. However, 9 projects are operated and owned by Electricity Generating Authority of Thailand (EGAT) and 1 project is operated by Energy Research and Development Institute, Nakornping of Chiang Mai University, which is owned by the government. Thus, a total of 153 projects remain as the target population for this study.

3.3.2 Sample Selection

A purposive sampling is used to select those who can be regarded as key informants to provide relevant data. This sampling technique relies on its own judgment when choosing members of a population to participate in the study. The sample selection is based on characteristics of a population and the objective of the study. The primary target is the TGO executive. TGO is a policy actor for CDM activities in Thailand. Its role is crucial for GHG reduction movements in Thailand. TGO executives have important roles to increase the capabilities and competitiveness of private and relevant sectors to implement CDM mitigation projects towards the conservation of natural resources, and environmental qualities for sustainable development in Thailand. To understand CDM implementation in Thailand, executives of TGO were selected as follows:

1) Director of TGO
2) CDM committees
3) Project Leaders

For this research, the samples are divided into two main groups. Both group samples are purposively drawn from the policy actors. They are the director, committee members and frontline implementers of GHG reduction in Thailand. TGO is established with a vision to garner the effective management of greenhouse gas emissions to support the economy, environmental conservation, the economic environment and society. Although, TGO is a public organization, and not a government agency, TGO has an administrative independence; it also acts as a center for collaboration between the government, private sector and international organizations as established under the Ministry of Natural Resources and Environment. Thus, TGO input is essential to this research because it serves as a policy actor and formulator for Thailand.

The second group was selected from private organizations which have implemented CDM projects. In-depth interviews will be conducted with key decision makers, executives, management, CDM committees, and CDM project leaders to investigate relevant factors in the conceptual framework. From the literature stream, Thailand attended COP21 in December, 2015. Following COP21, Prime Minister General Prayut Chan-o-cha of Thailand said that Thailand had adopted a Philosophy

of Sufficiency Economy as a way to carry out sustainable development in the country as part of his speech delivered in Paris at the 21st session of the Conference of the Parties to the United Nations Framework on Climate Change. Global temperatures and sea level have increased and droughts have become severe. With Thailand's reduction emission target, many organizations, both public and private, are encouraged to reduce their emission of greenhouse gases by 2030. The country has launched several environmental campaigns, especially those concerning energy consumption and reforestation. However, there is a lack of participants in CDM projects in Thailand despite the benefits. Therefore, by exploring the implementation factors of CDM for current operating organizations, this study will illustrate the benefits and the impacts of those implementation factors.

3.3.3 Qualitative Methods for Data Collection

Both primary and secondary data is collected to yield rich data for the understanding of the CDM activities carried out by TGO and companies who consider implementing a CDM project. There are 2 main research instruments used in this research.

1) In-depth interview

To explore issues in detail

2) Participant and Non–participant observation

In order to investigate future activity carried out by TGO and UN

3.3.4 Qualitative Analytic and Data Analysis

The proposed conceptual framework is analyzed by using causal networking, a qualitative data analysis technique. The qualitative analytic technique is used because it explains the phenomenon under study in terms of a cause and effect relationship of the phenomenon in their actual situation. Thus causal networking, a qualitative data analysis technique proposed by Miles and Huberman (1994), is used to analyze the qualitative data collected by in-depth interviews and participant observation. The causal networking technique was especially developed for explaining a phenomenon by the qualitative approach.

Miles and Huberman (1994) described the causal networking technique as a comparative analysis of all cases in a sample which uses variables estimated to be the most influential in accounting for the outcome or criterion. For each outcome measured, the stream of variables leading to or determining the outcome is examined. Streams that are similar or identical across cases and that differ in some consistent way from other streams are extracted and interpreted. The basic principle is that of developing one or more meta-networks that respect the individual case networks from which they have been derived.

Rubin and Rubin (1995) state cross-case causal networking involves manipulating several sets of boxes and arrows at the same time. Its process can be broken down into successive analytic steps, as follows:

1) Assemble the causal networks.
2) Isolate the causal "streams" for each case that lead to the dependent variable being analyzed.
3) Match the variable streams to other cases with the same outcome.
4) Verify the scenarios for similar and contrasting outcomes.

Interviewing is a method of storing data according to the research. The interview relies on the ability of interviewers to ask questions in order to track issues. Information detailing this profound question contains two questions on its nature. The Main Question: (browse and prosecutorial questions), and the Probe Question (follow up) (Rubin and Rubin, 1995).

To get the correct information regarding CDM implementation, the selected population is interviewed in both structured and unstructured fashion, time and circumstances permitting, and the suitability of the person being interviewed. In order to know the factors that have a major effect on the effectiveness of the policy implementation, it has been designed to ensure that the theoretical framework is practiced correctly in reality. However, close-ended and open-ended questions are prepared, which allows the interviewees to respond freely to the question.

The literature review has confirmed that in theory, the questions asked were prepared to confirm to the findings from the literature stream.

CDM implementation factors

1) Why is CDM attractive to your business?

CDM implementation obstacles

2) What are the obstacles of CDM implementation?

CDM benefits and result

3) Does CDM benefit the company and local community?

4) What benefits of CDM (i.e. socio-economic, environmental, financial, sustainable development, etc.) do you see, and does CDM affect the company's competitive advantage strategy?

CDM linkage to sustainable development

5) Does CDM lead to sustainable development in your business?

3.3.4.1 Qualitative Analytic and Data Analysis: TGO

Organization Background

The severity of global warming and climate change has caused a widespread impact, requiring two fundamental response strategies, mitigation and adaptation. As is well-known, greenhouse gas emission is the major cause of the problem. Hence, to control emissions, countries are not only required to mitigate the impacts by developing projects under the Clean Development Mechanism (CDM), but also to increase the capabilities and competitiveness of private and relevant sectors to implement these mitigation projects towards the conservation of natural resources and environmental qualities for the sustainable development of the nation.

According to TGO (2014), the Cabinet's resolution of Thailand approved the institution of the greenhouse gas emission Management Organization as a public organization in accordance with the law on public organizations on May 15 B.E. 2550 (2007). While the autonomous public organization has an Associate in Nursing independent body, it additionally acts because it's the center for collaboration among government, non-public sector and international organizations. As published on July 6 B.E. 2550 (2007), in Government Gazette of Thailand Volume 124 Part 31 A, the public organization entitled "Thailand Greenhouse Gas Management (Public Organization)", called "TGO" in brief, is established under the Ministry of Natural Resources and Environment with the main tasks of analyzing, scrutinizing and

collecting views and opinions in relevancy of the approval of schemes, likewise on pursuing and appraising approved projects.

This section examines the standing and evolution of the Clean Development Mechanism (CDM) and summarizes the main issues of CDM relating to its implementation from a policy actor perspective. Varied factors that strengthen the CDM within the current and also future climate regimes are reviewed in order to maneuver forward by promoting more practical participation of countries in GHG mitigation.

Findings

Mr. Thada Voroonchotikul, CDM Assistant Senior Official and project coordinator of TGO, was interviewed in September 2014. Mr. Thada is one of the CDM committee members who analyzes and approves various CDM projects, since 2012. The input from this interview contributes to the support of literature gaps in the implementation decisions of organizations.

Respond to question 1: why is CDM attractive to your business?

The company is interested in CDM because the carbon price incentive is an abatement option and can equalize marginal abatement costs across the resources and methodology to which the carbon price applies. CDM does this, therefore by making incentives for markets to use of all levers accessible to cut back emissions: the kind of activity pursued in the structure and energy intensity of a selected business or of the economy as a whole, and the type of energy chosen for production. The carbon price is generally normalized to the amount of GHG that would lead to the same equivalent as a ton of CO2 over a specific period, and is specified as a price per ton of CO_2e (or CO2 equivalent).

CDM encourages business to decrease the carbon intensity of the energy sector and merchandise, and shoppers to settle on less carbon-intensive merchandise or operations. By making opportunities to extend profit or economize through the reduction of GHG emissions, carbon rating conjointly promotes innovation and incentivizes the generation of latest concepts and solutions. Rating carbon will facilitate a drive for innovation in technologies and business models that may cut back carbon emissions and promote resource potency, and so boost productivity enhancements.

Respond to question 2: what is the obstacle of CDM implementation?

CDM can be implemented by embedding theoretical prices, for example, financial instruments that reduce the capital costs of low-carbon programs and projects (compared with other, more carbon-intensive programs and projects). Because CDM implementation, especially in energy-efficient power generation and renewable energy, often involves higher upfront costs and larger uncertainties than traditional energy sources, the relatively high capital costs tend to encourage the use of traditional fuel systems. To achieve a given degree of carbon reduction for Thailand, a company with relatively low capital costs needs to impose higher financial and technology support for reducing carbon emissions than a company with higher capital costs. This aspect is particularly important for developing and emerging businesses where technology and capital is limited.

CDM will be easier to implement if an enabling environment and an appropriate policy framework exists by the government, as a Designated National Authority, or DNA by UNFCCC or TGO, does not have authority to enforce CO_2 reduction. Critical preparation steps for a CDM system include the following: setting the scope of the instruments; collecting robust emissions data; and determining the ambition of the instruments in line with the jurisdiction's overall climate change mitigation objectives, and how best to recycle the revenue from carbon taxes or auctioned emission rights, which all require time and transparency. Once CDM instruments are in place and become effective, governments have to be compelled to directly tackle implementation challenges connected with the review and refinement of those instruments.

Respond to Question 3: does CDM benefit your company and local community?

CDM can absolutely benefit the company and local community. On the revenue side, projects will have carbon revenues from the production and sale of CERs and may also create non-carbon revenues from the sale of co-products such as electricity, bio-fuel, and agricultural products. The economic perspectives are significant increases in employment, improved balance of payment to local business, and boosting the capacity of local manufacturing and users to adapt and utilize new technologies to optimize company profitability. From a social standpoint, the

indicators include benefiting marginalized populations economically and benefiting marginalized populations environmentally. Certain CDM projects can provide energy to energy-poor populations, and increasing the adaptive ability or resilience of communities and regions. Finally, important environmental benefits include reducing polluting emissions, preventing or reducing natural resource degradation, greening the process of energy production, and promoting the development and dissemination of new energy technologies or sources.

Respond to Question 4: what benefits of CDM (i.e. socio-economic, environmental, financial, sustainable development, etc.) do you see, and does CDM affect your company's competitive advantage strategy?

While it is important for organizations to have a clear value proposition for the social sector, it is equally important for its business model to make economic sense in order to sustain it independently. This economic logic helps differentiate the environmentally sound construct from philanthropy. In order to create the business model of a self-sustaining organization, it makes sense to take a market-based view to help us track such a venture's waste management and capability development through the CDM project. A recent review of CDM from a sustainable development perspective revealed that despite being a topic of capital investment, relative socio and environmental benefits have seen CDM to be attractive from management and entrepreneurship lenses.

Organizations that have continuous engagement with stakeholder groups understand and address their respective concerns in doing business, it is also critical to avoid local conflict to ensure public and political support, as well as encourage collaboration between government and CDM benefits. While the CDM process takes time and resources, it helps ensure the long-term credibility and sustainability of carbon credit revenue and corporate social responsibility, which is a key advantage to investments in a low-carbon business. CDM will have advantages on the other hand from emission reductions, as enhancements in technical and institutional capability entails crosscutting advantages, which will support different climates and development policy objectives.

Respond to Question 5: does CDM lead to sustainable development in your business?

The decision on sustainable development must take into consideration the CDM advantages that may be generated by carbon reduction, other than just the reduction in carbon emissions and revenue. Emission reductions could seem a great proportion of profit once considering their co-benefits, admired reduced pollutions, improved individual health, and optimized public image. These issues can have an effect on each of the ambitions of emission reductions in a given organization and therefore the acceptable balance between express and implicit advantages. The advantages and co-benefits of climate action could also be an aggregate into the competitive strategy for higher business operators. Business policy frameworks that deliver carbon reduction to match surrounding goals ought to encourage the business and money sector to explore lower carbon methods. In this context, confidence within the basic direction of energy and climate policy is crucial.

Redirecting major investments toward CDM schemes needs credible carbon-price pathways spanning many decades. Temperature change may be a world spatial relation, and so may be best tackled globally. However, there is increasing recognition that the transition to a low-carbon society by the Thai government is not solely appealing as a result of the temperature change impacts that may be avoided, however additionally is a result of the advantages and co-benefits it generates within the long and short term. This widespread recognition contributes to the agreement of urban center protocol and facilitates international cooperation.

Though, there is a risk that if any organization fails to require active measures, or if carbon reduction becomes regulation wide across the nation, businesses with high levels of CO_2 emissions could be subjected to lose advantage in the local and world arena. At present, such may be ascertained in the EU, in all probability as a result of the variations in energy costs and environmental rules across the countries who are dominated by different factors, adore labor and transport prices, or different restrictive components. Nevertheless, temperature change could become a difficulty as climate policies become stricter in some countries, however the consequences on Thai business is unsure. The implication of pollution caused by doing business is becoming unacceptable in society. CDM may be important, and undermine support for sturdy low carbon policies in Thailand.

3.3.4.2 Qualitative Analytic and Data Analysis: Rajburi Ethanol Co., Ltd.

Company Background

Rajburi Ethanol Co., Ltd. was established in March 2006 for the turn-key project of an ethanol plant production. The plant is designed to produce high-quality motor-fuel grade ethanol at a capacity of 150,000 liters per day. The plant was commissioned in October 2007. This project is to follow the Thai government's policy to supply renewable energy to the nation so that green energy is used and the country will be less reliant on foreign imported oil in the future.

After months of studies, Rajburi Sugar Co., Ltd. and Rajburi Ethanol Co., Ltd. have come to an agreement with ENVIMA (Thailand) Co., Ltd. to act as our authority for applying for CDM Project standing for the company's planned new sewer water treatment facility UASB system. After over 30 years of the open pond system for wastewater treatment facility, the company applied for CDM project funding of a UASB system for water treatment. The company focuses on environmentally friendly business operations following electricity generation using biogas and ISO 14001:2004 Certification.

Findings

During data collection, there was an opportunity to visit Rajburi Ethanol Plant (REP) in July 2015 and conduct an in-depth interview with Mr. Chaiyaporn Kijasivavej, Plant Manager.

Respond to question 1: why is CDM attractive to your business?

The company's mission is to develop a good relationship with the local community. The core business is sugar mills under Rajchaburi Sugar Co.,Ltd. The company's mission is to keep improving production technology. While REP cares for environmental conservation. REP focuses on the safety and security of all its staff, communities and neighbors. The company is committed to being good citizens and will make continuous contributions to society. Thus, any activities that can help reduce pollution and increase efficiency are very interesting. CDM seems to be a good mechanism that can help the company to know its carbon activity and potential revenue from the carbon trading scheme. For the REP process, high energy consumption is inevitable, that has led REP in trying to find alternative sources, such as methane and solar into an Ethanol production process.

Respond to question 2: what is the obstacle of CDM implementation?

CDM in theory is quite attractive, but it's the unclear regulation and support from government in terms of financial and technology that puts this project at risk. REP needs to invest in new machinery for energy, switching to increase production efficiency and reduce waste. Now management demands a feasibility study for IRR. The company also studies the advantage of import duty and tax benefits from BOI regarding CDM ventures and income, which I believe to be tax free or a deduction. Nonetheless, the carbon price in the market is uncertain. From REP's internal analysis, income from the CER trading scheme is very little compared to the initial investment that the company has to invest in new processes and overhead costs. Another concern is political uncertainty. The current government does not give a clear policy execution to support pollution reduction activity. In fact, there are environmental laws and regulations that the company needs to meet for ethanol production. Numerous random audits are being done by government agencies and NGOs. CDM should be on a voluntary basis, which is the baseline for common understanding for corporations and related parties. In addition, "methane combustion" is considered as an appropriate technology for REP, with significant sustainability benefits and the ability of reducing the level of methane concentration in the atmosphere, which is a goal of REP. Financial support and technology advisement would encourage the company to invest in CDM.

Respond to question 3: does CDM benefit your company and local community?

The company agrees that CDM can benefit the company and local community. With a trading scheme, there will certainly be additional income. However, that income is not the company's main aim. Business nowadays must look at innovative ways for value to be generated for the social good and involve stakeholders at the supplier, buyer or consumer level. By reducing carbon emissions to the atmosphere, it answers the company mission statement. It will show that the company has a responsibility to the society as a whole and to locals. In such a scenario, the firms create business models that enable organizations to meet basic requirements so they can capitalize upon the opportunity. Nevertheless, new machines or processes will result in higher production rates which require more input. Cane

producers can supply more produce to the factory. Locals will enjoy more income and a better environment. In fact, electricity generation in the Ratburi area comes mainly from conventional thermal units, which use primarily natural gas and secondary coal and oil. REP requires a great amount of electricity in order to fulfill its energy needs. The alternative “steam boiler upgrading” resulted as a high priority technology for CDM as several environmental benefits were gained from its implementation, such as the achievement of local clean air as well as domestic resources conservation.

Respond to question 4: what benefits of CDM (i.e. socio-economic, environmental, financial, sustainable development, etc.) do you see, and does CDM affect your company’s competitive advantage strategy?

The CDM concept can by far create great benefits to the company, environment, and society. It will certainly be a sustainable way for development and provide for better business practice. Nowadays, the company cannot focus only on profitability, but social responsibility is a must also. In fact, the company is forced by law to meet with pollution standards, which some locals still do not understand that the production process of ethanol is safe and meets all requirements by authorities. But the idea of CDM for turning industrial waste into energy is attractive. RES puts high priority on technology options that turn into “biogas for generators” and “biomass boilers”, due to the fact that they are able to contribute to the decrease of energy dependency on the regular grid line and assist in energy sustainability. This technology has great potential, biogas and the installed biogas systems generate approximately 1 or 2 MW of power, with additional savings estimated for total energy consumption potential. There is a huge potential of biomass in the Ratburi area and most CDM projects in the sugar industry also fall under the same category. On the contrary, there is also a high potential for solar, considering the resource availability. However, the technology is low ranked, an outcome which can be explained considering the very high investment cost and the less output which leads to a very low efficiency.

CDM supplies alternative energy sources, adding to the operational processes which can help reduce energy cost and increase profits. For local communities, surplus energy can be distributed to the community in terms of electricity or methane gas for cooking schools, temples, or even nearby households. In

short, CO_2 emission reduction activity from CDM projects can create alternative paths which led to sustainable ways of living and business operations.

Respond to question 5: does CDM lead to sustainable development in business?

Environmental and financial benefits are the main considerations. CDM can answer to both. Taking into consideration that the method is based on the stakeholders' judgment, the results are dependent on a lack of knowledge about carbon reduction technology. Importing technologies requires a very complex customs procedure (over 30 forms to fill in) and implementing some technology alternatives may conflict with locals and government agencies. For example, besides carbon trading schemes, subsidized feed-in tariffs are also options for additional income. The income from CDM activities is subjected to being tax free or not, in this case and in this implementation chain, the two governmental policies are contradictory.

However, besides these factors above there some other dimensions that need to be considered, such as financial aid, support in terms of technology, and the local community. External pressure also forces the company to change. The global community has promoted GHG reduction; any business that does not comply with environmental policy will lose their competitive advantage in the global market. In fact, Rajburi Sugar Co., Ltd. received the carbon footprint for organizations which can define their exact amount of CO_2 emissions in 2014. As part of the local community, the company takes environmental policies very seriously. This commitment has led the company to be the first 5 mills in Thailand to be awarded the environmental certificate ISO14001:2004. The company also encourages our cane producers to supply fresh green canes rather than burned, then they can be turned into raw material for the waste to energy program. The above discussion has referred to the sustainable development aspects of the CDM, with the emphasis laid on CDM contribution to RES needs and priorities. The decision to support CDM approaches and methods can have a significant contribution in this respect of sustainable practice in many means. Based on a preliminary study of REP, the CDM approach does require businesses to aim towards national sustainable development goals, which is the company’s driven decision.

3.3.4.3 Qualitative Analytic and Data Analysis: Kato Steel Thai Co., Ltd.

Company Background

Kato Steel Thai (KST) was established on 10 November 1996 to produce, sell and export various types of Die-Casting shot parts. KST leads in the development of these markets across the globe. The company is committed to the environment, KST is active in retaining the improvement of metal technologies from companies like Toshiba machine, Ube machine and Toyo machine to balance efficiency across all their operations. Their choice of materials applies to Zinc alloy, Magnesium alloy and Aluminum Alloy. KST provides high quality products based on the evident technology. KST is a leading part producer of cold and hot metal die casting machines as well as plunger sleeves, plunger rods, core pins, couplings, rim bushes, holding blocks and plunger joints, by upholding Japanese technical innovation and top quality standards.

Findings

An in-depth interview with Mr. Sutja Naenon, Plant Manager of KST, was conducted on April 5, 2016 at the Thailand Partnership for Market Readiness: PMR, venue Mandarin Room, Mandarin Hotel, organized by TGO.

Respond to question 1: why is CDM attractive to your business?

Material use, energy use, and carbon emissions by the steel industry depend on production rates. Increased production rates tend not only to increase input requirements and emissions but are accompanied by higher CO_2 and the other potential residuals from steel production. CDM requires new technologies and shifts in the mix of operations processes, for instance from basic oxygen furnaces (BOF) to electric arc furnaces (EAF). In terms of environmental sustainability, scrap steel is one that’s in every foremost utility for recycled materials in Japan and plenty of other countries, in associated degrees the overall employment rate is regarding to be sixty eight percent.

The steel industry is a major consumer of electricity that uses power in its substantial production processes. Although there are no direct emissions of carbon dioxide associated with the consumption of electricity, coal and gas fired energy sources are standard factors in the reporting protocols for greenhouse gases and

represent a significant component of steel-industry energy usage. KST is searching for alternative energy sources which can answer to a better output. In the near future Japanese chambers of commerce (JCC), including steel producers, can be expected to measure direct and indirect climate-related impacts through the use of recognized, reliable, consistent, and transparent calculation and reporting of greenhouse gases for internal company use and for reporting to the public, as well as to specific audiences such as governments and special interest groups.

Respond to Question 2: what is the obstacle of CDM implementation?

The obstacle of CDM for KST is that energy consumption in steel production is a key element of the GHG emissions reduction scenario because the steel industry (including iron production) is among the largest energy consumers in the manufacturing sector in Thailand. Switching the energy source requires energy security and capital investment. In fact, KST is considering renewable energy sources from the excessive heat for power generation. The manufacture of steel involves many energy intensive processes that consume raw or recycled materials, such as iron ore and scrap metal, which produces high temperature gas along the process. Raw materials with intrinsic carbon contents (e.g., cementite, carbon electrodes, charge carbon, or limestone), the first resources for production, will have material significance within the calculation of the carbon footprint if KST scales back greenhouse gas emissions. CDM is clearly a good mechanism for KST. From a preliminary study, all of the greenhouse gas emissions associated with steel production in KST and others in Japan, however, all consist of the carbon dioxide emissions related to energy consumption; the primary focus of climate related impacts in the steel industry are processes associated with carbon-related energy sources.

Respond to Question 3: does CDM benefit your company and local community?

KST contributes to the community by outlining environmental policy and competitiveness seeking behavior of green and eco-friendly firms. In particular, KST is able to inform the community that in order to be successful, the core business model in emerging markets is in utilizing resources in an innovative manner. CDM leverages on available resources being carefully consumed. In order to create a value proposition that redistributes the resources from the community that possesses them to

those stakeholders that do not; in a way leading to an equalizing balance to the community, the environment and profit of the company. The source of these activities may be in the nature of CDM that exists in the absence of the business venture. Second, the income allocation of carbon trading does have a clear outcome expectation from an economic perspective. It requires KST to make capital allocation decisions with highly environmentally friendly technology. This not only entails taking risk, but also vision. It is to the great benefit of KST if CDM brings a strong community network, distinct managerial style, and commitment to creating a sound, innovative business model.

Respond to Question 4: what benefits of CDM (i.e. socio-economic, environmental, financial, sustainable development, etc.) do you see, and does CDM affect the company's competitive advantage strategy?

Although KST is a Japanese joint venture, it operates under a sufficient economy philosophy. Successful ventures have their founding roots in an established core business model. KST established organizations that not only focus on profit but also the surrounding environment. We are very successful in efficiency building and standard of operations to meet with environmental regulations in Thailand. KST is also in the process of ISO:14000, which will give advantage on a global scale as well. CDM may not yet exist in KST's current operations, but the foundation of CDM in such established organizations gives it the confidence to challenge social norms and receive acceptance from the stakeholders. It also endows a better utilization with resources (finance, beneficiary know-how, skill-sets, employment, etc.) that would otherwise be difficult to access in normal business conditions. CDM can offer these opportunities in a form of technology and know-how support from developed countries which certainly can lead to sustainable development in the long run.

Respond to Question 5: does CDM led to sustainable development in business?

Heavy industry often drives the choice of profit and product to be served, and environmental challenges to the society. A business policy in the form of social responsibility helps shape the business model of the venture in a way that best utilizes the overall resources available. Corporate identity such as the "green factory" creates an ecosystem for the CDM to be successful. Carbon reduction and additional

revenue from trading together enable a firm to achieve competitive advantage by way of being an “innovative firm” regarding the resources and operations that may or may not have been existing in the industry. Such an innovative use of resources and technology is facilitated by financial, institutional, and governmental support. The evidence suggests that clean technology, such as renewable energy, requires institutional and government support that is contingent upon the usage. In other words, the more innovative the usage by a firm, the more the support that firm will need. This virtuous cycle helps Thai firms that implement CDM in facilitating a competitive edge.

Based on KST management review, decisions draw insights related to the top management composition of successful CDM ventures. Executives propose that there is an evolutionary pattern among the socio-benefits, environmental benefits and financial benefits in the design of CDM implementation. The carbon offset is closely controlled by the law and regulations already. As a good citizen of society, KST should assume leadership roles in moving forward with CDM projects. During this stage of international cooperation of climate change, the reduction of GHG emission is essential to help resolve such an urgent issue. As the business grows, gaining social acceptance is a must. CDM can also provide the carbon footprint of a business operation. This information should be public for society and employees. This is a fact that can build trust between the company and the community. By nurturing the companies who join CDM ventures voluntarily, the necessary capability is built for the environment to then take up business strategic roles. In the context of emerging markets, this becomes a critical factor for organizations looking to solve environmental issues at the level where government policies fail to make an impact, due to policy execution problems and political instability. In such scenarios, the innovative usage of resources (CDM) forces a company to enhance the effectiveness of their business model and increase the impact on society. KST and managers of the group therefore need to focus on the innovative usage of resources.

3.3.4.4 Participant and Non–participant Observation

Participant observation suggests looking at the events or state of affairs or activities from within by participating within the cluster to be ascertained. Scientists freely interact with the opposite cluster members, participate in numerous

activities of the cluster, and acquire the approach of the lifetime of the ascertained cluster or his own (Liu and Maitlis, 2010). Associates in an organization study their behavior or different activities, not as outsiders, but by turning into members of that cluster as a technique for this section.

According to Miles and Huberman (1994), for the success of participant observation it is essential that the respondents being studied must not have any doubt regarding the intention of the scientist. A constructive consequence of participant observation is incredibly ample dependence on the innovation, reflection, personality manners and intellect of the observer. On the other hand, Miles and Huberman (1994) state non-participant observation involves perceptive participation while not actively taking part. This feature is employed to know a development by getting into the community or scheme concerned, whereas staying broken away from the activities being ascertained. Nonprobability sampling could be a common technique in qualitative analysis wherever analysis uses their own judgment to pick out the sample, in contrast to likelihood sampling, where every participant has a similar probability of being selected. Participants select victimization of the nonprobability sampling technique to square measures chosen as a result of their meeting reestablished criteria (Rubin and Rubin, 1995). The observation method could be in three-stages, beginning with descriptive observation, during which investigators perform a broad scope of observations to induce a summary of the setting, then moving to targeted observation, during which they begin to listen to a narrower portion of the activities that the majority that interests them, then elite observation, during which they investigate relations among them, whether they need to be elite to be of greatest interest (Liu and Maitlis, 2010).

Participant Observation: TGO conference (TGO1)

Topic: Global Warming Project for security, prosperity and sustainability.

Venue: Room Cathariya 2, Rama Garden Hotel, Bangkok, Thailand

Date: December 8, 2016

Participant: 80 entrepreneurs, government agencies and trading federations

Objective: To prepare for all sectors in developing a project to reduce greenhouse gas emissions.

Reacher attended the “Global Warming Project for security, prosperity and sustainability” to get knowledge and understanding about the greenhouse gas reduction program developed by TGO. The problems and policy of Thailand were discussed. The proposal program of Thailand Voluntary Emission Reduction Program: T-VER was introduced.

Findings

At the seminar, Mrs. Prasertsuk Jamarman, Director of the Thailand Greenhouse Gas Management Organization, stated "Today, climate change is likely to intensify and make international attention. Being aware of how to jointly prevent and solve such problems is the agency to support the reduction of greenhouse gases. It has developed mechanisms and tools to reduce voluntary greenhouse gases in the country. By the name "Voluntary greenhouse gas reduction program in Thailand or T-VER", it aims to prepare the sector in developing projects to reduce greenhouse gas emissions.

From 2015 there have been 46 projects of T-VER. Greenhouse gas emissions are expected to decrease by 1,527,827 tons of carbon dioxide equivalent per year. There are 27 greenhouse gas reduction projects, with a combined greenhouse gas reduction of 626,661 tons of carbon dioxide equivalent. TGO is the unit responsible for promoting and supporting greenhouse gas management of the country and appreciates companies with Corporate Social Responsibility. Participating in the T-VER project also contributes to environmental, economic and social benefits, such as reducing energy costs, increasing local job creation, and creating a good corporate image. It is also a social expression.

TGO will need to prepare for all sectors to deal with our commitment to reduce greenhouse gas emissions by promoting greenhouse gas emission reduction projects in Thailand. T-VER will continuously be an important part of supporting the vision of the government to develop the country to be stable, prosperous and sustainable. "

Participant Observation: TGO Conference (TGO2)

Topic: Application of geo-informatics technology to assess the greenhouse gas situation.

Venue: Centrara Government Complex and Convention Center, Bangkok, Thailand.

Date: December 26, 2016.

Participant: 50 government agencies, education institutes and trading federations.

Objective: To introduce the Gas Information Center.

Reacher attended the “Application of geo-informatics technology to assess greenhouse gas situation” in order to explore the platform and situation of GHG monitoring systems in Thailand. This conference illustrated the presentation of geospatial technologies related to greenhouse gases, and exchanged knowledge and present research supporting greenhouse gas emissions and adaptations to climate change.

Findings

In this seminar, Mr. Jadas Sakulku, Director, Thailand Greenhouse Gas Information Center, presented the results of the Greenhouse Gas Emission Assessment (GHG), along with the assessment of greenhouse gas emissions in the atmosphere using geo-informatics technology. Participants were also invited to attend the seminar under the topic “Research and application of geo-informatics technologies related to greenhouse gases and adaptation to climate change for Thailand ".

Continuous development of greenhouse gas data for an information integration platform and the need for integration of geospatial technologies is critical. In addition to data processing in conjunction with data from the ground, which is representative of Thailand, information on GHG emission is limited. Transparency is essential to the development of environmental policy. To get the right information, geo-informatics technology can be used as a policy to support information and support the adaptation of a climate change platform in Thailand.

Asia Pacific Carbon Forum 2017

Venue: United Nations Conference Centre, Bangkok, Thailand

Date: December 13-15, 2017

Participants: more than 300 guests, i.e., Ministers, senior policymakers, scholars, private sector leaders, practitioners, associations, project development financiers, experts and development partners from around the world.

Asia Pacific Carbon Forum 2017 (APCF 2017) is a leading annual carbon market event in Asia for climate finance, carbon markets and low carbon

technologies. APCF is a part of the progression of annual “Climate Weeks” that continues in each region of the world to advance regional climate engagement through the promotion of economic-based instruments and the sponsoring of climate actions to scale-up aspirations and achieve cost effective policy mitigation and adoption across the region. The event’s aim is to support implementation of countries’ Nationally Determined Contributions (NDCs) under the Paris Agreement, including Thailand, and identify opportunities for scale-up and explore the role of capital markets to finance the NDCs.

Over the past decade, the APCF has provided a unique platform for Asia-Pacific to engage in climate change issues in the region. The Forum brings together key stakeholders from the public sector and other non-party actors from Asia-Pacific and beyond. This event brings together the participation of key multilateral and bilateral development institutions and experts to discuss urgent actions needed on the ground and share experience and build capacity for implementation of actions for climate change and environmental issues.

The APCF has been pivotal in connecting project developers with foreign investors, carbon market representatives and government representatives, engaging Asia-Pacific in the global climate finance process. For progressive policymakers from the Asia-Pacific, the annual forum has been a “must-attend” event, critical for keeping up with the latest on climate finance, carbon markets and mechanisms. Thus, the APCF is clearly the best opportunity for policymakers, private and public sector officials to build their professional and business networks.

The APCF 2017 was co-hosted by the UN Economic and Social Commission for Asia and Pacific (UNESCAP), the Thailand Greenhouse Gas Management Organization (TGO) and the Ministry of Natural Resource and Environment (MVRE), and co-organized by the Asian Development Bank (ADB), International Emissions Trading Association (IETA), Institute for Global Environmental Strategies (IGES), the United Nations Framework Convention on Climate Change (UNFCCC), in collaboration with UNDEP DTU, UNDP and the World Bank Group. The APCF 2017 was organized under the umbrella of the Nairobi Framework Partnership (NFP).

Participant Observation (UN1)

The findings from AFCF 2017 on December 13th, 2017 as representatives from the private sector of the automotive industry sector, was very fruitful. The conference under the topic of "Updates on Carbon Markets in the Asia-Pacific" was discussed. The objective of this meeting was to recognize the rise of carbon markets in Asia-Pacific and the era of carbon market mechanisms in its new phase in the near future.

Objective: To track the latest developments in the Asia-Pacific region.

Participate: 30 (Korea, India, China, New Zealand, Japan, Philippine, Laos, Vietnam, Singapore and Thailand)

Venue: Meeting Room G, UN Conference Centre

Time: 11:00 – 12:00

Format:

1) Presentation of carbon market development states of Japan, India, Korea, and New Zealand.

2) Hearing from non-Annex I and recommendations for future development.

3) Address problems and concerns among Annex I and non-Annex I groups.

Findings

1) Korea is entering a second phrase of its Emission Trading Scheme (ETS). The Korean government is tracking down its industries for a carbon footprint. The carbon offset program is being promoted for organizations to either reduce their carbon emissions or become carbon neutral. Nonetheless, the second phase of the Korean ETS is focusing on the public sector and individual activities to meet its target. Beginning in Phase II, however, the recent change in Administration has slowed progress due to a change in the Ministries that manage and oversee the ETS policies. Another important policy challenge Korea faces is its de-carbonization strategy related to coal and nuclear plants.

2) Japan established a bilateral crediting mechanism by supporting market-based carbon reduction activities called the Joint Crediting Mechanism (JCM), a project-based counterbalancing system similar to CDM in approach and

methodology. One of the experiments will be “scaling up” the project. The JCM collaboration document is signed by developing countries in Asia, Africa, Small Island Developing States (SIDSs), the Middle East and Latin America. Deliberations are underway to increase companion countries. Japan has negotiated with developed countries for the JCM since 2011. As of July 2016, Japan has begun the JCM with 16 partner countries, which are Costa Rica, Palau, Cambodia, Mexico, Saudi Arabia, Chile, Myanmar, Thailand, the Philippines, Mongolia, Bangladesh, Ethiopia, Kenya, Maldives, Viet Nam, Lao PDR, and Indonesia. With current participants, JCM is estimated to deliver 50 to 100 million tons of CO_2 emission reductions by 2030.

3) India has acknowledged the use of market-based mechanisms in their NDCs, India has announced a voluntary carbon market and is contemplating other market-based measures to be in place by 2023. India is one of the world´s largest hosts of such clean development projects. From 2003 to 2017, there have been more than 3,800 projects, around one quarter of the global total. The state-level correlation between the projected count and expected emissions reductions by 2020 was 0.81, so the project count serves as a good indicator of the potential to reduce emissions. In particular, India is focusing on driving emissions reduction in the sectors of waste and small-medium enterprise (SME) sectors.

The Indian government is not fully capitalizing on the CDM´s potential to contribute to sustainable development. In contrast to China, where the central and provincial governments offer institutional support to CDM project developers, India´s moderate approach to the CDM prevents the less industrialized states from benefiting from the investment opportunities that the CDM creates. To improve the CDM´s contribution to sustainable development in India, the government of India should consider investing in capacity building in those less developed states that are implementing few CDM projects relative to their population and the needs of the people in the area.

4) The Philippines currently has legislation for a tax on carbon affecting coal-fired power generation plants and is moving towards putting a price on carbon emissions more broadly. However, it seeks support and buy-in from the private sector in those sectors most affected (i.e., transport, energy), and regional institutional bodies, like UNESCAP, and UNFCCC, to support it through capacity

building, identifying the instruments that will be most effective for their specific needs, and convening stakeholder consultations.

5) China: Since 2013, China has enforced eight sub-national pilot ETS schemes. This has provided China with important expertise in implementation. In terms of its emissions profile and economic context, these pilots are terribly numerous, providing attention-grabbing lessons regarding the planning and implementation method. In the Gregorian calendar for 2017, the NDRC formally launched its nation-wide ETS, which could be the biggest system in the world. One of the key aspects for the success of this initiative is the event of a powerful legal and restrictive framework, building on its MPC law, and therefore the institution of a strong information management system.

6) As businesses and organizations in Thailand become more conscious of climate change, carbon management gains a more crucial role in performance management. By tracking their carbon footprint, or the overall impact they have on the global climate in terms of the total amount of greenhouse gases produced, businesses and organizations are making noticeable improvements. Thailand focuses on how transparency can help to strengthen more robust and ambitious climate actions, enable comparability and potentially facilitate linkages. It will take into account the spectrum of tools and practices that governments, civil society, and knowledgeable teams to measure mistreatment and reinforce the transparency of NDCs and climate actions.

7) Since, the CDM is facing numerous issues, Thailand has been involved in the voluntary emissions reduction (VERs) market for a number of years, and launched its T-VER (Thailand VER) program in 2013 in conjunction with CDM. Sumon Sumetchoengprachya of the Thailand Greenhouse Gas Management Office (TGO) explained Thailand’s Voluntary Emissions Trading Scheme (V-ETS), which is currently at the end of a pilot phase that began in 2015. The concentration of CDM projects in more industrialized areas is understandable, given that the industrial sector is particularly amenable to mitigation.

Non-Participant Observation 1(UN2)

"The Future of the Clean Development Mechanism in Climate Action" is an event that takes stock of the recent negotiation outcomes regarding CDM. JI and Article 6 of the Paris agreement were discussed with deeper discussions about the transition of CDM into new mechanisms and the role that Asia-Pacific countries can have in supporting relevant negotiations.

Objective: To explore options to use the CDM in future mechanisms.

Participate: 25

Venue: Meeting Room G, UN Conference Centre.

Date: December 13th, 2017

Time: 16:00 – 17:00

Findings

The Clean Development Mechanism (CDM), established under the Kyoto Protocol of the UNFCCC, has been successful in driving change, leading to $300 billion of emission reductions, 100,000 GWh/year of savings, all resulting in enormous co-benefits, such as facilitating access to clean drinking water for an estimated 850,000 people. Five regional cooperation centers (RCCs) have been set up to support CDM roll out and are partially funded through CDM revenues. CDM designated national authorities (DNAs) exist in virtually all developing countries, Programs of Activities (POAs) are in 111 countries, and the number of projects is continuing to grow, with 53 new projects registered this year.

Therefore, the CDM process and its associated developed infrastructure remains an important complementary asset in the transition towards the new successor mechanism stipulated by Article 6. There is a lot to learn from the CDM and it was a valuable experience. But as we approach the end of the last Kyoto commitment period, it is time to learn, move on, and make Article 6 fit for the climate's purpose. In the Paris Agreement world, we need to build on good building blocks and delete undesirable parts. With entry into the Paris Agreement, there are many questions and ideas about how CDM could continue to support climate action during the emerging architecture of the Paris Agreement and market provisions within Article 6.

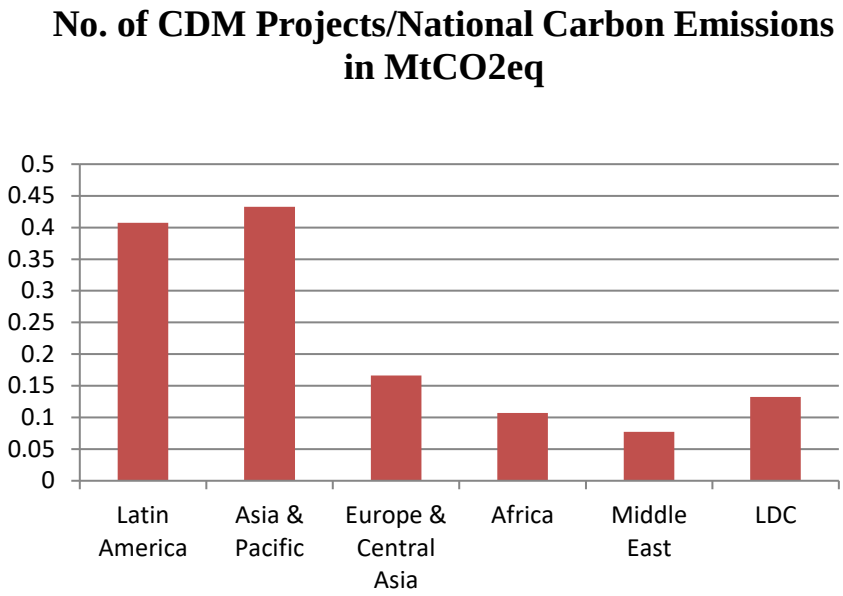


Figure 3.1 Number of CDM Projects/National Carbon Emissions

Source: UNFCCC, 2018.

Non-Participant Observation 2 (UN3)

"Potential to Link Carbon Markets across the Asia-Pacific Region" is another event of non-participant observers. The Asia-Pacific region has already experienced ETS bilaterally linked to Tokyo in 2011. The goal is to achieve a global carbon market with robust accounting and effective emissions reductions. Participants discussed CO_2 pricing methods that may be appropriate in the Asia-Pacific formation and explored existing prospects to support domestic and regional efforts.

The World Bank has been working with countries in carbon pricing, and providing support to develop technical capability. It is currently essential to increase and build capability in alternative countries that have expressed interest in victimization carbon rating in their NDCs. The World Bank mentioned that the next phase of its Partnership for Market Readiness (PMR) will hopefully support increased ambition in a second round of NDCs, and help countries implement the mechanisms beyond readiness (e.g., carbon pricing).

Objective: To explore linkage of CDM trends in Asia–Pacific.

Participate: 27

Venue: Meeting Room H, UN Conference Centre.

Date: December 14th, 2017

Time: 14:00 – 15:00

Findings

As commented by Suzi Kerr, a Senior Fellow at Motu Economic and Public, through the government to government purchases (financing) of large scale technology projects and emission reduction policies in Asia-Pacific, a benefit of linking can be for countries with high marginal costs with NDC targets that are very challenging to achieve, to link their carbon systems with countries with low marginal costs. However, ETS connecting is challenging as it is influenced largely by the MRV systems. Furthermore, ETS linking does not provide security for the host country, opening each country to the political, policy, and economic impacts of their partner country.

Existing Programs Supporting Carbon Pricing in the Asia-Pacific Region:

1) UNFCCC Cooperative Instruments for Ambitious Climate Action (CI-ACA): The CI-ACA project will reinforce market mechanisms capable of driving action at the national level while arranging the groundwork of possible international accommodating climate action.

2) World Bank's Partnership for Market Readiness (PMR): the next phase of PMR, going beyond readiness, will be to help countries implement market mechanisms.

Three challenges are:

1) Moving from readiness to implementation of mechanisms;

2) Expanding the global reach - PMR can only support a certain number of countries, however, PMR also wants to support the rest of the world, exploring ways to collaborate with the Secretariat to achieve this;

3) Resources: implementation means mobilizing a large amount of resources, approximately $1.5 trillion needed by 2030 - tapping into private resources is key.

3.3.5 Data Analysis

Miles and Huberman (1994) state the analysis of qualitative research involves aiming to uncover and/or understand the big picture by using the data to describe the phenomenon and what it means. From the interviews with TGO, Rajburi Ethanol Co. Ltd. and Kato Steel Thai Co. Ltd., factors derived from the literature stream are discovered in qualitative field work. The finding of factors affecting CDM implementation and leading to sustainable development are as follows:

Table 3.1 Independent Variables Derived from Qualitative Method

Factors	TGO	REP	KST
Material Variables (TRAC) refers to the idea that the problem situation and the severity of the problem will have an effect on how the policy is designed, in this case: environmental problems.	In order to create the business model of a self-sustaining organization, it makes sense to take a market-based view to help us track emission management and capability development through CDM projects.	Any activities that can help reduce pollution and increase efficiency is very interesting. CDM seems to be a good mechanism that can help the company to know its carbon activity.	Japanese chambers of commerce (JCC), including steel producers, can be expected to measure direct and indirect climate-related impacts through the use of recognized, reliable, consistent, and transparent calculations and reporting of greenhouse gases for internal company and public use.
Structural Variables (ASSI) refers to its goals, an implicit causal theory about how to impact the problem situation.	CDM will be easier to implement if an enabling environment and an appropriate policy framework exist by the government.	Nowadays, a company cannot focus only on profitability but social responsibility is a must also.	KST contributes to the community by outlining environmental policy and competitiveness seeking behavior of green and eco-friendly firms.

Table 3.1 (Continued)

Factors	TGO	REP	KST
Contractual Variables (NAVI) refers to major elements of non-policy factors.	CDM encourages business to decrease the carbon intensity of the energy sector and manufactured products, and consumers to choose less carbon-intensive goods or operations.	For local communities, surplus energy can be distributed to a community in terms of electricity or methane gas for cooking schools, temples, or even nearby households.	Corporate identity such as the "green factory" creates an ecosystem for the CDM to be successful.
Globalization (GLOB) implies global impacts toward policy implementation which adds significantly to the decision making process.	Ccountries are not only required to mitigate their impacts by developing projects under the CDM, but also to increase their capability and competitiveness for sustainable development of the nation.	The company is committed to being good citizens and will make continuous contributions to society. Thus, any activities that can help reduce pollution and increase efficiency.	KTS's energy consumption in steel production is a key element of the GHG emissions reduction scenario in the manufacturing sector in Thailand.

Table 3.1 (Continued)

Factors	TGO	REP	KST
Transparency (TRN) denotes the importance of information. Disclosing information to the public is very import for policy implementation.	CDM systems, including the following: setting the scope of the instruments; collecting robust emissions data; determining the ambition of the instruments, in line with the jurisdiction's overall climate change mitigation objectives, and how best to recycle the revenue from carbon, which all requires time and transparency.	Rajburi Sugar Co.,Ltd. receives a carbon footprint for organizations which can define their exact amount of CO_2 emission in 2014. As part of the local community, the company takes environmental policies very seriously.	climate-related impacts through the use of recognized, reliable, consistent, and transparent calculation and reporting of greenhouse gases for internal company use and for reporting to the public, as well as to specific audiences such as governments and special interest groups.
Environmental Benefits (ENVO) impacts on environment and contributions to resource sustainability: efficiency of	Environmental benefits include reducing polluting emissions, preventing or reducing natural resource degradation, greening the process of energy	In terms of environmental sustainability, scrap steel is one of the most recyclable and recycled materials in Japan and many countries, with an overall	By nurturing the companies who join CDM ventures voluntarily, the necessary capability is built for the environment to then take up

Table 3.1 (Continued)

Factors	TGO	REP	KST
resource usage, access of local community to resources, impact on resource degradation.	production, and promoting the development and dissemination of new energy. technologies or sources.	recycling rate of about 68%.	business strategic roles.
Socio-Economic Benefits (SOEC) impact the quality of life of local communities. For example, employment, poverty reduction, and impacts on human health in the community.	The economic perspectives are significant increases in employment, improved balance of payment to local business, and boosting the capacity of local manufacturing and users to adapt and utilize new technologies to optimize company profitability.	Cane producers can supply more produce to the factory. Locals will enjoy more income and a better environment.	In order to create a value proposition that redistributes the resources from communities that possess them to those stakeholders that do not; in a way leading to an equalizing balance to the community, environment and profit of the company.

Table 3.2 Dependent Variable Derived from Qualitative Method

Factors	TGO	REP	KST
Implementation of CDM links to SD	CDM can have benefits, for instance, improvements in technical and institutional capacity entails crosscutting benefits that can support other climate and development policy objectives which leads to sustainable business development.	In short, CO_2 emission reduction activity from CDM projects can create alternative paths which lead to sustainable ways of living and business operations.	CDM can offer these opportunities in the form of technology and know-how support from developed countries which certainly can lead to sustainable development in the long run.

3.3.6 Data Analysis from Participant and Non-participant Observation

After the qualitative study results are synthesized into the discipline and consistency of qualitative analysis, the result depends on presenting solid descriptive data so that others reading the result can derive the interpretations. Implications of the data are transformed in the generation of meaning. In brief, qualitative data are changed into the form of brief text, and the analysis involves the examining of all elements of the data sets, from the in-depth interviews and observations, to the process concepts and constructs of the deconstruction of textual data into manageable categories, patterns, themes and relationships according to the research objectives (Liu & Maitlis, 2010). Seven decision rules are applied to decide whether two streams belong in the same scenario or have matched patterns. The following steps are used in analyzing casual relation between variables in the proposed conceptual framework for CDM implementation, as follows: (Miles & Huberman, 1994)

1) All (or all but one or two) of the core predictor variables on the stream are the same.

2) The most immediate predictor variables—the two or three closest to the outcome measure are the same and are in the same sequence.

3) The common predictors have the same ratings (high, moderate, low).

4) The outcome theme is the same.

5) The narrative confirms the similarity or identity of the outcome theme derived from the stream of variables in the network.

6) The outcome themes are different (or absent) in cases with a differently rated outcome variable.

7) In these differently-rated cases, the predictor variables closest to the outcome variable are different or, if the same, are rated differently.

Table 3.3 Factors Towards CDM Implementation

Factors	TGO	REP	KST	TGO1	TGO2	UN1	UN2	UN3
Material Variables (TRAC)	√	√	√	√		√	√	√
Structural Variables (ASSI)	√	√	√		√	√	√	√
Contractual Variables (NAVI)	√	√	√	√		√	√	
Globalization (GLOB)	√	√	√	√	√	√	√	√
Transparency (TRN)	√	√	√	√	√	√	√	√
Environmental Benefits (ENVO)	√	√	√	√	√	√	√	√
Socio-Economic Benefits (SOEC)	√	√	√	√	√	√	√	√

Table 3.4 Factors Affecting Sustainable Development in the Dimension of Sustainable Business

Factors	TGO	REP	KST	TGO1	TGO2	UN1	UN2	UN3
Sustainable Development linkage to Sustainable Development (CDMSD)	√	√	√	√	√	√	√	√
Environmentally friendly business practices impact on corporate sustainability. (CDMENVO)	√	√	√	√	√	√	√	√
Businesses that take into account the economic and social benefits lead to sustainable development (CDMSOEN)	√	√	√	√	√	√	√	√

Table 3.5 Problems with the Government Sector

Factors	TGO	REP	KST	TGO1	TGO2	UN1	UN2	UN3
Clarification of Greenhouse Gas Reduction Policy	√	√	√	√	√	√	√	√
Clarification of CDM policy	√	√	√	√	√	√	√	
Investment Support Policy		√				√		√
Policy on collecting income tax from the carbon trading scheme		√	√		√	√	√	√
Access to clean technology	√		√	√	√	√		√
Approval process		√	√			√	√	√
Problem of communication with government agencies			√		√	√	√	√

Table 3.6 Problems from other Related Policy Implementations

Factors	TGO	REP	KST	TGO1	TGO2	UN1	UN2	UN3
CDM expertise	√		√	√	√	√	√	√
Shortage of human resources	√	√		√	√	√	√	√
Risk assessment data		√	√	√	√	√		
Ability to access investment funding	√	√	√		√	√	√	√
Compensation from carbon trading scheme	√	√		√	√		√	√
Support from management to CDM projects	√	√	√	√	√	√	√	√

Table 3.7 Information of Factors that Impact Consideration of Environmental Benefits

Factors	TGO	REP	KST	TGO1	TGO2	UN1	UN2	UN3
Globalization has influenced your decision to consider environmental benefits.	√	√	√	√	√	√	√	√
Transparency in the implementation of CDM has the potential to address environmental concerns.	√	√		√	√	√	√	√

Table 3.8 Information of Factors that Impact Ability of Policy Implementation

Factors	TGO	REP	KST	TGO1	TGO2	UN1	UN2	UN3
Globalization affects ability of your environmental policy performance	√		√	√	√	√	√	√
Top executives are aware of environmental issues in implementing policies.		√	√	√	√	√	√	√
Transparency in the operation and communication of information to the public can help reduce conflicts in policy implementation.		√		√	√	√	√	√

Table 3.9 Factors that Impact Non-statutory Problems for Policy Implementation

Factors	TGO	REP	KST	TGO1	TGO2	UN1	UN2	UN3
Environmental effect of business performance has impacts on environmental policy.	√	√	√	√	√	√	√	√
Socio-economic benefits are the main goal of environmental policy.	√	√	√	√	√	√	√	√

Table 3.10 Factors Affecting the Consideration of Economic and Social Benefits

Factors	TGO	REP	KST	TGO1	TGO2	UN1	UN2	UN3
Globalization allows you to consider the economic and social benefits of implementing a policy.	√	√	√	√	√	√	√	√
Transparency of CDM communication results in economic and social benefits.	√	√	√	√	√	√	√	√

Table 3.11 Information on the Performance of CDM Projects

Factors	TGO	REP	KST	TGO1	TGO2	UN1	UN2	UN3
Revenue from carbon trading scheme increases your company's income level.	√		√		√	√	√	
CDM project enhances your company's competitive advantage.	√	√	√	√		√		

3.3.7 Review Relevant Data Analysis of Secondary (Secondary Data)

Secondary data is used to assist in the analysis. The data are expected to be accessible. For example, government laws and regulations of environmental policy, the 12th National Economic and Social Development Plan, CDM documentation seminar, UNDP report, UNEP report, UNFCCC reports, TGO seminar documents and the CERs purchase agreement, the results of a consulting firms that work with TGO and the meeting notes stored in the system.

3.4 Quantitative Approach

3.4.1 Target Population and Unit of Analysis

The questionnaires will be developed and distributed to the identified population, the project is compiled in terms of organizations that participate in CDM programs with TGO and UNFCCC. The unit of analysis is a "Project". Thailand had 279 projects registered with UNFCCC in 2016, however, there were only 163 active projects as of October 2017. The majority of CDM project activities can be classified into technologies which generate energy, reduction of emissions, reduction of waste, and energy conservation. Moreover, this research targeted only private organizations to explore the implementation factors which occupied 94% of CDM projects. CDM project activities in Thailand can be stated as follows:

Table 3.12 CDM Project Type

Project Type	Number Registered	Occupation Rate	Government Ownership
Methane avoidance	79	48%	1
Biomass energy	30	18%	
Solar	28	17%	2
Landfill Gas	6	4%	
Hydro Power	6	4%	6
EE own generation	5	3%	

Table 3.12 (Continued)

Project Type	Number Registered	Occupation Rate	Government Ownership
Wind	3	1.8%	
EE supply side	2	1.2%	1
EE service	1	0.6%	
Fugitive	1	0.6%	
Hybrid renewables	1	0.6%	
N_2O	1	0.6%	
Total	**163**	**100%**	**10 (4%)**

The organizations which meet both TGO and international standards for CER trading (UNFCCC) are carefully reviewed. An additional filter in the sampling method is for Thai organizations which have successfully implemented CDM thus far and earn income from a CO_2 trading scheme in a mandatory market and contribute to CO_2 reduction. Thus, the response from CDM implementers, which is a local actor in CDM policy implementation, is very critical to this study.

3.4.2 Sample Selection

As there was a diversity of target groups, and as activities of the CDM projects were conducted at different activities, the sample selection must consider the similarity of each unit of analysis, which can be in terms of type of CDM technology, certification of the carbon trading scheme and size of the CER emission rate. Moreover, due to time constraint and limitation of resources, the study therefore used a purposive sampling technique to collect data from 153 private organizations in Thailand who have obtained certification from TGO and UNFCCC and contribute more than 10,000 tCO_2e.

In order to obtain constructive data for this study, questionnaires were sent to top executives and management of the organizations. The input from this population represents the organizations' actions in such a way that leads to the decision making process in company policy or action. The survey was planned to distribute the

questionnaire to 153 organizations that actively trade CERs via the primary carbon market basis.

To be able to analyze by regression analysis with variables used in the analysis, there were 7 statistically significant differences. Some authors have created sample size guidelines proposing a minimum required sample size based on the ratio between the number of independent variables and the number of cases, such as 30 to 1 or 10 to 1. Tabachnick and Fidell (1997) proposed using a formula of "50 + 8m" where "m" is the number of factors. In this study, there are 7 factors to be observed, the sample size calculation is thus, as follows:

Formula: 50 + 8 (m)
50 + (8 x 7)
= 106 Samples

It has been suggested that there should be at least about 10-15 samples per one variable for social studies (Nunnally, 1978). Thus, more than 70 samples are needed for this study.

3.4.3 Quantitative Method for Data Collection

In this research a cross-sectional approach between October to December 2017 and January to April 2018 using a survey was employed. The questionnaires, along with a letter of recommendation for collecting data from NIDA, Graduate School of Public Administration (GSPA), were sent to the selected organizations. Each set contained a questionnaire and return envelope with stamp. Then it was sent by registered mail, e-mail, or fax to the president, director, manager, or top executive of each organization. Nonetheless, all questionnaires were be traced by an ID number to see the response rate.

In cases of a non-response after 1 month, the alternative management would be considered and sent a questionnaire again. Each questionnaire was monitored after 2 weeks to see the response rate from companies who did not respond back. Then, each company was contacted by telephone via the secretary of the company's

management for input on the CDM questionnaire. In some circumstances, a phone interview was conducted for gathering data to the survey.

According to Babbie (2007), quantitative analysis focuses on gathering numerical knowledge and generalizing it across teams of individuals or clarifying a selected development. Data were obtained by means of the mail questionnaire, e-mail and/or telephone to 140 executives or management who participate in CDM under UNFCCC listing in Thailand. These organizations are monitored by UNFCCC and are recertified periodically to ensure transparency and the optimum carbon emission rate. The questionnaire structure is Closed-End questions and Open-Ended questions, with a 5 points Likert Scale used to determine the relationship between factors derived from qualitative works and outcome variables of CDM implementation linkage to sustainable development, in the dimension of better business practices within the population. This research design is descriptive and experimental for results from a CDM perspective.

A pre-test of 15 sets was sent to CDM experts and consultants. There were 2 responses from CDM consultants. To this extent, many criticisms from respondents regarding technical wording and unclear questions were discovered. The test was put on hold until the end of October 2017. Another 30 sets of a revised version were sent out on December 20, 2017 to selected organizations who had already participated in CDM projects. The response rate was only 4 respondents, which was very low. After consideration of the data collection method, the organizations were categorized into the size of either small or large scale projects (UNFCCC classification) and the type of CDM technology used. Then the CDM technology was selected, choosing the Methane avoidance and Biomass sectors (occupying more than 67% of CDM projects in Thailand) to initiate a pre-test questionnaire. A third set of 25 pre-test questionnaires was sent out on January 23, 2018. There were 9 returned back. After 2 weeks, the secretaries of the organizations were contacted to get a response by phone, and an additional 5 questionnaires were completed.

On February 19, 2018, a fourth set of questionnaires was sent to an additional 30 Biomass energy and 10 solar energy generation operators. The response rate for the fourth pre-test was also quite low. The delay problem that was discovered was because most of the recipients who receive mail are staff level employees and it took

some process before the mail reached management's office. Hence, the data collection method was revised to hybrid methods which rely on electronic forms and direct phone calls. On February 26, 2018, there were 42 questionnaires sent out and some more returned back. Direct calls to organization management were very effective and constructive for receiving feedback, which mostly commented on the questionnaire structure and length of time to complete, as the questionnaire was quite long. Nonetheless, the complexity of technical words and lack of definitions to explain certain questions or answers created much confusion and reluctance in answering the questionnaire.

A total of 23 sets were analyzed by using statistical tools and modifications. More definitions of technical words were inserted. Some parts of questions were revised with common wording. The layout of the questionnaire was also modified. Each section was clearly identified and labeled, especially the factors associated with CDM implementation, which were combined with a check box for the Likert's scale. In addition, the obstacle to CDM implementation part was divided into government and non-government factors to explore the additional relationship of what prevents CDM implementation. During March and April 2018, the actual questionnaires were sent and tracked by registered mail, email and direct phone calls. During this period, there was some mail that was sent back as undelivered due to no recipient or wrong address. The recipient's address was rechecked with The Federation of Thai Industries (F.T.I.) to ensure a correct contact person and mailing address.

After 121 sets of questionnaires were sent to the organizations as planned, additional questionnaires covered the entire sample. It was found that the number of questionnaires that responded was less than the required amount. The people who had not answered all the enquiries were found. We rechecked process of the name and address for all respondents to verify the accuracy of the database with F.T.I. again, then a letter or facsimile was resent to the participants in April 2018. Continuous calling and tracking of data gathered was performed as required. Detail of the quantitative method for data collection is displayed in Table 3.13

Table 3.13 Quantitative Method for Data Collection

Number	Date	Questionnaire	Number (Set)	Sample type(s)	Method(s)	Responses	Remarks
1	9/10/2017	Pre Test	15	CDM Expert and consultant	E-mail	2 (13.33%)	Modified questionnaire and gave technical definitions.
2	20/12/17	Pre Test	30	CDM Registered	Registered Mail	4 (13.33%)	Modified questionnaire and revised question in CDM implementation part.
3	23/01/18	Pre Test	25	CDM Registered / Expert (Methane Avoidance & Biomass)	E-Mail / Fax /Phone	14 (56%)	Used recommendation to adjust CDM implementation and obstacles for CDM. Modified wording in questionnaire.
4	19/02/18	Pre Test	40	CDM Registered (Solar)	E-Mail / Fax /Phone	9 (22.5%)	Add linkages of CDM factors to SD and competiveness factors.
5	26/02/18	Questionnaire	42	CDM Registered	E-Mail /Phone	17 (40.47%)	Sent questionnaire via E-mail to company and made appointment to interview by phone. Many companies need more than 2 contacts via secretary to conduct survey. Response rate too low.

Table 3.13 (Continued)

Number	Date	Questionnaire	Number (Set)	Sample type(s)	Method(s)	Responses	Remarks
6	5/3/2018	Questionnaire	121	CDM Registered	Registered / E-Mail/ Fax/ Phone Mail	38 (31.40%)	Using registered mail and email. Tracking questionnaire arrival online. It appears that there are some companies who changed address or phone number. Rechecking with F.T.I database to update company information. Waited for 2 weeks for return documents. Started calling company on week 3 for contribution of inputting data for the study
7	2/4/2018	Questionnaire	57	CDM Registered	Registered / E-Mail/ Fax/ Phone Mail	24 (42.1%)	Resend to updated company list and unanswered companies via registered mail and tracked questionnaire arrival online. Waited for 2 weeks for return documents. Started calling on week 3 for management contribution for inputting data.
Total						108	

The questionnaire was used as a tool to collect data. The plan was sent to all inquiries and a follow-up was requested. It was planned to have a return document, approximately 71% of which later updated the database and submitted additional questionnaires and calls. So, the follow-up was provided by 108 respondents from 153 samples.

3.4.4 Quantitative Data Process and Analytic

After sending out the entire questionnaire of 153 sets, the data were collected and input was prepared for the process of analysis as follows.

1) Step one takes all completed questionnaires for an extensive check for accuracy of input data in the spread sheet to convert the data into the same format.

2) Step two takes the information from the spread sheet from step one and creates coding into an SPSS program for data input preparation.

3) Step three assigns codes created in SPSS into a questionnaire data set.

4) Step four inputs all data into SPSS for statistical analysis.

5) Step five loads the data from SPSS 18 and draws a Path Analysis model.

3.4.5 Quantitative Data Analysis

One of the most effective ways to explain the causal relationship of cause and effect in public policy is through path analysis (Dye, 1978). Path analysis provides an overall estimate of the explanatory value of a proposed model of CDM implementation. The methodologies selected characterize the nature of the relationship between theory and research and whether theory guides this research or whether a new theory is an outcome of the research. Methodology for a study specifies what information is to be gathered, from where, and what methods of data collection and analysis are to be employed (Babbie, 2007).

In the quantitative part, parametric statistical methods are used as the primary tool. The multivariate method selected was path analysis. The first assumption before running parametric statistics is that the variables must have a normal distribution which is a function that defines the distribution of scores in a population with respect

to population parameters. The normal distribution is used in statistical analysis in order to make standardized comparisons across different populations (Tabachnick and Fidell, 1997).

According to Tabachnick and Fidell (1997), path analysis posts advantages in several areas. First, path analysis is a highly flexible and comprehensive methodology. Second, path analysis requires formal specification of a model to be estimated and tested to support a hypothesis with theory or research and specify relations a priori. Third, path analysis is a multivariate technique specifying relationships between observed (measured) variables. Multiple, related equations are solved simultaneously to determine parameter estimates. Variables in path analysis could be independent and dependent variables. Fourth, path analysis allows for recognizing the imperfect nature of their measures. Fifth, traditional analysis provides straight significance tests to establish group differences, relationships between factors, or the amount of variance explicated. Path analysis provides no obvious tests to regulate the model fit. However, a graphical language provides a convenient and powerful way to present complex relationships in path analysis (Hair, Black, Babin, Anderson and Tatham, 2006).

Model specification involves formulating statements about a set of variables. A diagram, a pictorial representation of a model, is transformed into a set of equations (Babbie, 2007). The set of equations are solved simultaneously to test for model fit and estimate parameters, which is very useful for CDM implementation models in Thailand. A descriptive study establishes associations between CDM implementation variables. After the discovery of linkages, an experimental study establishes causality policy implementation to outcomes. The advantage of collecting quantitative data is that the numerical outcomes result in data that can be statistically analyzed, that may be viewed as credible and useful in decision making. However, the disadvantage of quantitative data is that it is apparent and consequently, it doesn't suggest solutions or contribute to making predictions.

3.4.6 Measurement

To be able to proceed with the development of the proposed conceptual framework, it is essential to obtain answers to questions that can be accurately

measured. The data of the questionnaires will be examined by an expert to analyze the scale used in this study as well. Testing the questionnaire with the sample target before distributing the questionnaire to the surveyor was also conducted. The questionnaire was designed to discover fact rather than opinion. Some questions were often left unanswered, for example, income, investment costs, and output capacity. These variables need to be avoided because the question of the actual value is risky for company confidentiality. Some were left unanswered either because the respondent did not know the exact number or it was confidential business.

Babbie (2007) describes a Likert scale as a non-comparative scaling technique that is uni-dimensional (only measures a single trait) in nature. Respondents were asked to indicate their level of agreement with a given statement by way of an ordinal scale. In order to measure the result that matches with policy implementation factors, this research is using a 5 point Likert scales. In the questionnaire there are 5 points that surveyors can select. “5” means “strongly agree” or “Highest”. “4” means “Somewhat agree” or “High”. “3” means “Neither agree nor disagree” or “Neutral”. “2” means “Somewhat agree” or “Low”. “1” means “Disagree” or “Lowest”.

In this aspect, the questions were modified to answer the facts leveled in this study, as intended. In order to explore other possibilities of CDM implementation factors and the linkages to SD, the questionnaire consists of a Closed-End Questionnaire and an Open-Ended Questionnaire that surveyors could self-administer. The questionnaire consists of 10 parts, as follows:

Section 1. Organization background and general information.

Section 2. Information of factors which lead to CDM implementation.

Section 3. Problems and concerns of CDM implementation.

Section 4. Information on factors’ impacts in consideration of environmental benefits.

Section 5. Information on factors’ impacts in ability of policy implementation.

Section 6. Information on non-statutory factors’ impacts on policy implementation.

Section 7. Information on factors’ impacts in consideration of socio-economic benefits.

Section 8. Information on factors’ impacts on sustainable development.

Section 9. Results of CDM project implementation.

Section 10. Opinions and recommendations.

3.5 Operational Definitions

The independent variables and dependent variable are respectively important. These two concepts are implicit in causal, or deterministic, models. The independent variable is a variable with values that are not problematical in an investigation but are taken as simply contributed (Kachigan, 1991). An independent variable is assumed to cause or change a dependent variable. The dependent variable is a variable presumed to depend on or be impacted by another, namely the independent variable (Babbie, 2007). To define the definition of independent and dependent variables which impact CDM implementation factors and linkage of SD, various literature reviews have been cited for the accuracy of this study, which is derived from the literature stream and qualitative studies. The working definition of the independent variable can be outlined in the 7 independent variables and dependent variable, as described in the table below. Measurement is at the core of doing research. Measurement is the assignment of numbers to things. In almost all research, everything has to be reduced to numbers eventually. Accuracy and precision in measurement are absolutely essential. The measures are what are truly used to test the proposed hypotheses. A research study needs good measurements for both independent and dependent variables (Babbie, 2007).

In this study, the ordinal level of measurement describes variables that can be ordered or ranked in some order of importance within the survey structure. It describes most judgments about things, such as big or little, strong or weak. Most opinion and attitude scales or indexes in the social sciences are ordinal in nature (Babbie, 2007). The questionnaire's structure is of Closed-End question and Open-Ended question, with a 5 point Likert Scale which is distributed to the target population under UNFCCC listing during the period of September 2017 to April 2018, as follows:

Table 3.14 Independent Variables and Questionnaire

Definition of Independent Variables	Measurements	Ground Theory and Empirical Study	Question	Unit of Analysis
1. Material Variables (Tractability of the Problem (TRAC)) refers to the idea that the problem situation and the severity of the problem will have an effect on how the policy is designed	• Awareness of Environmental problem	Adapted from Mazmanian and Sabatier (1989); Matland (1995); Stavins (1998)	• External factors affecting environmental policy, such as global warming, community demands and business competition	Ordinal Likert Scale 1- 5 1= Strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree
2. Structural Variables (Ability of the statute to structure implementation (ASSI)) refers to its goals, an implicit causal theory about how to impact the problem situation, financial resources, the decision rules of the implementing agency, ability	• Level of internal pressure	Adapted from Mazmanian and Sabatier (1989); Matland (1995); Stavins (1998)	• Internal factors influencing environmental policy, such as consistency of corporate goals and management support • Globalization affects ability of your environmental performance	Ordinal Likert Scale 1- 5 1= Strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree

Table 3.14 (Continued)

Definition of Independent Variables	Measurements	Ground Theory and Empirical Study	Question	Unit of Analysis
of outside actors to influence implementation, and the selection of implementers.				
3. Structural Variables (Ability of the statute to structure implementation (ASSI)) refers to its goals, an implicit causal theory about how to impact the problem situation of the implementing agency and ability of outside actors to influence implementation.	• Level of internal pressure	Adapted from Mazmanian and Sabatier (1989); Matland (1995); Stavins (1998)	• Top executives are aware of environmental issues in implementing policies • Transparency in the operation and communication of information to the public can help reduce conflicts in policy implementation.	Ordinal Likert Scale 1- 5 1= Strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree
4. Contractual Variables (non-statutory variables affecting implementation (NA	• Commitment of implementing • Level of Environmental effect in business operation	Adapted from Mazmanian and Sabatier (1989); Matland (1995); Stavins (1998)	• Other non-legislative factors, such as the impact of business and social responsibility • Environmental effect of business performance impacts	Ordinal Likert Scale 1- 5 1= Strongly Disagree 2= Disagree 3= Neutral

Table 3.14 (Continued)

Definition of Independent Variables	Measurements	Ground Theory and Empirical Study	Question	Unit of Analysis
refers to major elements of non-policy factors including socio-economic conditions, attitudes and resources of external groups, commitment of implementing officials.			on environmental policy • Socio-economic benefits are the goal of environmental policy.	4= Agree 5= Strongly Agree
5. Globalization (GLOB) implies global impacts toward policy implementation which are significant to the decision making process.	• Level of globalization pressure to policy implementation of the firm	ONRE (2010); Stern (2006); Streck (2007); UNDP, (2004); UNDP (2014); UNEP RISO (2014); NESDB, (2012); TGO (2014); UNFCCC (1998); World Bank (2004, 2012, 2013, 2014	• Globalization impacts to CDM implementation, such as good governance	Ordinal Likert Scale 1- 5 1= Strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree
6. Transparency (TRN) denotes the importance of information. Disclosing information to the public is very import for policy implementation.	• Level of Information disclosure	deLeon and deLeon (2002); Etzioni (2010); Porter & Kramer (2006); UNDP (2014); UNEP RISO (2014); NESDB, (2012); TGO (2014); UNFCCC (1998); World Bank (2004, 2012, 2013, 2014)	• Transparency in the process, such as environmental reports and availability of information impacting CDM implementation	Ordinal Likert Scale 1- 5 1= Strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree

Table 3.14 (Continued)

Definition of Independent Variables	Measurements	Ground Theory and Empirical Study	Question	Unit of Analysis
7. Environmental Benefits (ENVO) impacts on environment and contribution to resource sustainability: efficiency of resource usage, access of local community to resources, impact on resource degradation.	• Level of positive impact on environment	Lohmann (2006); NEDSB (2012); ONRE (2010); Stern (2006); Streck (2007); Sutummakid, Sukhaparamate, and Pravitrangul (2009); UNDP (2014); UNEP (2014); World Bank (2004, 2012, 2013, 2014)	• Environmental benefits influence CDM implementation	Ordinal Likert Scale 1- 5 1= Strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree
8. Socio-Economic Benefits (SOEC) impacts on quality of life in local communities. For example, employment, poverty reduction, and impact on human health in the community.	• Level of quality of life improvement in local communities	Lohmann (2006); NEDSB (2012); ONRE (2010); Stern (2006); Streck (2007); Sutummakid, Sukhaparamate, and Pravitrangul (2009); UNDP (2014); UNEP (2014); World Bank (2004, 2012, 2013, 2014)	• Socio-economic, such as increasing employment and support of local business leading to CDM implementation	Ordinal Likert Scale 1- 5 1= Strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree

Table 3.15 Dependent Variables and Questionnaire

Definition of Dependent Variables	Measurements	Ground Theory and Empirical Study	Question	Unit of Analysis
Implementation of CDM linkages to sustainable development (CDMSD) refers to 7 factors regarding material variable, structural variable, contractual variable, globalization, transparency, environmental benefits and socio-economic benefits. These factors impact decisions of an organization to participate in CDM projects which link to sustainable development.	• Implementation of CDM in the dimension of organization's SD goals	Adapted from Mazmanian and Sabatier (1989); Matland (1995); Stavins (1998); deLeon and deLeon (2002); Etzioni (2010); Porter and Kramer (2006); UNDP (2014); UNEP (2014)	- Factors below influence your decision to participate in the CDM project at what level ◦ Material Variables ◦ Structural Variables ◦ Contractual Variables ◦ Globalization ◦ Transparency ◦ Environmental benefits ◦ Socio-economic benefits	Ordinal Likert Scale 1- 5 1= Strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree

3.6 Validity and Reliability

Both validity and reliability in the questionnaires are pre-tested prior to administration to ensure that the questionnaire is effective. Deprived of the capacity to use research instruments and procedures that generate consistent measurements, a study would be incapable to adequately draw conclusions, formulate theories, or make claims about the concept of the research. In this study, reliability is tested by Cronbach's alpha: their validity is assessed by content-validity analysis (Kachigan, 1991). Internal Consistency values for reliability coefficients range from 0 to 1.0 (Suchart, 2014).

According to Suchart (2014), since all tests have some error, reliability coefficients of Cronbach's Alpha never reach 1.0. If the reliability of a standardized test is above .70, it is expressed to have a very good reliability; if the result is below .50, it should not be deliberated as a very reliable test. For a research study to be accurate, its findings must be reliable and valid (Hair, Black, Babin, Anderson, and Tatham, 2006). Reliability means that the findings would be consistently the same if the study were done over again. Validity refers to the truthfulness of findings.

According to Babbie (2007), a study can be reliable but not valid, and it cannot be valid without first being reliable. Results cannot be assumed valid no matter how reliable the measurements are. Validity refers to the degree to which a study accurately reflects or assesses the specific concept that the research is attempting to measure. While reliability is involved with the precision of the actual quantifying instrument or procedure, validity is involved with the study's achievement at measuring what the investigators set out to measure (Kachigan, 1991).

This study wants to standardize or clarify the measurement instrument to reduce user error, which will add to the reliability of the test. The test-retest technique is to administer the test, instrument, survey, or measure to the same group of people at different points in time. Most academics administer what is called a pretest for this, and to troubleshoot bugs at the same time (Tabachnick & Fidell, 1997). All reliability estimates are usually in the form of a correlation coefficient, so here, all you do is calculate the correlation coefficient between the two scores on the same group and report it as the reliability coefficient (Babbie, 2007).

3.6.1 Content Validity

The questionnaire was submitted to two experts in the field of industrial processing and an environmental project manager for ISO: 14001 with experience in environmental management standards and CDM implementation for many organizations.

1) Mr. Sid Seaneewong Na Ayudhaya is a project advisor for ISO: 9001 with 14001 certification at Chevron (Thailand) Co., Ltd. Moreover, Mr. Sid is also experienced in policy formulation for Chevron headquarters in the United States. From the interview in October 2017, it led to modification of the questionnaire regarding the ease of understanding of question structure. The technology type of the organization is also important in the research, which should be included in the questionnaire because it reflects the investment cost and CER generation of the CDM project. Nonetheless, the linkages of documents and approval process of various government agencies should be added into the questionnaire for better explanation of CDM implementation obstacles.

2) Mr. Pichaipat Chaichinarat of Suzuki Motor (Thailand) Co., Ltd. is a team leader of the ISO: 9001 certification audit team and a technical instructor for the production process of automotive and industrial waste management. Prior to Suzuki Motor (Thailand), Mr. Pichaipat led several environmental projects for Mitsubishi Motor (Thailand) Co., Ltd. and Tata Motor (Thailand) Co., Ltd. From the interview and pre-test, he commented on the other dimension of CDM projects, such as economic indicators and CDM as a competitive tool for brand image and value added for competitive advantage. He also mentioned the complexity of several questions regarding the environmental policy formulation of each company. The question has been modified, with some points deleted in the policy formulation process and socio-economic factors.

3.6.2 Construct Validity: Pre-Testing

The pre-test questionnaires of 23 sets were sent to get reliability testing. The test is a measure of the stability as to whether it is acceptable or not. All samples had an alpha value of Cronbach's Alpha Coefficient of more than 0.5. However, for some questions which had an alpha value below 0.7 they had to be deleted, which referred

to the policy formulation process. After adjusting the questionnaire structure regarding environmental policy formation and CDM implementation, the Alpha value improved.

Table 3.16 Cronbach's Alpha Coefficient Pre-Testing

Section	Number of Questions	Cronbach's Alpha Coefficient
Information of factors which lead to CDM implementation	7	0.708
Problems and concerns of CDM implementation	13	0.453*
Information of factors impacting consideration of environmental benefits	2	0.599*
Information of factors impacting ability of policy implementation	3	0.514*
Information of non-statutory factors impacting policy implementation	2	0.628*
Information of factors impacting consideration of socio-economic benefits	2	0.786
Information of factors impacting sustainable development	3	0.772

Note: * Cronbach Alpha < 0.7

3.6.3 Reliability Analysis from the Actual Questionnaire

After receiving the questionnaires back until reaching the target of 106 respondents, the measurements which were used for causal relationship were the material variables, structural variables, contractual variables, globalization, environmental benefits, socio-economics benefits, and transparency. Also, variables of problems and concerns of CDM implementation were checked for internal consistency. Cronbach's Alpha Coefficient is widely used to estimate the reliability, or internal consistency of a composite score. It also gave this research a way to measure whether or not the score is reliable. It is used under the assumption that you have multiple items measuring the same underlying construct.

Table 3.17 Cronbach's Alpha Coefficient

Section	Number of items	Action	Cronbach's Alpha Coefficient
Information of factors which lead to CDM implementation	7	-	0.708
Problems and concerns of CDM implementation	13	Deleted 1question	0.715
Information of factors impacting consideration of environmental benefits	2	Modified 1 question	0.714
Information of factors impacting ability of policy implementation	3	Modified 2 questions	0.720
Information of non-statutory factors impacting policy implementation	2	Modified 2 questions	0.709
Information of factors impacting consideration of socio-economic benefits	2	-	0.786

Table 3.17 (Continued)

Section	Number of items	Action	Cronbach's Alpha Coefficient
Information of factors impacting sustainable development	3	-	0.772
Total	32		0.701

As the questionnaires returned from respondents, constant and construct reliability checks was performed periodically. After the pretest, there were several items which had low Cronbach Alpha values, as seen in Table 4.5.2. In this section of problems and concerns of CDM implementation, the Cronbach alpha value was 0.453. After carefully examining the questionnaire, it appeared that the question regarding "Problem of CDM investment funds" had a low selection rate and participants were asked in a similar context about "Investment support policy" in another section. It appears that they are redundant. Therefore, elimination of one question from the problem with policy implementation section was done. Subsequently, the Cronbach alpha value reached 0.715, which is considered an acceptable range of consistency (Suchart, 2014).

There were 3 more sections of information of factors impacting consideration of environmental benefits, information of factors impacting the ability of policy implementation, and information of non-statutory factors impacting policy implementation, which had a Cronbach Alpha value less than 0.7. After the pre-test and questionnaire review from experts, it appeared that this questionnaire consisted of many technical words, for example, transparency in the process and sustainable development. If the respondents are not in the environmental sector, it would be difficult to clarify the meaning thoroughly. Moreover, the question's structure was important for exploring the answers of respondents in their pattern of consistency. Thus, the question structure and additional question structure of environmental research regarding CDM topics from many scholars in environmental study were

reviewed. As a result of data collected, all data had a Cronbach Alpha value of more than 0.7 in the reliability analysis.

3.6.4 Multivariate Analysis

The methodologies selected characterize the nature of the relationship between theory and research and whether theory guides this research or whether a new theory is an outcome of this research. Methodology for a study specifies what information is to be gathered, from where, and what methods of data collection and analysis are to be employed (Babbie, 2007).

In this research, parametric statistical methods were used as the primary tool to explore the relationship among IVs and DV. The multivariate methods that were selected are Regression analysis and Path analysis. Regression analysis was used in the study to examine if the independent variables predicted the dependent variables (Hair, Black, Babin, Anderson, and Tatham, 2006). A regression analysis equation "describes the nature of the relationship between two variables" and "regression analysis supplies variance measures which allow the research to assess the accuracy with which the regression equation can predict values on the criterion variable…" (Kachigan, 1991). Regression analysis could also be termed prediction analysis because it measures the degree of the relationship between the predictor variable and the criterion variable. This study hypothesized material variables, structural variables, a contractual variable, globalization, environmental benefits, socio-economic benefits and transparency (predictor variables) to predict CDM implementation which links to sustainable development (criterion variables). A p-value of 0.05 or less was used as the criterion variable to decide if the degree of prediction was significant (Kachigan, 1991).

According to Suchart (2014), a path analytic approach was used to develop the correlation matrices theorized in the study and to test the hypothesized causal paths between variables. A stepwise linear regression method, in SPSS 18, was used to estimate path coefficients and the pictorial model. While multiple regression analysis does the same, which is estimating path coefficients, in the estimation it is simultaneous (Kline, 1998). In SPSS estimation of all the variables in the model were

calculated at the same time (Pallant, 2001). A significant value of each path will be discussed later on in Chapter 5.

The first assumption before running parametric statistics is that the variables must have a normal distribution that is a function that defines the distribution of scores in the population. According to Table 3.5.1, all standard deviation values are less than the mean value, which indicates normality of the data. Nonetheless, the Skewness and Kurtosis values are in the range of +/- 1, so all data appears to be normally distributed in this research (Tabachnick & Fidell, 1997).

3.6.5 Normality Test

From Table 3.5.1, all variables are significant, which proves the normality among these variables. Moreover, according to the P-P chart, Q-Q chart and scatterplot, there is no appearance of an outlier and it shows normality, which allows shifting to another assumption on the multi-collinearity test (see Appendix C).

A Correlation matrix is another test that must be done before running a multivariate technique which describes correlation among variables. This is a square symmetrical variable matrix with the element equal to the correlation coefficient r between one variable and another variable. The diagonal foundations which are relationships of variables among research variables are always equal to 1.00 (Tabachnick & Fidell, 1997).

This tool also helps justify a third assumption of the parametric statistic method, which is a multi-collinearity problem. The critical value for correlation (r) in the regression analysis, which is vital for path analysis, is below 0.75 (Tabachnick & Fidell, 1997).

In path analysis, the correlation is equal to the sum of the impact of all the directional lines across which the two variables are connected. The value of each of the variables contributing pathways is calculated as the consequence of the path-coefficients along that pathway (Suchart, 2014). In this statistical method a multi-collinearity problem is not permitted, the highly correlated variable will involve the coefficient, which will absolutely interrupt the result of regression analysis (Tabachnick & Fidell, 1997).

According to Table 3.18, all coefficients are far below 0.75, so it can be concluded that there is no multi-collinearity issue for this data set. Nonetheless, there are also 8 variables which appear statistically significant to our hypothesis of variables that affect the decision for CDM implementation in the dimension of sustainable development, which are the material variable, structural variable, contractual variable, globalization, environmental benefits, socio-economic benefits, and transparency.

Table 3.18 Correlations Matrix

Variables	SD caused by CDM	External Factors (Material Variables)	Internal Factors (Structural Variables)	Non-Law Factor (Contractual Variables)	Globalization	Environmental Benefits	Socio-economic Benefits	Transparency
External Factors (Material Variables)	.736							
Internal Factors (Structural Variables)	.742	.626						
Non-Law Factors (Contractual Variables)	.642	.457	.418					
Globalization	.656	.529	.712	.410				
Environmental Benefits	.607	.563	.474	.325	.402			
Socio-economic Benefits	.747	.580	.696	.487	.643	.624		
Transparency	.733	.689	.741	.386	.612	.446	.641	n/a
Min	3.0	3.0	3.0	2.0	3.0	2.0	2.0	3.0
Mean	4.2	4.3	4.0	4.3	4.2	4.2	4.3	4.4
Std. Deviation	.74	.71	.71	.70	.77	.76	.66	.74
Skewness	-.61	-.31	-.43	-.21	-.46	-.51	-.55	-.45
Kurtosis	-.774	-1.103*	-.905	-.481	-.861	-.755	-.609	-.734

Max = 5

Note: * Skewness and Kurtosis value is greater than +/- 1, using natural log to adjust value for univariate normality

Source: Suchart, 2014.

3.7 Summary

This research is a mixed method research. Beginning from the literature review from previous works of policy study and CDM implementation data for creating a conceptual model of CDM implementation in Thailand, there are also in-depth interviews and observations from CDM related conferences and seminars which provided insights to create a query that matches the conceptual model. Later, research tools to test with the target group and expert reviews to get comments for revision were prepared. Nonetheless, the study tests Cronbach Alpha for internal consistency to ensure accuracy and reliability before proceeding to submit the questionnaire to all the samples. This study focused on multivariate analysis. It is the methodology selected that characterizes the nature of the relationship between theory and research and whether the theory guides this research or whether a new theory is an outcome of this research. All data has been tested for normality and other testing, which ensures the basic rule of linear regression analysis. Lastly, the question is designed to be closed end and open end, to explore additional data and recommendations which relate to CDM implementation in Thailand and, as intended, to discover any factors and obstacles.

CHAPTER 4

FINDINGS AND DISCUSSIONS

This chapter discusses descriptive statistics and explains the effectiveness of CDM policies in the form of private sector participation. Later, inferential statistics was used (Path Analysis) to test the hypothesis of the research and present the conclusion.

4.1 Sample Selection

This section describes the characteristics of the sample population in this study. The sample population is divided into the respondents' status and organizational characteristics, which are listed by UNFCCC and TGO as organizations that have implemented CDM and joined a carbon training scheme. The sample was tested within the operational time of the organization. The number of management characteristics of the respondents included 13.9 percent as president, executive director level was 21.3 percent, board of direct level was 14.1 percent, general manager level was 19.4 percent, director level was 24.8 percent and manager levels were 6.5 percent. Details are shown in Table 4.1.

Table 4.1 Respondents' Status

Detail	Frequency	Cumulative Percent
President	15	13.9
Executive Director	23	21.3
Board of Director	16	14.1
General Manager	21	19.4
Director	26	24.8

Table 4.1 (Continued)

Detail	Frequency	Cumulative Percent
Manager	7	6.5
Total	108	100.0

The company's age according to all respondents are divided into intervals. The nature of the organizations which had implemented CDM were mostly in business between 1 – 10 years. The first group is companies aged between 1-to 5 years at 38.9 percent. The second group is companies aged between 6 to 10 years at 41.7 percent, which is the highest percentage of company age. The third company age fell between 11 – 15 years, which had 16.7 percent. The last group is companies between 16 – 20 years in business, which came in at 2.8 percent. Please see details in Table 4.2.

Table 4.2 Company Age

Operation Period	Frequency	Valid Percent
1 - 5 Years	42	38.9
6 - 10 Years	45	41.7
11 - 15 Years	18	16.7
16 - 20 Years	3	2.8
Total	108	100.0

The companies which implement CDM are mostly small and medium sized. The number of employees in companies which implemented CDM with between 1 - 100 employees was 35.2 percent. In the second group of CDM, companies with full time workers between 101 - 200 employees, it was at 50 percent. Companies among the third group, which have 201 - 300 employees totaled 13 percent. The last group, which has more than 300 employees, had 1.9 percent. Please see details in Table 4.3.

Table 4.3 Number of Full Time Employees

Number of Employees	Frequency	Valid Percent
1 - 100 Employees	38	35.2
101 - 200 Employees	54	50.0
201 - 300 Employees	14	13.0
301 - 400 Employees	2	1.9
Total	108	100.0

In this study, 84.3 percent of the organizations are actively trading carbon credits in the primary market. There are 14 organizations that exited the CDM project but used to be in the program. There are 3 organizations who applied for CDM, however have not started trading, as described in Table 4.4.

Table 4.4 Organization CDM Status

CDM Status	Frequency	Valid Percent
CDM Member	91	84.3
Used to be a CDM Member	14	13.0
Never enrolled in CDM	3	2.8
Total	108	100.0

The nature of CDM technology respondents are as follows: 54.6 percent of organizations are using methane avoidance as carbon credits for this study. The second group is organizations who use a Biomass technology method, which is 21 organizations. Solar technology has a 5.5 percent response rate. Wind and Landfill technology is among the lowest response rate, with 3 responses in total. There are 39 respondents who did not answer in this context because they are in a management position and unknowing of the technical details of the company. Please see Table 4.5 for more details.

Table 4.5 CDM Technology

CDM Type	Frequency	Valid Percent
Methane avoidance	59	54.6
Biomass	21	19.4
Solar	6	5.5
Wind	1	.9
Landfill	2	1.9
Did Not Answer	39	36.1
Total	108	100.0

CDM projects are classified by the amount of CERs that the project will create. Most of the respondents are small scale projects, which total 77.8 percent. Another group is large projects, which made up 22.2 percent of the respondents. However, there were 31 who could not answer this question due to their limitation of data access and other reasons. As described in Table 4.6.

Table 4.6 Classification for CDM Project Size

Size	Frequency	Valid Percent
Small Projects	65	60.2
Large Projects	12	11.1
Did Not answer	31	28.7
Total	108	100.0

4.2 Characteristics of Independent Variables

Based on a sample of 108 out of 153 in the population, the questionnaires were able to summarize the characteristics of the variables used in this research. There are 7 independent variables and 1 dependent variable. These variables will be explained for the understanding of CDM implementation conditions in the

organizations. There are 13 variables of CDM obstacles for the private sector in Thailand, which will be explained in this section.

External factors (TRAC) are considered for CDM implementation. Also, 12 percent of organizations did not comment on this matter. It can be either that their external factors do not have an effect on environmental policy, or the respondents are not sure of the impact. 37 percent of respondents agreed that external factors have a high impact on CDM implementation. The highest of this factor is 48.1 percent of organizations who selected external factors as a CDM implementation indicator. There are 3 respondents who did not answer. See Table 4.7.

Table 4.7 External Factors

	Frequency	**Valid Percent**
Neutral	13	12.0
High	40	37.0
Highest	52	48.1
Did Not Answer	3	2.7
Total	108	100.0

Internal factors (ASSI), or structural variables influencing environmental policy, such as consistency of corporate goals and management support, is a second variable that will be used to determine CDM implementation. In Table 5.2.2, there are 13 respondents who selected the neutral choice, which is that internal factors have no impact on CDM implementation. There are 25 percent who selected high impacts for internal factors. The highest impacts, as well as highest selection of 58.3 percent, are for 63 respondents who express the relationship of internal factors and CDM implementation. Interestingly, there are 5 organizations who did not select this factor as a linkage to CDM implementation. See Table 4.8.

Table 4.8 Internal Factors

	Frequency	Valid Percent
Neutral	13	12.0
High	27	25.0
Highest	63	58.3
Did Not Answer	5	4.6
Total	108	100.0

Contractual Variables (NAVI), or non-statutory variables affecting implementation (NAVI), refers to major elements of non-policy factors, which includes economic conditions, attitudes and resources of external groups, and the commitment of implementing officials. There were 2 respondents who gave the low relationship of contractual variables towards CDM implementation. This indicates that there is a low relationship between contractual variables towards CDM implementation. However, it is very low percentage, which can also mean that respondents may not understand the question well. Further statistical analysis will be performed to check normality of the data. 13.9 percent did not give a rating or were not sure about the relationship. 33.3% gave a high score for contractual variables towards CDM implementation. The highest rating that respondents assigned was 48.1%, which indicates the highest relationship among contractual variables towards CDM implementation. See Table 4.9.

Table 4.9 Non-statutory Variables

	Frequency	Valid Percent
Low	2	1.9
Neutral	15	13.9
High	36	33.3
Highest	52	48.1
Did Not Answer	3	2.7
Total	108	100.0

Globalization (GLOB) implies global impacts toward policy implementation with significance to the decision making process. There were 11 respondents, or 10.2 percent feedback, for neutral relationships among variables. 50.9 percent presented a high impact for the globalization parameter. 37.0 percent showed the highest influence to be between globalization and CDM implementation. See Table 4.10.

Table 4.10 Globalization

	Frequency	**Valid Percent**
Neutral	11	10.2
High	55	50.9
Highest	40	37.0
Did Not Answer	2	1.9
Total	108	100.0

Environmental benefits (ENVO) influence CDM implementation. It intends to reduce risks on human health and the environment through reducing and eliminating the production, use and release of persistent organic pollutants and their waste under the CDM process. 6.5 percent gave a low impact on environmental benefits. 10.2 percent did not give a score to the relationship of environmental benefits factor. 39.8 percent gave environmental benefits impact toward CDM implementation as a high relationship. 41.6 percent gave the highest relationship of environmental benefits to CDM project implementation. See Table 4.11.

Table 4.11 Environmental Benefits

	Frequency	**Valid Percent**
Low	7	6.5
Neutral	11	10.2
High	43	39.8
Highest	45	41.6
Did Not Answer	3	2.7
Total	108	100.0

Socio-Economics (SOEC) are not indicated as only social benefits but also as economic benefits to the society, such as increased employment and support for local business leading to CDM implementation. In Table 4.12, there were 4 respondents who gave a low score for socio-economic benefits. 4 organizations selected neutral, which indicates no relationship or not sure of a relationship among variables. 20.4 percent of socio-economic indicators had a high impact on CDM implementation. The highest, with a 66.6 percent selection of relation among variables, suggests an impact toward CDM implementation.

Table 4.12 Socio-Economic Benefits

	Frequency	**Valid Percent**
Low	4	3.7
Neutral	4	3.7
High	22	20.4
Highest	72	66.6
Did Not Answer	6	5.5
Total	108	100.0

Transparency in the process of CDM project implementation requires the project to be transparent in terms of CDM operational data and public hearings, such as with environmental reports and the availability of information impacting the clean development technology that the organization selected. Transparency and accountability are generally considered the two main pillars of good corporate governance. The implication of transparency is that all of an organization's actions should be conscientious enough to assume public scrutiny. There were 12.0 percent who selected neutral. Another 21.3 percent stated that transparency has a high relationship among variables. 61.1 percent expressed the highest score for association of transparency towards CDM implementation. See Table 4.13.

Table 4.13 Transparency

	Frequency	Valid Percent
Neutral	13	12.0
High	23	21.3
Highest	66	61.1
Did Not Answer	6	5.5
Total	108	100.0

Based on the study of 108 out of 153 in the population, the questionnaires were able to summarize the characteristics of the independent and dependent variables used in this research. There are 7 independent variables and 1 dependent variable. These variables are explained by means of understanding CDM implementation conditions in organizations in Thailand, which can explain the implementation factors.

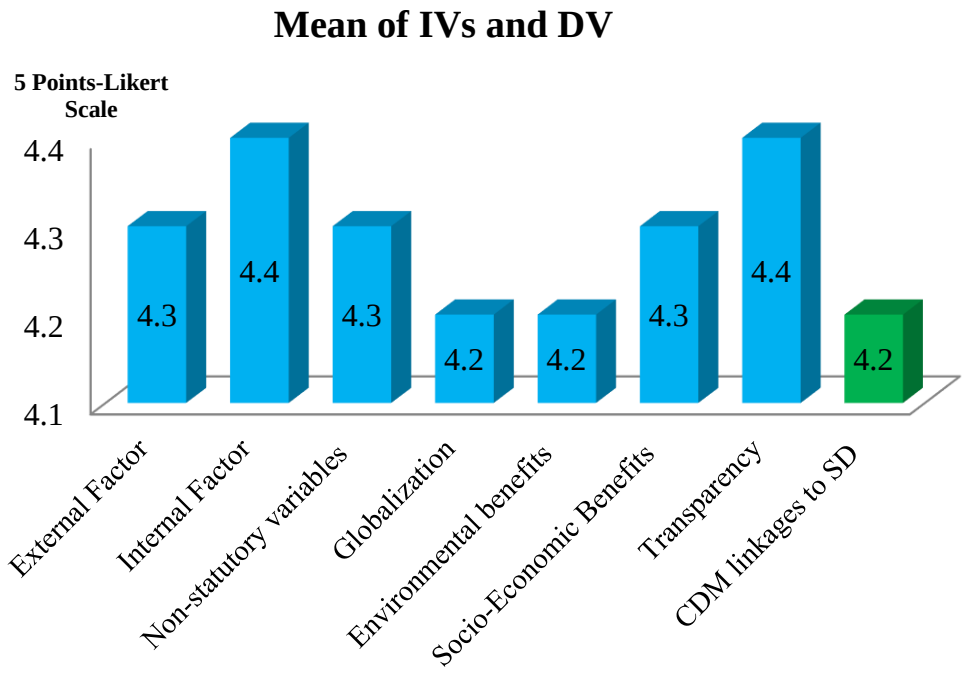


Figure 4.1 Mean of IVs and DV

Discovering CDM implementation obstacles in Thailand is the second objective of this study. Although there has been successful implementation of the CDM approach in some developed countries, it is more difficult in developing countries like Thailand. In this section, there were 93 respondents selected for this problem. There were 6 respondents who stated a low problem with clear GHG policy. 13.9 percent of organizations were neutral about clear GHG policy. 40.7 percent had high problems with clear GHG policy. Another 25.9 percent had the highest problem with clear GHG policy. See Table 4.14.

Table 4.14 Problems with Clear GHG Policy

	Frequency	**Valid Percent**	**Cumulative Percent**
Low	6	5.6%	5.6%
Neutral	15	13.9%	19.4%
High	44	40.7%	60.2%
Highest	28	25.9%	86.1%
Total	93	13.9%	100.0%
Did Not answer	15		

There were 86 respondents who answered the problem regarding clear CDM policy. 6 respondents stated low problems with clear CDM policy. 12.8 percent of organizations were neutral about clear CDM policy. 37.2 percent had high problems with clear CDM policy. The highest selection, 43 percent, stated the highest problem was a clear CDM policy. See Table 4.15.

Table 4.15 Problems with Clear CDM Policy

	Frequency	Valid Percent	Cumulative Percent
Low	6	7.0	7.0
Neutral	11	12.8	19.8
High	32	37.2	57.0
Highest	37	43.0	100.0
Total	86	100.0	
Did Not answer	22		

There were 95 respondents who answered the problem with financial support. 3.2 percent of respondents stated low problems with financial support. 17.9 percent of organizations were neutral about financial support policy. 30.5 percent had a high degree of problems with clear finance support policy. The highest selection, 48.4 percent, stated their highest problem was clear finance support policy. See Table 4.16.

Table 4.16 Problem with Finance Support

	Frequency	Valid Percent	Cumulative Percent
Low	3	3.2	3.2
Neutral	17	17.9	21.1
High	29	30.5	51.6
Highest	46	48.4	100.0
Total	95	100.0	
Did Not answer	13		

There were 93 respondents who answered the problem of tax from CDM income. 5.4 percent of respondents stated a low problem with the tax system from CDM income. 14 percent of organizations were neutral about CDM income tax policy. 37.6 percent had a high problem with tax from CDM income policy. The

highest selection, 43 percent, stated their highest problem was tax from CDM income policy. See Table 4.17.

Table 4.17 Problem with Tax from CDM Income

	Frequency	Valid Percent	Cumulative Percent
Low	5	5.4	5.4
Neutral	13	14.0	19.4
High	35	37.6	57.0
Highest	40	43.0	100.0
Total	93	100.0	
Did Not answer	15		

There were 94 respondents who answered the problem of access to CDM technology. 4 respondents stated the lowest problem with access to technology. 2 respondents stated a low problem with access to technology. 20.2 percent of organizations were neutral about any problem of technology accessibility. 30.9 percent had a high problem with access to technology. The highest selection, 42.6 percent, stated the highest problem was access to technology. See Table 4.18.

Table 4.18 Problem with Access to Technology

	Frequency	Valid Percent	Cumulative Percent
Lowest	4	4.3	4.3
Low	2	2.1	6.4
Neutral	19	20.2	26.6
High	29	30.9	57.4
Highest	40	42.6	100.0
Total	94	100.0	
Did Not answer	14		

There were 87 respondents who answered the problem with the approval process. 4 respondents stated the lowest problem with the approval process. 6.9 percent of respondents stated a low problem with the approval process. 12.6 percent of organizations were neutral about any problem regarding the approval process. 37.9 percent had a high problem with the approval process. 33 respondents stated their highest problem was with the approval process. See Table 4.19.

Table 4.19 Problem with Approval Process

	Frequency	**Valid Percent**	**Cumulative Percent**
Lowest	4	4.6	4.6
Low	6	6.9	11.5
Neutral	11	12.6	24.1
High	33	37.9	62.1
Highest	33	37.9	100.0
Total	87	100.0	
Did Not answer	21		

There were 92 respondents who answered the problem was coordinating with the Government. 7 respondents stated their lowest problem was coordinating with Government. 4.3 percent of respondents stated low problems coordinating with Government. 15.2 percent of organizations were neutral about a problem of coordinating with Government. 32.6 percent had high problems coordinating with Government. 37 respondents stated the highest problem was coordinating with Government. See Table 4.20.

Table 4.20 Problem with Coordinating with Government

	Frequency	Valid Percent	Cumulative Percent
Lowest	7	7.6	7.6
Low	4	4.3	12.0
Neutral	14	15.2	27.2
High	30	32.6	59.8
Highest	37	40.2	100.0
Total	92	100.0	
Did Not Answer	16		

In order to elaborate on more details concerning problems with the approval process, an additional 5 items were added regarding the initial application process, letter of acceptance (LoA), environmental impact assessment (EIA), reviewing duration of TGO board, and sustainable development assessment (IEE SD).

The most selected problem of the approval process was project initiation. 59 percent had problems with the initial process. 38 respondents stated problem with the LoA. The EIA report had 33 percent respond that it was a problem. The period of approval from the TGO committee displayed as a problem for 35 percent of respondents. 43 percent of respondents had problems with the IEE SD report. See details in Table 4.21.

Table 4.21 Problem with Approval Process

	Frequency	Percent
Problem with Project Initiation	64	59%
Problem with LoA	38	35%
Problem with EIA	36	33%
Problem with TGO Committee approval period	38	35%
Problem with IEE SD	46	43%

Note: N = 108

Of the most selected problems with communication with a government agency, 43 percent had problems with TGO. 23 respondents stated problems with BOI. The problem of Local Authority had 3 percent respond. Problems with the Provincial Industry Office and Provincial Admin Organization displayed at 6 percent. 4 percent of respondents had problems with the Pollution Control Office. See details in Table 4.22.

Table 4.22 Problem of Communication with Government Agencies

	Frequency	**Percent**
Problem with TGO	46	43%
Problem with Local Authority	3	3%
Problem with Provincial Industry Office	7	6%
Problem with Provincial Admin Organization	7	6%
Problem with Pollution Control Office	4	4%
Problem with BOI	23	21%

Note: N = 108

There were 59 respondents who answered the problem with CDM expertise. 1 respondent disagreed with there being a CDM expertise problem. 20.3 percent of organizations were neutral about a problem of CDM expertise. 39 percent agreed there is a CDM expertise problem. 23 respondents stated strongly that they agree with problems regarding CDM expertise. See Table 4.23.

Table 4.23 CDM Expertise

	Frequency	Valid Percent	Cumulative Percent
Disagree	1	1.7	1.7
Neutral	12	20.3	22.0
Agree	23	39.0	61.0
Strongly Agree	23	39.0	100.0
Total	59	100.0	
Did Not Answer	49		

There were 59 respondents who answered the problem over a lack of Human Resources. 1 respondent disagreed with any lack of Human Resources. 22 percent of organizations were neutral about a lack of Human Resources. 45.8 percent agreed a problem existed with a lack of Human Resources. 18 respondents stated they strongly agreed with a lack of Human Resources concern. See Table 4.24.

Table 4.24 Lack of Human Resources

	Frequency	Valid Percent	Cumulative Percent
Disagree	1	1.7	1.7
Neutral	13	22.0	23.7
Agree	27	45.8	69.5
Strongly Agree	18	30.5	100.0
Total	59	100.0	
Did Not Answer	49		

There were 58 respondents who answered the problem with risk assessment data. 1 respondent disagreed with a risk assessment data problem. 17.2 percent of organizations were neutral about risk assessment data. 43.1 percent agreed with a problem concerning risk assessment data. 37.9 percent of respondents strongly agreed with risk assessment data concerns. See Table 4.25.

Table 4.25 Risk Assessment Data

	Frequency	Valid Percent	Cumulative Percent
Disagree	1	1.7	1.7
Neutral	10	17.2	19.0
Agree	25	43.1	62.1
Strongly Agree	22	37.9	100.0
Total	58	100.0	
Did Not Answer	50		

There were 62 respondents who answered the problem of access to investment funds. 1 respondent strongly disagreed with access to investment funds problems. 2 respondents disagreed with access to investment funds problems. 14.5 percent of organizations were neutral about access to investment funds. 43.5 percent agreed there's a problem with access to investment funds. 37.1 percent of respondents strongly agreed with access to investment funds obstacles. See Table 4.26.

Table 4.26 Access to Investment Funds

	Frequency	Valid Percent	Cumulative Percent
Strongly Disagree	1	1.6	1.6
Disagree	2	3.2	4.8
Neutral	9	14.5	19.4
Agree	27	43.5	62.9
Strongly Agree	23	37.1	100.0
Total	62	100.0	
Did Not Answer	46		

There were 67 respondents who answered the problem regarding compensation from CERs. 3 respondents disagreed with compensation from CERs. 13.4 percent of organizations were neutral about compensation from CERs. 25.4 percent agreed about a problem with compensation from CERs. 56.7 percent of respondents strongly agreed with compensation over CER concerns. See Table 4.27

Table 4.27 Compensation from CERs

	Frequency	Valid Percent	Cumulative Percent
Disagree	3	4.5	4.5
Neutral	9	13.4	17.9
Agree	17	25.4	43.3
Strongly Agree	38	56.7	100.0
Total	67	100.0	
Did Not Answer	41		

70 respondents answered the problem about management support. 1 respondent disagreed with management support. 14.3 percent of organizations were neutral about management support. 45.7 percent agreed with a problem with management support. 38.6 percent of respondents strongly agreed with management support. See Table 4.28.

Table 4.28 Management Support

	Frequency	Valid Percent	Cumulative Percent
Disagree	1	1.4	1.4
Neutral	10	14.3	15.7
Agree	32	45.7	61.4
Strongly Agree	27	38.6	100.0

Table 4.28 (Continued)

	Frequency	Valid Percent	Cumulative Percent
Total	70	100.0	
Did Not Answer	73		

The study explored the problem of risk assessment data. Risk assessment is a study used to describe the overall process or method where risk is identified for the factors that have the potential to cause problems for a CDM project. Analyzing and evaluating the risk associated with access to technology was at 31 percent. Risk that the CDM project would not get approved was 13 percent. 17 percent responded about a lack of community support. 6 percent selected a policy change of government policy. Economic instability was selected by 15 respondents. 11 respondents stated that investment risk of project data appeared to be an obstacle to CDM implementation. See Table 4.29.

Table 4.29 Problems with Risk Assessment Data

	Frequency	Percent
Access to Technology	34	31%
Rejection from Government	14	13%
Lack of Community Support	18	17%
Government Policy Change	6	6%
Economic Instability	15	14%
Investment Risk	11	10%

Note: N = 108

Environmental benefits are long term, occurring slowly over time in CDM implementation. A CDM project considers the medium- and long-term effect of environmental interventions on the agro-ecosystem. It aims to produce benefits while establishing an ecological balance to prevent eco-problems. CDM projects take a proactive approach as opposed to treating problems after they emerge. 79 percent of respondents stated that CDM projects can decrease air pollution. 62 percent of respondents answered that CDM projects can decrease water pollution. 56 percent of respondents stated that CDM projects can decrease noise pollution. 52 percent of respondents answered that CDM projects can improve soil quality. 70 percent said CDM projects can decrease industrial waste. See Table 4.30.

Table 4.30 CDM Projects Contribute to Environmental Benefits

	Frequency	**Percent**
Decrease Air Pollution	85	79%
Decrease Water Pollution	67	62%
Decrease Noise Pollution	60	56%
Reduce Soil Contamination	56	52%
Decrease Industrial Waste	76	70%

Note: N = 108

Socio-economic benefit refers to benefits offered to a community as a whole through the byproduct of CDM projects, and can include long-term impacts on the prevailing economic conditions, on levels of wellbeing, on the family unit or on employment levels. 80 percent of respondents stated that CDM projects can improve the local economy. 62 percent of respondents answered that CDM projects can improve local environments. 53 percent of respondents stated that CDM projects can create renewable energy sources. 51 percent of respondents answered that CDM projects can improve relationships with local communities. 69 percent said CDM projects can increase jobs. See Table 4.31.

Table 4.31 CDM Projects Contribute to Socio-economic Benefits

	Frequency	Percent
Improve Local Economy	86	80%
Improve Local Environments	67	62%
Create Renewable Energy Sources	57	53%
Improve Relationship with Local Community	55	51%
Increase Jobs	75	69%

Note: N = 108

In this study, the focus of CDM toward competitive advantage elaborates on 6 topics. 80 percent of respondents stated that CDM projects can reduce the cost of production and services. 61 percent of respondents answered that CDM projects can improve innovation in environmentally friendly products. 66 percent of respondents stated that CDM projects can improve the production process and quality. 72 percent of respondents answered that CDM projects can produce products and services that answer social and environmental needs. 51 percent of respondents answered that CDM projects can brand an image of social responsibility. 63 percent said CDM projects can increase value added to products and services. See Table 4.32.

Table 4.32 CDM Projects Contribute to Competitive Advantage

	Frequency	Percent
Reduce Cost of Production and Services	70	65%
Innovation of Environmentally Friendly Products	66	61%
Improve Production Process and Quality	71	66%
Products and Services that answer to Social and Environmental Needs	78	72%
Brand Image of Social Responsibility	55	51%
Value Added to Products and Services	68	63%

Note: N = 108

Information on CDM project investment is limited. Due to the confidentiality of each firm, respondents did not disclose that information, only 47 organizations were willing to share the information. 8.5 percent invested less than 10 million Baht. 25.5 percent invested between 10 million – 20 million Baht. 21.3 percent invested between 20 million – 30 million Baht. 3 organizations invested between 30 million – 40 million Baht. 38.3 percent invested more than 40 million Baht. See Table 4.33.

Table 4.33 CDM Investment (Baht)

Baht	Frequency	Valid Percent	Cumulative Percent
Less than 10 Million	4	8.5	8.5
10 Millions - 20 Million	12	25.5	34.0
20 Millions - 30 Million	10	21.3	55.3
30 Millions - 40 Million	3	6.4	61.7
More than 40 Million	18	38.3	100.0
Total	47	100.0	
Did Not Answer	61		

Income from carbon trading scheme information is inadequate. Due to the confidentiality of each firm, respondents did not disclose this information, only 24 organizations were willing to reveal the information. From the phone interviews, respondents were reluctant to disclose the amount of income due to two main reasons. First, respondents did not have updated information. Second, in order to do so, official requests needed to be made to company management to approve of financial information disclosure. The results can be summarized as follows: 1 firm received income of less than 1 million Baht. 62.5 percent had income between 1 million to 5 million Baht. 12.5 percent earned income between 5 million to 10 million Baht. 5 organizations earned income more than 10 million Baht. 84 organizations did not disclose the information. See Table 4.34.

Table 4.34 Income from Carbon Trading Schemes

Income in Baht	Frequency	Valid Percent	Cumulative Percent
Less than 1 Million	1	4.2	4.2
1 Millions - 5 Million	15	62.5	66.6
5 Millions - 10 Million	3	12.5	79.2
More than 10 Million	5	20.8	100.0
Total	24	100.0	
Did Not Answer	84		

59.3 percent responded that CDM increased company income at the lowest level. 28.4 percent stated that CDM increased company income at a low level. 10 organizations were neutral regarding CDM increasing company income or not. See Table 4.35.

Table 4.35 CDM Increases Company Income

CDM Increases Company Income	Frequency	Valid Percent	Cumulative Percent
Lowest	48	59.3	59.3
Low	23	28.4	87.7
Neutral	10	12.3	100.0
Total	81	100.0	
Did Not Answer	27		

Competitive advantage is an attribute that allows a company to outperform its competitors. Many scholars have mentioned a CDM linkage to competitive advantage in both direct and indirect ways. 4 percent of organizations responded there's a low relationship of CDM impacting competitive advantage. 13.5 percent stated a neutral linkage of the variables. 39.3 percent of respondents gave a high relationship of CDM

and competitive advantage. 43.2 percent responded that CDM has the highest impact to competitive advantage. See Table 4.36.

Table 4.36 CDM Impacts Competitive Advantage

CDM Impacts Competitive Advantage	Frequency	Valid Percent	Cumulative Percent
Low	3	4.0	4.0
Neutral	10	13.5	17.6
High	29	39.2	56.8
Highest	32	43.2	100.0
Total	74	100.0	
Did Not Answer	34		

Organizations that posted CO_2 reduction from CDM projects between 1 to 100,000 CERs totaled 32.6 percent. 39.1 percent reduced CO_2 between 100,001 to 1,000,000 CERs. 19.6 percent reduced 1,000,001 to 10,000,000 CERs. 4 organizations reduced more than 10,000,000 CERs. See Table 4.37.

Table 4.37 CO_2 Reduction from CDM Projects

CO_2 Reduction from CDM Projects	Frequency	Valid Percent	Cumulative Percent
1 - 100,000 CERs	15	32.6	32.6
100,001 - 1,000,000 CERs	18	39.1	71.7
1,000,001 - 10,000,000 CERs	9	19.6	91.3
More than 10,000,000 CERs	4	8.7	100.0
Total	46	100.0	
Did Not Answer	62		

4.3 Characteristics of Dependent Variables

In research, a variable influenced by respondents is called an independent variable. The dependent variable is the event expected to change when the independent variable is manipulated (Babbie, 2007). In this case, the study is testing whether the CDM implementation variables listed in the above section are vital. This research aims to ensure that projects are implemented in which the policy implementation decision was seriously considered when the decision to proceed with the investment was made.

The intent of this research is to identify the relationships between the constructs that affect implementation intention of CDM projects that require a linkage of sustainable development intention. The literature review provided evidence to support the policy implementation by measuring particular constructs of SD and the policy formulator of the organization. 5.6 percent of organizations were in a neutral position. 31.5 percent agreed that CDM impacts sustainable development indications. 63 percent strongly agreed that CDM implementation impacts sustainable development practice.

Table 4.38 SD Caused by CDM

SD Caused by CDM	Frequency	Valid Percent	Cumulative Percent
Strongly disagree	1	1.0	1.0
Disagree	3	2.7	3.7
Neutral	6	5.5	9.3
Agree	34	31.5	40.7
Strongly Agree	60	55.5	96.3
Did Not Answer	4	3.7	100
Total	108	100.0	

4.4 Data Analysis and Results

In this section, the results of the correlation tests are as follows. The policy of promoting the use of CDM is a form of project implementation linking sustainable development and private organizations who responded with independent variables according to the proposed concept. This study uses multivariate regression analytical techniques to develop a theoretical approach and to analyze the data using a path coefficient to test the relationship. The results were processed by SPSS Version 18.

Correlation analysis between independent variables is used to test the problem of the relationship between variables (multicollinearity problem) descriptive statistics show the mean, standard deviation, skewness and kurtosis of the sample group to test normality (Kachigan, 1991). The method described in Chapter 3 gives the average value of the variable scale to be interpreted. From the numbers to the description, the comments are the same. The mean of the comments in each variable must be used. We changed the level using the interpretation criteria in Table 4.3. The value of 1.00 to 1.80 is Strongly Disagree, 1.81 to 2.60 is Disagree, 2.61 to 3.40 is Neutral, 3.41 to 4.20 is Agree, and 4.21 to 5.00 is Strongly Agree.

According to Allen and Seaman (2007), Likert scaling is a bipolar scaling method, measuring either a positive or negative response to a statement. Therefore, this study applies Likert scaling techniques to measure the values in the following way:

$$\text{Interval (I)} = \frac{\text{Range (R)}}{\text{Class (C)}}$$

$$\text{R} = \text{Highest score - lowest score} = 5\text{-}1$$

$$\text{C} = \text{Interval Scale} = 5$$

$$\text{Interval (I)} = \frac{5\text{-}1}{5} = 0.8$$

As a consequence, the measured interpretation must explain and specify the score to show how to compute it, as shown in the table below.

Table 4.39 Average Conversion

Average	Definition	Scale
1.00 – 1.80	Strongly Disagree	1
1.81 – 2.61	Disagree	2
2.62 – 3.41	Neutral	3
3.42 – 4.21	Agree	4
4.22 – 5.00	Strongly Agree	5

Thus, the interpretation of the mean score and the standard deviation has been set by a value between 1.00 and 5.00 (between the lowest and the highest). Each level on the scale is assigned a numeric value, starting from 1 and incremented by one for each level. The following is the level of average scores used to describe the important levels relevant to Likert (1932).

4.4.1 Relational Values and Descriptive Statistics of Variables

The purpose of this section is to test the concept of research in response to research questions. All data were analyzed using Statistical Program for Computing Model (SPSS for Windows Version 18). Analysis of correlation coefficients was used in the analysis. It measures the degree to which two variables are related, a matrix is used to measure the linear relationship between the variables' range of values for the correlation coefficient of 1.0 on an absolute value basis, or between -1.0 to 1.0.

Before further analysis, all data must be under the assumption that all independent variables must be independent of each other. The relationship between independent variables in the equation cannot be highly correlated or exceed R <.75 (Suchart, 2014). Among the variables used in the analysis, the CDM implementations in the dimension of sustainable development cooperation which rely on the causality between implementation factors are tested.

According to Table 4.40, data were analyzed from the population. Tabachnick and Fidell state that Pearson's correlation coefficient, r, can take a range of values from +1 to -1. A value of 0 indicates that there is no association between the two variables. A value greater than 0 indicates a positive association; that is, as the value

of one variable increases, so does the value of the other variable. A value less than 0 indicates a negative association; that is, as the value of one variable increases, the value of the other variable decreases. The correlation coefficient was not higher than 0.75 (R <0.75). Moreover, the VIF value is less than 10 and the tolerance value is less than 1. Hence, there is no problem of multicollinearity and using multi-variate analysis technique.

As illustrated in Table 4.40, the mean of CDM implementation in the dimension of sustainable development is 4.2, it is the indication of agree. External Factors (Materials Variables) have a mean of 4.3, which indicates strongly agree with the impact of external forces to an organization for CDM projects. It refers to the idea that the problem or situation and the severity of the problem will have an effect on how the policy is designed, in this case environmental problems. Internal Factors (Structural Variables) have a mean of 4.4, it refers to organization goals, an implicit causal theory about how to impact the problem/situation of policy implementation. Non-Law Factors (Contractual Variables) have a mean of 4.3, which means they strongly agree with a linkage of CDM and sustainable development. It is a major element of non-policy factors.

Table 4.40 Pearson Correlation Matrix

Variables	SD caused by CDM	External Factors (Materials Variables)	Internal Factors (Structural Variables)	Non-Law Factors (Contractual Variables)	Globalization	Environmental Benefits	Socio-Economic Benefits	Transparency
External Factors (Materials Variables)	.736*							
Internal Factors (Structural Variables)	.742	.626*						
Non-Law Factors (Contractual Variables)	.642	.457	.418*					
Globalization	.656	.529	.712	.410*				
Environmental Benefits	.607	.563	.474	.325	.402*			
Socio-Economic Benefits	.747	.580	.696	.487	.643	.624*		
Transparency	.733	.689	.741	.386	.612	.446	.641*	n/a
Min	3.0	3.0	3.0	2.0	3.0	2.0	2.0	3.0
Mean	4.2	4.3	4.0	4.3	4.2	4.2	4.3	4.4
Std. Deviation	.74	.71	.71	.70	.77	.76	.66	.74
Tolerance	-	.411	.311	.708	.440	.541	.343	.351
VIF	-	2.431	3.217	1.412	2.272	1.849	2.912	2.850

Note: N = 108, Max = 5, VIF < 10, Tolerance < 1

* Variable is significant at the 0.05 level (2-tailed)

CDM encourages businesses to decrease the carbon intensity of their energy sector and manufacturing, which shows a business image that decreases carbon intensity and is one of corporate social responsibility. Globalization implies global impacts toward policy implementation, which is significant to the decision making process. The mean of 4.2 for this factor is among the lowest means, but it falls into the agree category. Environmental benefits also have the lowest mean of 4.2, but it's still in the range of agree. Environmental benefits includes reducing polluting emissions, preventing or reducing natural resource degradation, greening the process of energy production, and promoting the development and dissemination of new energy technologies or sources. Socio-Economic benefits have the highest mean of 4.3. It impacts the quality of life in local communities. For example, employment, poverty reduction, and impacts on human health in the community. Transparency is also among the high means. It has 4.4, which indicates a high impact for this factor. It denotes the importance of information. Disclosing information to the public is very import for policy implementation.

From the result of non-parametric statistics, the data is not required to fit a normal distribution. Nonparametric statistics uses data that does not rely on numbers, but rather a ranking or order of sorts. For instance, a study conveying consumer predilections ranging from agree to disagree would have deliberate non-parametric statistics. It makes no assumption about the sample size or whether the observed data is quantitative. This method is useful when the data has no clear numerical interpretation, and is best to use with data that has a ranking of the sort like decision making of CDM projects. This study aims to explain the relationship among variables with multivariate tools, as will be introduced in the next section.

4.4.2 Relationship Analysis between Variables.

The theory of causation has been discussed and studied for many years. The important concern for this study, however, is focused on the needed theoretical approach for the proposed methodology. The cause of an event can be anything which is thought to be, to some varying degree, responsible for that event (Nagel, 1965). The cause-and-effect theory was begun by natural scientists looking for curative and generative techniques and variables (Babbie, 2007).

The typical purpose of multiple regressions is to study more about the relationship between numerous independent and dependent variables, which is an examination of the affiliation between multiple independent variables and one dependent variable (Allen & Seaman, 2007). Scaled data was analyzed by regression analysis using multiple regressions. This outlook on causation is referred to as multiple causations. According to Nagel and others of the same theoretical belief, they have argued the assumption that this is an approach to cause and effect. Basically, they state that a cause might have been partially responsible in the "causing" of the event taking place. Probably, a more important aspect of this theoretical conceptualization can be derived.

The focal point of the theory purported by this study will be derived from the integrated model of policy implementation theory. The function of the literature stream in the causal approach developed and assisted the conceptual model for theorists with qualitative results. Causal methodology, then, can be used to demonstrate the goodness-of-fit of the conceptual model building stage (Hair et al., 2006). In the framework of regression analysis, certain problematic processes are encountered. In the conceptual framework, to determine the predictive ability of a set of independent variables to explain a dependent variable, multiple linear regression and correlation are the techniques utilized.

Hierarchical regression is a technique to illustration if variables of significance describe a statistically significant amount of discrepancy in your dependent variable (DV) after accounting for all other variables. This is a framework for model comparison rather than a statistical method (Tabachnick & Fidell, 1997).

In this research, the research is testing the model by selecting the “Enter” option in Linear Regression of SPSS 18. The system enters all variables into the equation by a hieratical method. 5 possible models were input by modeling retraction. It shows the direction of the factors of the independent variables on the dependent variable.

The first tested model is trying to see whether the original theory, which consists of material variables, structural variable, and non-statutory variables, is statistically significant towards CDM implementation in Thailand. The second equation derives from the qualitative finding of the force of globalization that impacts

a company's decision to implement CDM. The third and fourth equations developed from the literature stream of core benefits of CDM implementation which affects an organization's decision. Last but not least, the last equation combines all factors with the addition of one significant factor from the qualitative analysis of the UN conference that most participants mentioned for the effectiveness of CDM implementation in Asia and Thailand.

The statistical significance of each variable of P value is less than 0.05 as depicted from SPSS analysis. The statistical significance of the model and the prediction ability of the model to describe the target population is exhibited in Framework 1.

4.4.3 Framework 1 Hieratical Regression Analysis

SDCDM = β0+β2ASSI+ β4TRAC+ β6NAVI+ e

SDCDM = β0+β2ASSI+ β4TRAC+ β6NAVI+ β3GLOB + e

SDCDM = β0+β2ASSI+ β4TRAC+ β6NAVI+ β3GLOB+ β1ENVO+ e

SDCDM = β0+β2ASSI+ β4TRAC+ β6NAVI+ β3GLOB+ β1ENVO+ β7SOEC+ e

SDCDM = β0+ β2ASSI+ β4TRAC+ β6NAVI+ β3GLOB+ β1ENVO+ β7SOEC + β5TRN+ e

SDCDM =	CDM implementation linkages to SD
ASSI =	Tractability of the problems which influences CDM implementation
TRAC =	Ability of the statute to structure implementation
NAVI =	Non statutory variant of the problem which refers to the non-government regulation force
GLOB =	Globalization
ENVO =	Environmental Benefits
SOEC =	Socio-Economic Benefits
TRAN =	Transparency
β0 =	Constant

Table 4.41 Model Summary of Hierarchical Multiple Regression

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
ASSI	.344	.330	.254	.252	.186
	(5.253)	(5.080)	(3.814)	(3.860)	(2.692)
TRAC	.393	.313	.283	.228	.156
	(6.128)	(4.103)	(3.852)	(3.0004)	(1.960)
NAVI	.320	.305	.297	.269	.275
	(5.706)	(5.448)	(5.515)	(4.986)	(5.219)
GLOB		.133	.124	.085	.071
		(1.889)	(1.837)	(1.245)	(1.065)
ENVO			.183	.123	.136
			(3.183)	(2.001)	(2.251)
SOEC				.179	.148
				(2.349)	(1.952)
TRAN					.184
					(2.459)
Constant	-.005	-.021	-.045	-.036	-.059
R^2	.750	.758	.780	.791	.803
$\triangle R^2$	.750	0.008	0.022	0.011	0.012
SEE	.038	.038	.036	.035	.035
F	103.890	80.734	72.340	63.873	58.348
$\triangle$ F	103.890	23.156	8.394	8.467	5.525
Sig $\triangle$ F	.000	.000	.000	.000	.000

As a result of hierarchical multiple regression analysis, the result of variables which are statistically significant appears to have 7 variables, which can explain up to 80.3 percent (R^2 = 0.803). The first factor, that CDM implementation in Thailand relies on Tractability of the problem which influences CDM implementation, refers to the idea that the problem situation and the severity of the problem will have an effect on how the policy is designed, in this case environmental problems. Second, the ability of the statute to structure implementation refers to its goals, an implicit causal theory about how to impact the problem situation. Third, non-statutory variants of the

problem refers to major elements of non- government. All three variables of policy implementation by Mazmanian and Sabatier are examined and statistically significant at R^2 0.75, as shown in Table 4.41, model 1. However, the integration model of additional factors has more explanation of R^2 0.803. The R^2 difference ($\triangle$ R^2) between models is 0.053, as shown in Table 4.41.

Lastly, non-statutory variants of the problem is the idea that the problem situation and the severity of the problem will have an effect on how the CDM policy is designed, for instance, the environmental impact study and competitiveness of the firm. These are the factors that play important roles of CDM policy implementation in Thailand.

It is critical that leaders in an organization have an understanding of their role in using clean technology and processes. According to Blair, the CDM project concluded that there is an influential connection between external forces of and transparency in the process of the firm's operations. Understanding this relationship between predictor and linkage will enable leaders to plan strategic support to facilitate CDM technology integration. Potter concluded that competitive advantage of a firm has a motivational influence on the intent of effective operation and relationships with an eco-friendly conscious. According to the analysis of Framework 1, these 5 factors are not statistically significant.

The research model contains constructs that have origins in several theoretical models and are discussed in detail in Chapter three; however, it may be useful to indicate in which models the constructs have been reported. The constructs of performance expectancy, effort expectancy, social influence, and facilitating conditions are included in the CDM model.

It is the organization who makes the decision to integrate clean technology into the operation, and it is the intention that has been investigated in this research. As discussed in the literature review, an organization's acceptance of CDM technology as a sustainable development intention is a mature field of research; however, there is limited research on the actual results from CDM project outcomes in terms of financial performance, and the present research has also measured implementation obstacle factors.

4.4.4 Path Analysis

In Path Analysis, the correlation is equal to the sum of the contribution of all the pathways through which the eight variables are connected. The concentration of each of the contributing directions is calculated as the creation of the path-coefficients along that pathway. For this analysis, a multicollinearity problem must raise caution; the more highly correlated the variable, the more effect will affect the coefficient, which will definitely disturb the results of regression analysis (Tabachnick & Fidell, 1997).

The intent of the conceptual framework is to examine the factors that affect the CDM implementation of SD activities that require organizations to use clean technology in the private sector in Thailand. The literature review has discussed several models that have incorporated many factors which have been found to influence the CDM use and behavior of individuals. The factors that influence CDM technology used by individuals in a corporate setting have been identified in the UFCCC reports.

Figure 4.1 presents the research model that includes the constructs and anticipates relationships that have been reported in the literature, and each construct is discussed in detail of Chapter three. The arrows of the model indicate hypothesized relationships between the construct and dependent variable of CDM implementation and are explained, along with the research questions in Chapter three. The relationships indicated in the model may be moderated by the seven independent variables along the bottom of the diagram in the model. Predictors are categories that define characteristics of the participants, and these categories may impact the relationship between the constructs and the dependent variable.

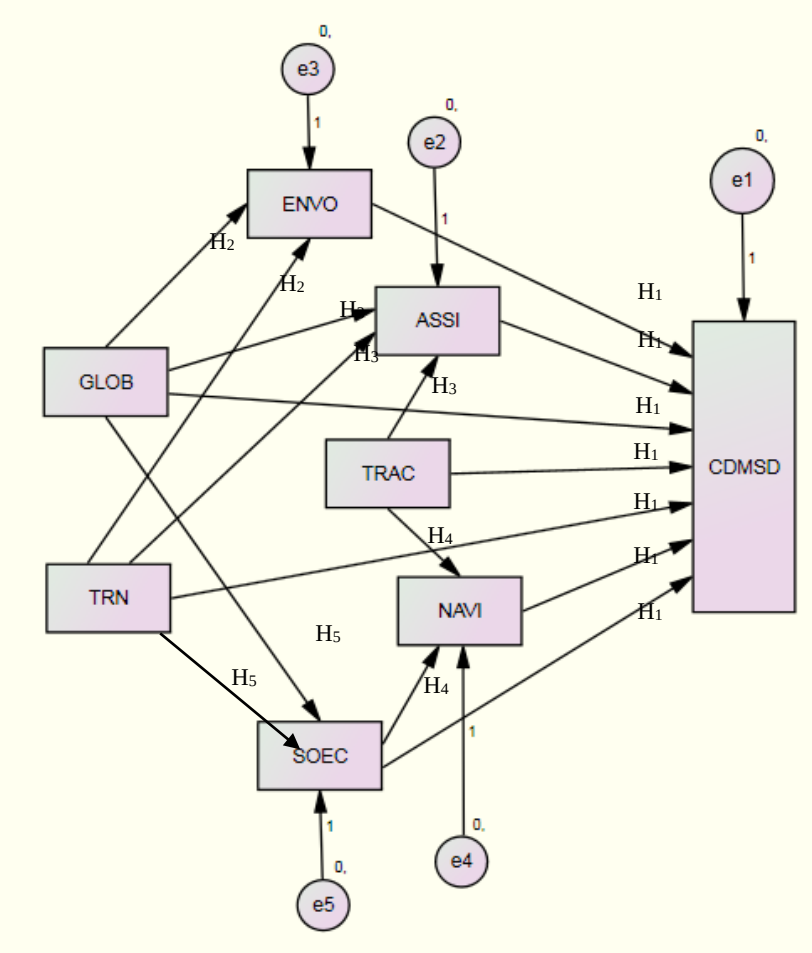


Figure 4.2 Hypothesis

4.4.5 Hypothesis

Hypothesis 1

This research aims to discover the factors affecting CDM implementation and linkages to Sustainable Development. The literature stream and qualitative study point to environmental benefits, socio-economic benefits, transparency, the ability of statue to structure implementation, tractability of the problem, non-statutory variable affecting implementation, and globalization.

$$= \beta 0 + \beta 1 ENVO + \beta 2 ASSI + \beta 3 GLOB + \beta 4 TRAC + \beta 5 TRN + \beta 6 NAVI + \beta 7 SOEC + e \quad \text{----------(E1)}$$

Table 4.42 Regression Analysis for Hypothesis 1

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
SOEC	.747	.482	.389	.261	.233	.166
	(11.563)	(7.294)	(6.164)	(3.800)	(3.415)	(2.250)
ASSI		.456	.384	.298	.238	.189
		(6.901)	(6.184)	(4.753)	(3.578)	(2.736)
TRAC			.277	.269	.274	.280
			(4.781)	(4.933)	(5.118)	(5.321)
NAVI				.261	.185	.187
				(3.752)	(2.454)	(2.520)
TRAN					.176	.191
					(2.326)	(2.555)
ENVO						.132
						(2.193)
Constant	-.216	.090	-.029	-.011	-.033	-.051
R^2	.558	.696	.751	.781	.792	.801
SEE	.050	.042	.038	.036	.035	.035
F	133.703	120.061	104.317	91.599	77.497	67.794
Sig.	.000	.000	.000	.000	.000	.000

Note: VIF value is 1 – 2.850

From table 4.42 equation 1 is revised as follows

CDMSD = - 0.051 + 0.166*SOEC + 0.189*ASSI + 0.280*TRAC + 0.187*NAVI

(2.250) (2.736) (5.321) (2.520)

+ 0.191*TRAN + 0.132*ENVO + e ----------(E1)

(2.555) (2.193)

R^2 = 0.801 SEE = .035 F = 67.794 Significant = .000

There are 6 variables which are statistically significant: value of the Socio-economic benefits, material variables, contractual variables, non-statutory variable, transparency and environmental benefits. These led to a second equation which intends to find the casual relationship of value of CDM implementation in Thailand.

Hypothesis 2

In order to explore the direct and indirect effects of this study, the findings also discovered a linkage of environmental benefits dependent on globalization and transparency.

$$ENVO = \beta 0 + \beta 10GLOB + \beta 13TRN + e_2 \text{ ----------(E2)}$$

Table 4.43 Regression Analysis for Hypothesis 2

Variable	Model 1	Model 2
Globalization	.504 (6.005)	.311 (2.518)
Transparency		.259 (2.095)
Constant	.330	.284
R Square	.254	.284
Std. Error of the Estimate	.075	0.074
F	36.063	20.802
Sig.	.000	.000

Note: VIF value is 1 – 2.239

From Table 4.43, equation 2 shows that all variables are sustained which have a P value less than 0.05. This is a confirmation of qualitative results. The equation is revised with beta and T value, as follows:

$$ENVO = 0\ .284 + 0.311*GLOB + 0.259*TRN + e2\text{----------(E2)}$$

(2.518) (2.095)

$R^2 = 0.284$ SEE = 0.074 F = 20.80 Significant = .000

Hypothesis 3

The original theory of policy implication and literature results illustrates the casual relationship of the ability of statue to structure implementation of CDM policy, which depends on globalization, tractability of the problem, and transparency.

$$ASSI = \beta 0 + \beta 11GLOB + \beta 8TRAC + \beta 14TRN + e_3 \text{ ----------(E3)}$$

Table 4.44 Regression Analysis for Hypothesis 3

Variable	Model 1	Model 2	Model 3
TRAC	.734 (11.112)	.496 (7.204)	.328 (4.193)
TRAN		.421 (6.113)	.380 (5.778)
GLOB			.284 (3.848)
Constant	.154	.081	.044
R Square	.538	.659	.702
Std. Error of the Estimate	.053	.046	.043
F	123.484	101.609	81.586
Sig.	.000	.000	.000

Note: VIF value is 1,0 – 2.133

From Table 4.44, there are 3 variables entered into stepwise regression, all 3 factors are statistically significant. Similar to equation 2, the empirical studies and qualitative results show that globalization, tractability of the problem, and transparency impacts an organization's ability of statue to structure implementation. Equation 3 is revised as follows:

$$ASSI = 0.044 + 0.328*GLOB + 0.380*TRAC + 0.284*TRN + e_3 \text{ ----(E3)}$$

(4.193) (5.778) (3.848)

$R^2 = .702$ SEE = .043 F = 81.586 Significant = .000

Hypothesis 4

Mazmanian and Sabatier state that non-statutory variants of the problem for policy implementation rely on tractability of the problem. However, for CDM policy implementation in Thailand, findings from the qualitative works and literature stream found many organizations that implemented CDM have included socio-economic benefits into the decision process.

$$NAVI = \beta 0 + \beta 12TRAC + \beta 16SOEC + e_4 \text{ ----------(E4)}$$

Table 4.45 Regression Analysis for Hypothesis 4

Variable	Model 1	t
TRAC	.452	5.222
Constant	.311	
R Square	.205	
Std. Error of the Estimate	.071	
F	27.265	
Sig.	.000	

Note: VIF value is 1

From the analysis, there are two variables being studied, tractability of the problem and socio-economic benefits. However, statistical study shows that only the tractability of the problem variable (TRAC) has significant value. Thus equation 4 is revised as follows:

NAVI = .311 + .452*TRAC + e_4 ----------(E4)

(5.222)

R^2 = .205 SEE = .071 F = 27.265 Significant = .000

Hypothesis 5

In this research, Socio-economic benefits for CDM implementation is being examined for its effect in the policy decision process. The findings show that this factor depends on globalization and transparency.

SOEC = β0 + β12GLOB + β15TRN + e_5 ----------(E5)

Table 4.46 Regression Analysis for Hypothesis 5

Variable	Model 1	t
TRN	.620	8.140
Constant	.202	
R Square	.385	
Std. Error of the Estimate	.066	
F	66.262	
Sig.	.000	

Note: VIF value is 1

From Table 4.46, 2 variables were entered into the equation. Equation 5 has only one variable surviving. Thus, it is revised as follows:

SOEC = .202 + 218*TRN + e5----------(E5)

(8.140)

R^2 = .385 SEE = .066 F = 66.262 Significant = .000

Moreover, VIF values of all 5 equations are between 1 – 2.850. This has proven non-multicollinearity among the independent variables. The VIF value

provides an indicator that calculates how much variance the square of the estimate's standard deviation of an estimated regression coefficient is compounded because of collinearity, which if it is high, will interrupt the result of multiple regression analysis (Tabachnick & Fidell, 1997).

4.4.6 Findings

After performing Multiple Regression Analysis, by using an enter and stepwise method, new equations have been developed, as follows, which is based on a P value less than 0.05:

CDMSD = - 0.051 + 0.166*SOEC + 0.189*ASSI + 0.280*TRAC + 0.187*NAVI
(2.250) (2.736) (5.321) (2.520)
+ 0.191*TRAN + 0.132*ENVO + e1 ----------(E1)
(2.555) (2.193)
R^2 = 0.801 SEE = 0.035 F = 67.794 Significant = .000

ENVO = 0.284 + 0.311*GLOB + 0.259*TRN + e2----------(E2)
(2.518) (2.095)
R^2 = 0.284 SEE = 0.074 F = 20.80 Significant = .000

ASSI = 0.044 + 0.328*GLOB+ 0.380*TRAC+ 0.284*TRN + e3 ----------(E3)
(4.193) (5.778 (3.848)
R^2 = 0.702 SEE = 0.043 F = 81.586 Significant = .000

NAVI = 0.311 + 0.452*TRAC + e4 ----------(E4)
(5.222)
R^2 = 0.205 SEE = 0.071 F = 27.265 Significant = .000

SOEC = 0.202 + 0.218*TRN + e5----------(E5)
(8.140)
R^2 = 0.385 SEE = 0.066 F = 66.262 Significant = .000

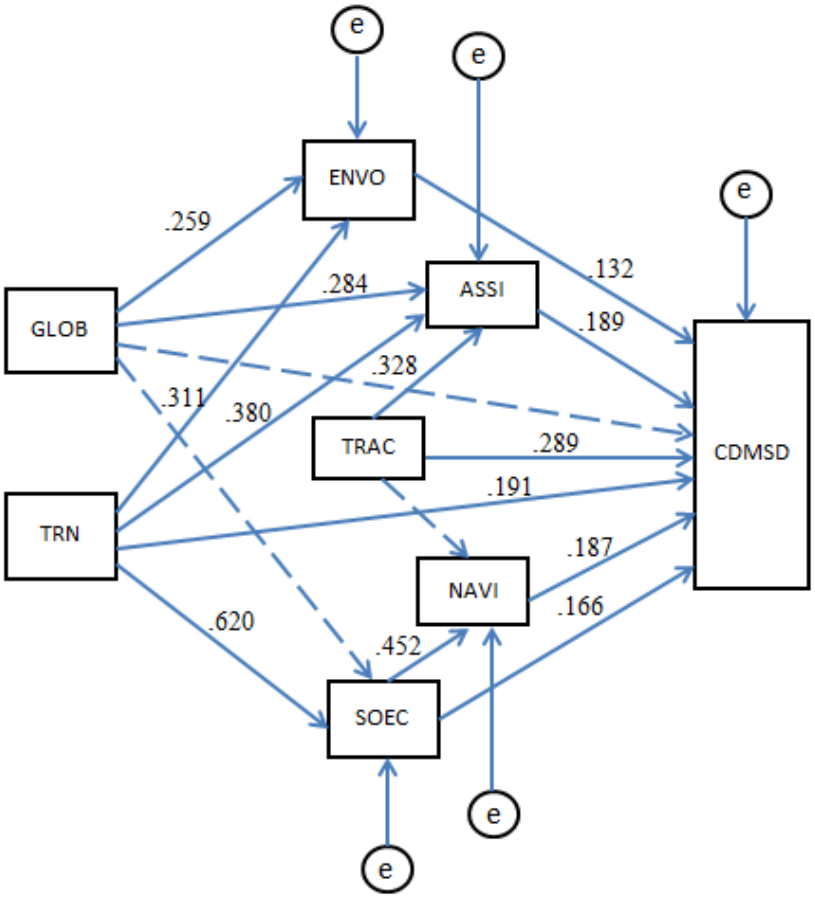


Figure 4.3 Path Diagram

These equations are used as a revision to the path diagram and calculate a direct and indirect effect table, which shows a causal and non-causal effect of this model. According to Figure 14, the new path diagram for CDM implementation is created from the findings. From the quantitative study, 6 significant independent variables can explain 80.1 percent of the organizations which are trading CO_2 under the monitoring of UNFCCC and TGO in the primary market. Moreover, the path diagram has an advantage of a pictorial direction of the causal relationship direction among variables, which provides the direct and indirect effects of prediction power. In this case, tractability of the problem (TRAC) has the highest prediction power, which refers to the support of the organization's leader and internal factors of the firm. The results of each variable are illustrated in Table 4.47.

Table 4.47 Direct and Indirect Effect

Variable	Total Correlation	Casual Effect			Non Casual Effect
		Direct	Indirect	Total	
ENVO	.607	.132	-	.132	.475
ASSI	.736	.189	-	.189	.547
TRAC	.742	.289	.062	.351	.391
GLOB	.656	-	.088	.088	.088
NAVI	.642	.191	-	.191	.451
TRN	.733	.187	.269	.456	.277
SOEC	.747	.166	.085	.251	.496

The findings demonstrate that among the seven variables, globalization is the only excluded variable. The original empirical study aimed to discover the factors affecting CDM implementation and linkages to Sustainable Development, it shows that 7 factors have a high correlation, as illustrated in Table 4.47 with a value between .607 - .747. The literature stream also points to environmental benefits, socio-economic benefits, transparency, the ability of statue to structure implementation, tractability of the problem, non-statutory variable affecting implementation, and globalization.

However, the result of multivariate regression analysis has confirmed only 6 significant factors have a direct effect on CDM implementation in the aspect of sustainable development. The path diagram illustrates that among the 7 variables, there are only 4 variables that have an indirect effect on the model, which are tractability of the problem (TRAC), globalization (GLOB), transparency (TRN), and socio-economic benefits (SOEC). The total effect is calculated and illustrates the prediction power of the new CDM policy implementation model. From Table 4.48, TRN has the highest total effect to CDM implementation in Thailand despite a low direct effect of beta value .187, which is the third range among all variables. TRAC has the highest direct effect at .289, and the total effect of .351 toward CDM implementation. Non-statutory variant of the problems (NAVI) has the direct effect of .191, which has to do with the indirect effect factor. Environmental benefit (ENVO)

has a direct effect of .132, which indicates the consideration of environmental concerns of the organization. The ability to statue problem (ASSI) has the direct effect of .132, which denotes the impact of external factors to CDM implementation. Globalization (GLOB) is not statistically significant but has an indirect effect of .088. The socio-economic benefit (SOEC) has the total effect of .251, of which .166 is direct effect.

Table 4.48 Hypothesis Results

Hypothesis	Result	Remarks
H_1: CDM linkage to Sustainable Development relies on environmental benefits, socio-economic benefit, transparency, ability of statue to structure implementation, tractability of the problem, non-statutory variable affecting implementation, and globalization.	Rejected	There are only 6 independent variables that have significant value to CDM implementation in the dimension of SD, excluding the globalization factor. The original conceptual framework was 7 variables.
H_2: Environmental benefits depend on globalization and transparency.	Accepted	There are both transparency and globalization forces that impact a firm to consider environmental benefits.
H_3: Ability of Statue to Structure Implementation of policy depends on globalization, tractability of the problem, and transparency.	Accepted	All 3 variables have significant values, which are tractability of the problem, globalization, and transparency.
H_4: Non-statutory variant of the problem for policy	Rejected	There is one variable statistically significant, which is

Table 4.48 (Continued)

Hypothesis	Result	Remarks
implementation relies on tractability of the problem and socio-economic benefits.		the tractability of the problem impacts non-statutory factor
H_5: Socio-economic benefits depends on globalization and transparency	Rejected	Only transparency has significant impact to socio-economic benefit.

4.5 Summary

Research findings on how CDM contributes to SD have been primarily on the policy implementation factors. The following studies analyze the existing data of CDM projects and their contribution to carbon reduction in the country and the world. There are seven factors of CDM linkages to Sustainable Development, which are environmental benefits, socio-economic benefits, transparency, ability of statue to structure implementation, tractability of the problem, non-statutory variable affecting implementation, and globalization. The findings show that most organizations in Thailand consider it's the socio-economic benefits, internal factor of management direction for environmental sound policy and operational results that help the environment. Moreover, the research discovered structural variable impacts, for instance, clear and constant objectives, combinations of suitable causal theory, categorized integration within and among established institutions, decisions and rules of implementing agencies, employment of implementing officials, preliminary allocation of financial resources, and formal access by outsiders. Also, the contextual variables illustrate the linkage to public support, socio-economic variables, support from legislators, and commitment from implementing officials. These factors are important conditions that need to be established for CDM implementation in Thailand.

Moreover, the CDM projects in Thailand rely not only on potential benefits and corporate social responsibility, but also on global forces that require a firm to be more competitive while maintaining or improving the ecosystem. For example, tractability of the problem of internal factors which influence CDM implementation refers to major elements of non-policy factors, including management attitudes and available resources, and the commitment of implementing agencies. Lastly, CDM implementation obstacles discovered that government policy is a problem causing a difficult situation and the severity of these unclear policies will have an effect on how the CDM policy is designed, for instance, the environmental impact study and competitiveness of the firm. These are the factors which play important roles in CDM policy implementation in Thailand.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

This chapter presents the results of the data and statistical analytics of the respondents' background information, business characteristics, factors toward CDM, firm performance, competitive advantage linkage, and the analysis of the statistical findings. From the literature stream and qualitative analysis, the current global warming is due to a situation where global temperatures are rising higher and faster than what used to be. There is a growing tendency to a condition called global warming which has become an international issue. This higher temperature causes the climate to change and humans can start to see the force of an unpredictable Mother Nature. It has many effects on every region of the world. As a result of this climate change, the amount of ice and snow are melting around the world. It causes effects on the world, including natural phenomena like El Nino and La Nina.

According to UNFCCC, the El Nino phenomenon is a phenomenon of the mid-ocean and eastern Pacific Ocean. This is due to the weakening of the Trade Winds and the phenomenon of rainfall, resulting in arid regions and, because of the influence of the monsoon and rain, frequent floods. The La Niña phenomenon is the opposite of El Nino, that is, the sea surface temperature in the center and east of the Pacific is lower than normal. South-east winds are stronger than normal. The warm sea surface from the East is accumulated in the West more. This area, which previously had sea surface temperatures and sea levels higher than in the east, sees even more temperature and sea level rise.

The technology advancements of industry in the last 3 decades has caused environmental problems with higher temperatures in the world caused by human activities that release carbon dioxide (CO_2) and other greenhouse gases like methane (CH_4), nitrous oxide (NOX) and chlorophyll carbon (Chlorofluorocarbons: CFC_5) (UNEP, 2014). When the accumulation of these gases is large in the atmosphere, it makes heat from sun's rays not able to pass back out through earth's atmosphere.

Instead of letting the heat drain through the atmosphere of the earth into space, it stores the heat and raises earth's temperature. This phenomenon is known as the Greenhouse Effect. Carbon dioxide is the most important contributor to greenhouse gases (Carbon Neutra Life, 2018). Nitrous oxide is the result of combustion in the industrial process and the use of vehicles in transportation when burning fossil fuel for power generation. Methane is produced by the decomposition of straw in rice fields or cultivated fields. Methane control is important in Thailand because it is an agricultural country. Chlorofluorocarbons, in addition to being the gas that destroys the ozone layer in the atmosphere, also contributes to the greenhouse effect.

CDMs offer the opportunity for developed countries to reach their emissions targets as economically and efficiently as possible, and for developing countries to receive international investment. This is realized through CDM's dual objectives of achieving cost effective reductions of GHGs in developed countries and sustainable development in developing countries. The Clean Development Mechanism scheme is under voluntary participation of developed and developing countries. According to the Tokyo Protocol there are no compulsory measures, so when the countries participating in the Clean Development Mechanism attempt to reduce greenhouse gas emissions in their sectors, the owners of Clean Development Mechanism schemes will benefit from carbon credits, while other non-participating sectors will not benefit from the Clean Development Mechanism.

While CDM has contributed to climate change mitigation and offers developing countries an opportunity to participate in the global carbon market by hosting projects, it is widely considered to be imperfect. The major criticisms surrounding CDM include high transaction costs, the promotion of CDM projects with higher dividends while neglecting the pursuit of sustainable development, and unequal distribution of both projects and funding across developing countries (UNFCCC, 2018). From a sustainable development aspect at the global level in CDM projects, the host country is responsible for determining whether the project assists in achieving sustainable development or not. This carries a risk of having different countries competing in order to attract CDM investment by taking the requirements to minimum levels. The decision to accept a project may be influenced by a company's priorities or interests of strong stakeholders, and the country needs to balance the

short-term benefits of CDM investment and the long-term benefits of sustainable development, which has led to the portfolio being mainly driven by the economic attractiveness of the project. This situation is exacerbated by the fact that technologies associated with higher sustainable benefits, like renewable energy which have the potential to provide reliable energy services while reducing GHG emissions, are also the most expensive. Renewable energy can help mitigate geopolitical concerns and energy price volatility, and at the same time provide a basis for technology innovation.

5.1 Conclusion

As there is a diversity of activities in CDM projects, the sample selection considered the similarity of each unit of analysis, which is in terms of the type of CDM technology, certification of carbon trading scheme, and size of CER emission rate. This study uses a purposive sampling technique to collect data from 153 private organizations in Thailand that have obtained certification from TGO and UNFCCC and contribute more than 10,000 tCO2e. A questionnaire was used as a tool to collect data. 71% or 108 respondents from the sample of 153, were analyzed using statistical programs and tools.

The high level of management characteristics of the respondents included 13.9 percent of presidents, the executive director level was 21.3 percent, the board of direct level was 14.1 percent, the general manager level was 19.4 percent, the director level was 24.8 percent and manager levels were 6.5 percent. These are the key persons in the policy decision making process of an organization, which is valuable for describing the organization's behavior towards CDM implementation. The majority of CDM projects are operated by companies aged between 1-10 years (80.6%). The number of employees mostly averaged between 101 – 200 employees (50%). At the time of data collecting, there were 91 organizations actively trading CO_2 in the primary market. The 2 main CDM projects in this study are methane avoidance: 59 projects, and Biomass: 21 projects, which represents 74 percent of this study. Out of 108 samples, 65 projects are categorized by UNFCCC as small projects.

5.1.1 Factors Impacting CDM Implementation in Thailand

By using a triangulation technique, the findings of the quantitative and qualitative study have elaborated on not only gaps among the various policy implementations, but also identified and described a host of contextual and environmental factors with specific suggestions to improve our understanding of CDM implementation's nature in Thailand. Propositions which were asked in the qualitative section were very useful, so we could not rule out close-ended questions. There were significant factors extracted from a theological background concerning the effective policy implementation theory developed by Mazmanian and Sabatier (1989), and a qualitative study of selective CDM project executives and observations. This study argues that although the original theory provides explanations for effectiveness in the policy implementation process, a theory that integrates the finding's factors offers an explanatory potential of CDM policy implementation in the private sector. The study relies on a modified Mazmanian and Sabatier (1989) policy implementation framework, with transparency, globalization, environmental benefits and socio-economic benefits, to demonstrate how the integrated theory can explain an organization's behavioral responses to CDM policy in Thailand and discover CDM implementation factors and barriers.

These factors are significant for CDM policy effectiveness and the decision making process, which promotes CDM projects as a nation necessity for social stability towards a sustainable development solution in the dimension of sustainable business and social wellbeing. These factors are synthesized into a conceptual framework of path analysis as follows.

5.1.1.1 Direct Effect

1) Ability of Statue to Structure Implementation

This factor refers to internal factors influencing environmental policy, such as consistency of corporate goals and management support or structural variables. Internal factors has a mean of 4.4, it refers to the organization's goals, an implicit causal theory about how to impact the problem of policy implementation. Mazmanian and Sabatier mentions the effectiveness of policy implementation, firstly, the organization must have clear and consistent objectives. In this case, results of the study show a trend of implementing CDM in Thailand with a strong environmental

policy. Nowadays, the focus of social responsibility has been shifted to businesses having an indirect social contract with contemporary lifestyles and stakeholders, where their preferences for products and services are shifting. Obviously, society demands greater obligation from firms to society. As described by the World Bank, the environmental cost is high, but ignoring it will be far more expensive. A case study of Volkswagen illustrates the serious consequences of neglecting the environmental aspect of business practice, which led to numerous lawsuits against the firm and most of all, the reputation of the VW brand.

Organizational leaders should pay careful attention to whether CDM involvement in their business vision and mission fits their business position and associates with their stakeholders. CDM focuses on impact, while organizations look back at the process. In CDM implementation, the organization's leader must consider the effect on business operations, whether it is a positive or negative impact. Then, the organization decides to maintain or promote positive impact and reduce negative impact. The result of policy implementation directly affects the society and economics of the organization.

2) Tractability of the Problem

External Factors has a mean of 4.3, which indicates they strongly agree on the impact of external forces to the organization for CDM projects. It refers to the idea that the situation and the severity of the problem will have an effect on how the policy is designed, in this case environmental problems. A good causal theory, a moderately close range of targeted behavior, an insignificant population target group, and a small anticipated change in behavior as a result of policy makes implementation more effective, all other things being consistent.

The framework does not account for the legal aspect, but it does for organizational maintenance and external institutional goals and financial resources. The external variable that impacts effectiveness is structured according to the tractability of the problem. It refers to a contextualization of the key CDM policy variables, and reflects the foundation's intent of the policy. It is crucial for attaining the CDM program's goal that performance indicators are developed and the connection to the understanding of the principal causal linkage to the establishment of policy content is made. Moreover, regarding CDM implementation, a lesser amount

of behavioral change will lead to more effectiveness concerning the CDM implementation.

3) Non-statutory Variable Affecting Implementation

The non-law factor has a mean of 4.3, which is the result of strongly agreeing with the linkage of CDM and sustainable development. It is a major element of non-policy factors. CDM encourages businesses to decrease their carbon intensity in the energy sector and manufacturing, with the business image that their decrease in carbon intensity is one of corporate social responsibility. Sabatier and Mazmanian define the translation of legitimate objectives into the policy decisions of implementing agencies, and these are amplified if there are well-defined objectives, compassionate agencies, authority, resources, fidelity to statutes and rules, leadership, and public support. The theory of the non-statutory variables affecting CDM implementation addresses the contextual variables. It states that clarity of the variables influences the process even though the policy may not be implemented yet. But it will be treated as a precaution for the policy implementation process. Factors like public support and media attention to policy issues certainly create firm awareness of the programs that can solve problems, for which the environmental issue is one of the main public concerns.

4) Environmental Benefits

Environmental benefits include reducing polluting emissions, preventing or reducing natural resource degradation, greening the process of energy production, and promoting the development and dissemination of new energy technologies or sources. Environmental Benefits also have the lowest mean of 4.2, but it’s still in the range of agree.

CDM encourages organizations in Thailand to understand the direct physical effects of climate change on their respective business activities, to understand the response measures undertaken by other organizations within the organization’s value chain and to create carbon assets through mitigation of clean technology. An organization who is willing to measure carbon assets with environmentally friendly practices will manage to reduce GHG emissions and generate CERs, which can be used to generate revenue and create an environmentally friendly company.

5) Socio-Economic Benefits

Socio-Economic Benefits has the high mean of 4.3. It impacts the quality of life of local communities. For example, employment, poverty reduction, and impacts on human health in the community. Organizations which implement CDM consider this factor as the main implementation factor.

From the findings, the main factor to this market based mechanism is that by implementing CDM, the companies can earn CERs from their investment and provide a positive impact to the economy and society. Thus, adopting and adapting to the environmental practice projects, especially for developing countries like Thailand, is to create an opportunity to discover networking potential and creates a more environmentally friendly society while continuing to further the progress of development of the three pillars of sustainable development, namely economic growth, social progress and environmental protection.

6) Transparency

Transparency is also among the high means. It has 4.4, which indicates a high impact for this factor. It denotes the importance of information. Disclosing information to the public is very import for policy implementation.

Organizations should want to continue to significantly improve transparency, consistency and impartiality in their work by disclosing the results of its operations, publishing detailed explanations of and the rationale for decisions taken, including sources of information used, without compromising the confidentiality of the business operation.

CDM projects must take into account input from relevant agencies, international organizations and parties involved in operations, resulting in additional project participants and designated operational entities in its decision-making process, which can benefit the business objective and community.

7) Globalization

Globalization implies global impacts toward policy implementation which are significant to the decision making process. The mean of 4.2 for this factor is among the lowest means, but it falls into the agree category. No organization will deny that globalization generates international cooperation in social science, politics, ideas, cultural values, and also the exchange of information across

the globe. The essential plan in globalization impacts to Thailand is a free transfer of capital, goods, and services across national frontiers. Many Thai organizations already have experience in implementing projects relevant to climate change that are CDM-like, such as renewable energy supply, demand side management, fuel switching and forestry. However, CDM projects are dissimilar because they contain another kind of input, which is CO_2 project investment. The CDM project generates carbon credits which have a monetary value. Globalization impacts the practical contributions of projects in renewable energy, in the solid waste management sectors, biomass industries, and water recovery practitioners. However, this factor is not statistically significant, with P value greater than 0.05. Thus, this factor was excluded from the CDM implementation model.

8) CDM Implementation Linkage to SD

Under the Kyoto Protocol, the framework of the carbon programs has assisted a diverse portfolio of Clean Development Mechanisms/Joint Implementation projects. In order to maximize sustainable development benefits, CDM has provided a broad set of project development services to a carefully selected group of high impact projects with significant emissions reduction potential. The mean for CDM implementation in the dimension of sustainable development is 4.2, it is an indication of agree. The policy implementation process mostly represents in terms of exclusive stages, which is determined in the dimension of sustainable business practice. The findings illustrate the extent of conformation between actual influence and the CDM program objective, and addition benefits.

CDM policy outputs have direct impacts on an organization’s behavior. Nonetheless, outputs have a long term effect on business operations, environment, and society. As a matter of fact, the stakeholders have divergent requirements and expectations, and there will inevitably be considerable points of intersection among the divergent stakeholders recognized by any firm. However, by considering the aspect of benefits of CDM towards SD, the common interests of organizations, stakeholders, and society can be justified. This study contributed information with in-depth and more specific results of the CDM project in order to generate a more comprehensive assessment of the implementation of CDM in Thailand.

5.1.1.2 Indirect Effects

Path analysis allows results to create a covariance between two variables in a physical equation model into additive aspects, thus helping to understand how the interrelationships between many variables in a model forecast the covariance between two or more selected variables. The direction of the path is given by theory and the requirement that feedback not be introduced. Direct effect: Either X causes Y, Y causes X, or both. Indirect effect: The relationship between X and Y is said to be indirect if X causes Z which in turn causes Y (Hair et al., 2006). This study finds the indirect effects as follows:

1) Environmental benefits depend on globalization and transparency.

From the results of the study, findings from the literature stream and qualitative work show a linkage of globalization and transparency toward environmental benefits of CDM implementation. Quantitative results illustrate that both factors are statistically significant, with a P value less than 0.05.

2) Ability of Statue to Structure Implementation of policy depends on globalization, tractability of the problem, and transparency.

The findings from literature and qualitative results demonstrate that the relationship of globalization, transparency, and tractability of the problem influences an organization's ability of statue to structure implementation in environmental policy. All 3 factors are proven to be significant, with a P value less than 0.05.

3) Non-statutory variant of the problem for policy implementation relies on tractability of the problem and socio-economic benefits.

Regarding CDM implementation, tractability of the problem and socio-economic benefits indicate the impact of non-statutory variants of the problem. In fact, this linkage is also mentioned in the original work of Mazmanian and Sabatier. However, after the quantitative result, there is only one variable having significant value with a P value less than 0.05, which is the tractability of the environmental problem impacts non-statutory factor.

4) Socio-economic benefits depend on globalization and transparency.

Globalization and transparency do not only impact the organization to have concern over the environment, but qualitative work also reveals the connection of socio-economic benefits. The quantitative results from organizations in Thailand indicate that only transparency has significant impact to socio-economic benefits.

5.1.2 Summary

As the results from the analysis of the structural equation model in this research shows, factors that had an influence on a firm's performance and the hypotheses' testing results of this research have been summarized as follows:

1) From the original 7 factors impacting CDM implementation in Thailand, only 6 independent variables have significant value to the CDM implementation in the dimension of SD, the globalization factor was excluded.

2) Environmental benefits have a positive impact on globalization and transparency.

3) The ability of statue to structure implementation of policy has a positive impact on globalization, tractability of the problem, and transparency.

4) Non-statutory variant of the problem for policy implementation relies on tractability of the problem.

5) Socio-economic benefits depend on transparency.

Likewise, the findings of the qualitative study through the interviews and observations regarding various executive opinions of how CDM activities affect their overall firms and financial performance produced mixed results. The reactions were divided between "positive contributions" and "negative feedbacks." The positive side indicated that by integrating a business model with prime concentration on transforming environmental advocacies into the economic advantages of a carbon trading scheme, it would eventually create a positive effect on the organization's sustainable development objective.

Hypothetically, UNFCCC claims CDM efforts could cause productive firms and financial performance, as well as GHG reductions and better relationships with the community. CDM could provide economic, environmental, and social benefits. On the other hand, the majority of respondents with negative feedback were aware of

the challenges of CDM involvement, ranging from unstable financial income (low trading price), investment funds, complicated procedures, or unclear policy to participate in CDM, particularly in the present economic downturn. In addition, it was obviously seen that the financial costs associated with CDM activities varied depending on the size of the organization, the type of project, the availability of resources, and the specific activities for CDM implementation.

5.2 CDM Results on a Global Scale

According to UNDP and Asia Pacific Carbon forum 2016, the carbon trading scheme supports the preparation of an impressive portfolio of highly sustainable development objectives. CDMs that are ready for implementation and will contribute towards significant environmental and sustainable development impacts once fully implemented are as follows:

Table 5.1 CDM Results

CDM	Findings
Global CO_2 Emission (2004 – 2016)	910,556,907.50 (kt/CO_2eq)
Number of CDM Projects	8,409
Emission Reduction Potential	1,879,022 kt/CO_2eq
Improved Livelihoods/People (2016)	600,000 households
New Jobs Created (2016)	1,500 (of which 50 percent are women)
Small & Medium sized Enterprises (2016)	400 (focus on rural enterprises)
Capacity building and training (2016)	2 million people with new skills
New equipment and technology (2016)	20,000 pieces of new equipment
Financial Outlay (2004-2016)	US$ 420.875 Billion

Note: Adapted Fenhann, 2017, UNFCCC, 2018 and UNDP, 2014.

The global emission rate is increasing. From 2004 to 2016, the emission rate was 910,556,907.50 (kt/CO_2eq). As a result, reducing GHG emissions globally is critical to limit the impacts of global warming. The Kyoto Protocol to the UNFCCC was adopted in 1997 as a mechanism to reverse the increase in GHGs emissions. Its main achievement, beyond creating social awareness, was to create legally binding obligations for industrialized countries. Nowadays, there are 8,409 CDM projects worldwide. However, the amount of CO_2 reduced is only 1,879,022 kt/CO_2eq, or a 0.01 percent emission reduction.

It is just the beginning of global cooperation in tackling this environmental issue together. According to the findings of UNDP, CDM produced more than 1,500 jobs in 2016 with 400 enterprises. There were 2 million new courses in capacity building and training. Most of all, from 2004 – 2016, CDM investment was US$ 420.875 billion that gets contributed to the economy.

As illustrated in Table 5.1, China, India, and South Korea are among the top 3 countries which have a high number of CER contributions. Vietnam is also among developing countries that enjoys the benefit of sustainable development thru CDM. From the qualitative study, results show that the government of each country has an important role in creating CDM policy and working closely with the private sector to apply for CDM projects.

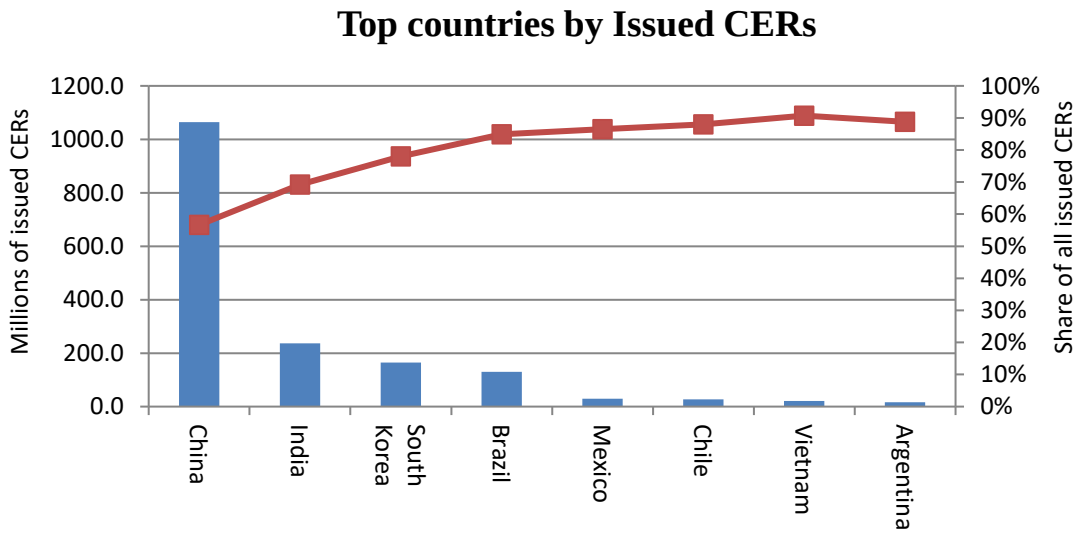


Figure 5.1 Top Countries by Issued CERs

Note: Adapted Fenhann, 2017 and UNFCCC, 2018.

The majority of CDM projects in the global arena are for reducing industrial emissions from production (HFCs, PFCs, SFs and N_2O). This activity focuses on operational efficiency and clean technology, which represents 47 percent. Renewable energy represents 31 percent of CDM projects, which are mainly located in Asia-Pacific. Not only in CO_2 reduction but also the additional availability of power sources, especially in rural areas. One of the most anti-pollution activities is methane (CH_4) avoidance in the cement and coal industries. Methane produced from heat can produce CO_2. It has a composition corresponding to natural methane and can be stored as an interim measure in the gas grid and retrieved in the production process of heavy industry. The CDM projects in the sector number 13 percent. CDM can also be fuel switching and Supply side EE, which represents 9 percent. Last but not least, afforestation and reforestation represent 0.6 percent of CDM projects in the world. UNFCCC mentions that afforestation and reforestation has many contributions to GHG reduction. Most importantly, it is the project that has added to both the ecosystem and food chain. Society can benefit more from this activity, which should be promoted globally. It is illustrated in Figure 5.1.

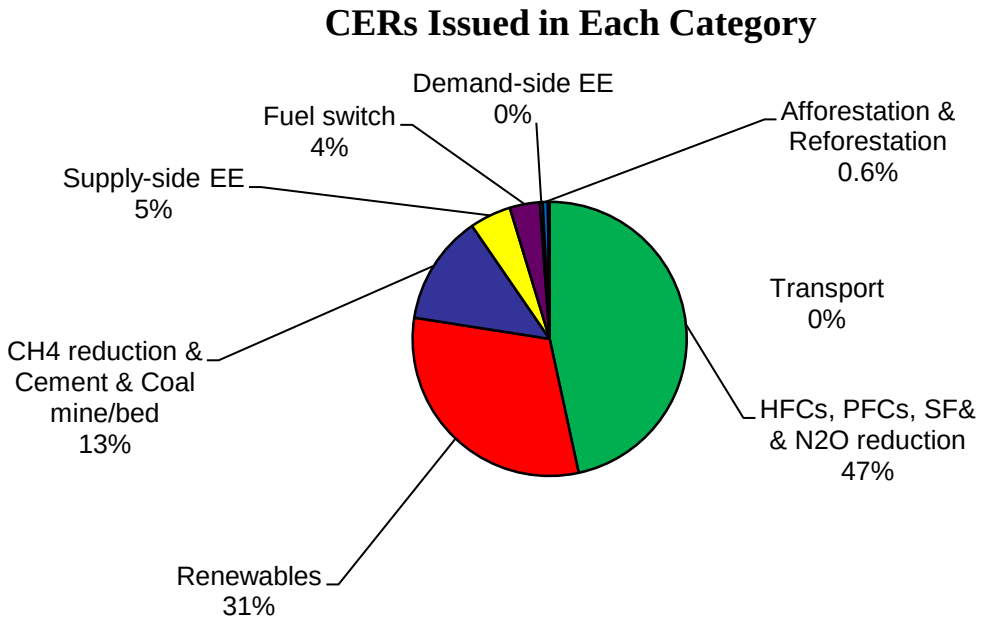


Figure 5.2 CERs Issued in Each Category

Note: Adapted Fenhann, 2017 and UNFCCC, 2018.

The number of projects relative to a host country's emissions is an indirect indicator of a country's ability to identify emissions reduction options and transform them into actual projects. This reveals the prominence of CDM relative to the actual opportunity for emissions reduction and may be a result of particular awareness rising. Asia-Pacific results show a high GDP carbon intensity, as illustrated in Figure 5.3.

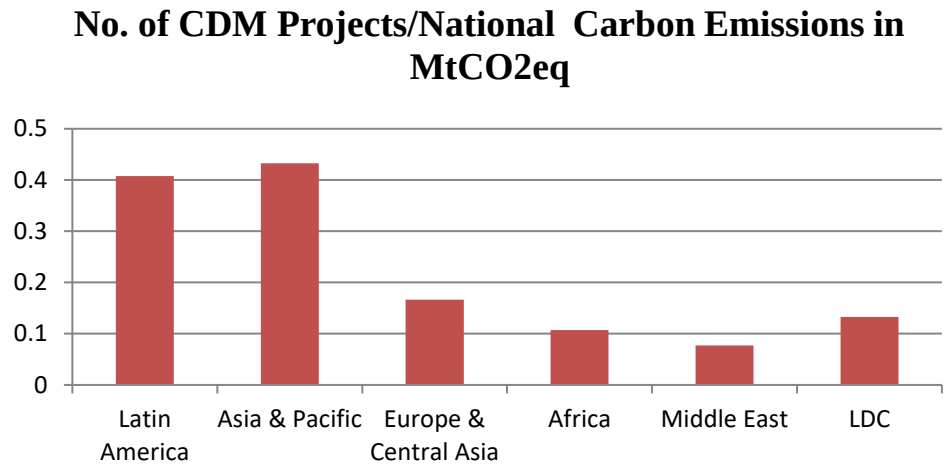


Figure 5.3 Numbers of CDM Projects/ National Carbon Emissions in MtCO2eq
Note: Adapted Fenhann, 2017 and UNFCCC, 2018.

The amount of CERs generated from CDM projects relative to the GDP of a given host country is an immediate expression of the importance of CDM to the economy, as shown in Figure 5.4.

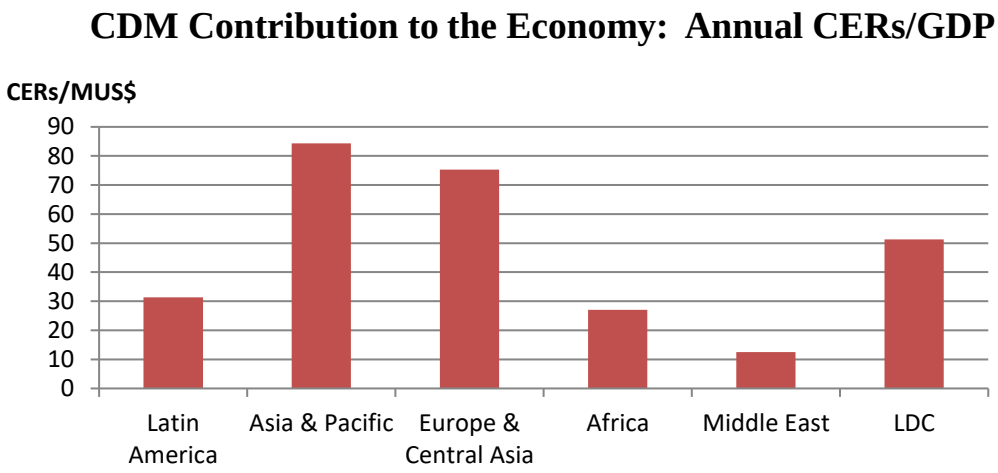


Figure 5.4 CDM Contribution to the Economy: Annual CERs/GDP

Note: Adapted Fenhann, 2017 and UNFCCC, 2018.

This indicator is focused on the financing capacity, alternatively the ability to attract external (non-domestic) financing, rather than the actual emissions reduction options, as shown in Figure 5.5.

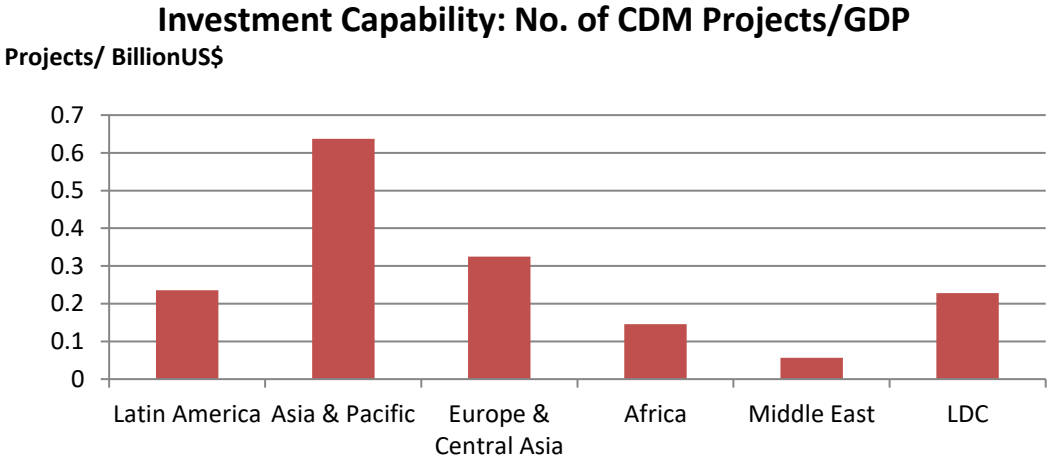


Figure 5.5 Investment Capability

Note: Adapted Fenhann, 2017 and UNFCCC, 2018.

The expected emissions reduction from CDM projects compared to a country's actual emissions gives a precise figure for the emissions reductions

achieved through CDM compared to the actual emissions, i.e. to what extent CDM is supporting the emissions reduction efforts in a given host region or country, as illustrated in Figure 5.6.

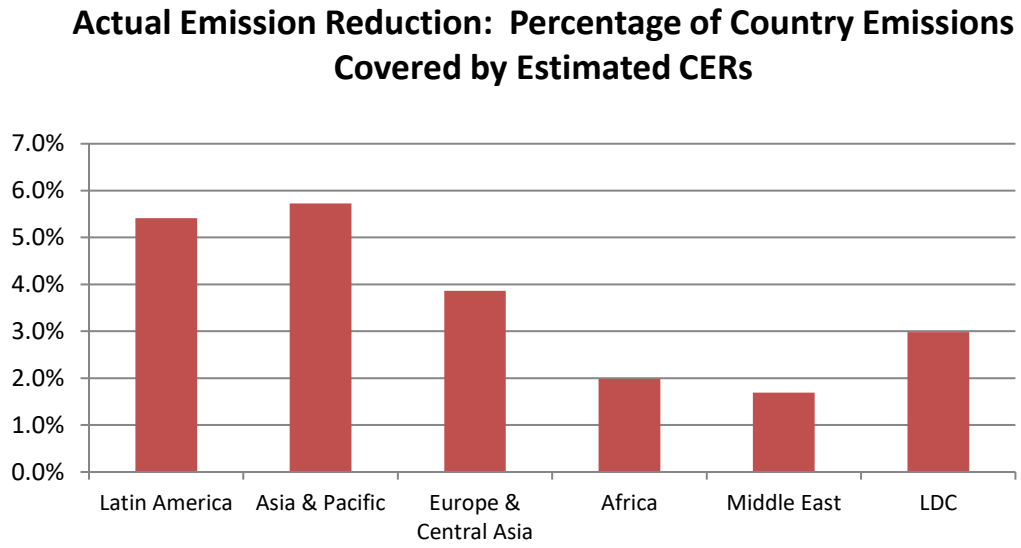


Figure 5.6 Actual Emission Reductions

Note: Adapted Fenhann, 2017 and UNFCCC, 2018.

5.3 CDM Results in Thailand

Thailand's emission rate from 2004 to 2016 was 3,187,239.83 (kt/CO_2eq). But GHG emissions reduction was limited. The Kyoto Protocol to the UNFCCC was adopted in 1997 as a mechanism to reverse the increase in GHGs emissions. Thailand is a member and ratified the Kyoto protocol for national GHG reduction. The CDM is an innovative feature under the Kyoto Protocol to the UNFCCC, which aims to stabilize the concentration of greenhouse gas in the atmosphere to prevent dangerous anthropogenic (human induced) interference with the climate system (UNFCCC, 1998). The CDM allows emission-reduction projects in developing countries to earn certified emission reduction (CER) credits, each equivalent to one ton of CO_2. Nowadays, there are 163 CDM projects which are certified by TGO and UNFCCC. The amount of CO_2 reduced is only 12,817 kt/CO_2eq, or a 0.04 percent national emission reduction.

Thailand attended COP21, in December, 2015. Following COP21, Prime Minister General Prayut Chan-o-cha of Thailand said that Thailand had adopted a Philosophy of Sufficiency Economy as a way to carry out sustainable development in the country as part of his speech delivered in Paris at the 21st session of the Conference of the Parties to the United Nations Framework on Climate Change. The Prime Minister urged all countries to cooperate and provide assistance in the form of finance, technology transfer, and capacity-building in order to protect global natural resources. Efforts aim to limit global temperature rise to 1.5 or 2 degrees Celsius. Thailand promises the world community to a 2 percent reduction compared to its national emission rate by 2020, as shown in Table 5.2.

Table 5.2 CDM Results in Thailand

CDM (2004 - 2016)	Findings
CO_2 Emission	• 3,187,239.83 (kt/CO_2eq)
Number of CDM Projects	• 163
Emission Reduction Potential	• 12,817 kt/CO_2eq
Financial Outlay	• US$ 2,690 Million

Note: Adapted Fenhann, 2017, UNFCCC, 2018 and TGO, 2014.

CDM has changed a lot since it started in 2005, when the first project was registered in Brazil. Until 2016, India showed the highest registry rate for new projects. During the last three years of the first commitment period, China took the lead and registered projects twice as fast as the rest of the world combined and is issuing CERs at a rate of almost three times. Thailand has the lowest contribution of total expected annual reduction, at 7,572 ktCO_2eq, among neighboring countries, as illustrated in Table 5.3.

Table 5.3 CDM Information of Thailand and Neighboring Countries

Host region/country	**Total number of CDM projects**	**Total expected Annual red. $ktCO_2eq$**	**Total GHG emissions $MtCO_2e$**	**Emission intensity CO_2/GDP tCO_2/1000US$**	**No. of projects / $MtCO_2eq$ emissions**	**Annual CERs/GDP tCO_2/MUS$**	**No. of projects / GDP Billion US$**	**Annual CERs/ Country Emissions**
Thailand	163	7572	223.0	0.70	0.69	23.74	0.48	3.4%
Vietnam	258	18071	266.0	2.57	0.97	174.48	2.49	6.8%
Malaysia	149	9163	287.7	1.21	0.52	38.53	0.63	3.2%
Indonesia	153	18346	759.0	1.07	0.20	25.90	0.22	2.4%
India	1978	179126	2709.0	1.70	0.73	112.10	1.24	6.6%
China	3853	618998	10268.0	1.73	0.38	104.38	0.65	6.0%

Note: Adapted Fenhann, 2017; UNFCCC, 2018 and TGO, 2014.

CDMs offer the opportunity for Thailand to reach its emissions targets as economically and efficiently as possible, and to receive international investment. This is realized through CDM's dual objectives of achieving cost effective reductions of GHGs in Thailand and sustainable development in developing countries, as illustrated in Table 5.4.

Table 5.4 CDM Benefits to Thailand

	Environmental	**Economic**	**Social**
Business	• Reduce emissions from production (mainly GHG) • Afforestation and reforestation (some projects) • Reducing pollution, eg, air, water, noise, and ground	• Reduce consumption of fossil based energy • Alternative energy sources • Industrial waste handling and disposal • Competitive advantage • Technology advancement	• Transparency & accountability of business operations • Better public image • Sustainable business and society • Improve relationship between business and locals
Society	• Natural preservation in the area of CDM projects • Waste reduction (waste to energy) • Reduce the usage of non-renewable energy sources	• Agricultural products can transform to energy • CDM project can use local raw materials in operation • Alternative energy sources • More employment in the area	• Improve quality of life for locals, esp., better ecosystem • Alternative path for business that benefits the environment and society
Nation	• Improve the nation's environment	• Improve energy reserve level • Less dependent	• Involvement of environmental issues on the

Table 5.4 (Continued)

	Environmental	Economic	Social
	• Clean technology transfer from Annex I countries • Leads to national target of 2% CO_2 reduction goal by 2020	on imported energy sources • Economic stability of the nation • Reduce government funding for environment conservation and protection	global scale • Increase negotiation power in global arena • In line with National development plan • Achieving sustainable development goals

CDM represents a huge potential to promote sustainable development in developing countries. Renewable energy offers greater sustainable development benefits in that it offers clean energy generation, contributes to energy independence and security, and often creates employment opportunities. However, analyzing the implementation of CDM programs over the first commitment period reveals that there has been a bias in favor of low cost emission reductions over sustainable development. The main reason the programs have not reached their sustainable development objectives lies in the fact that the assessment process that used to award CERs is too subjective, depends heavily on decentralized standards of sustainable development that vary from country to country, and lacks a rigorous and standard evaluation process overseen by the United Nations. The assessment of sustainable development has been left to each country's sovereignty, which has resulted in competition between host countries to gain CDM projects by lowering their sustainable development requirements. National authorities are faced many times with the decision between short-term benefits of CDM incomes against long-term benefits of sustainable development.

5.4 Barriers to CDM Implementation in Thailand

The low utilization of CDM in Thailand, particularly in methane avoidance and the Biomass sector, is mainly due to the limitations in CDM modalities and procedures, including the methodology requirement. The Kyoto Protocol calls for all CDM project activities to be certified by the DOE in terms of emissions reductions that are 'additional' to baseline emissions or any that would occur in the absence of the certified project activity. According to this guideline, the baseline should be firmly established, taking into account relevant national or sectorial policies. The findings from both qualitative and quantitative works have discovered many implementation obstacles. There are barriers born of the nature of the private sector, such as the relatively long duration of CDM project construction processes compared to the life cycle of the project. The huge energy demands of heavy production machinery also render switching to renewable energy sources difficult. The barriers are illustrated in Table 5.5.

Table 5.5 CDM Implementation Obstacles in Thailand

Problems	Details
Economic barriers (such as higher initial costs for efficient equipment).	A lack of references for baselines for CDM projects in new investment presents a major challenge to project developers.
Hidden costs/benefits (such as transaction costs).	The higher ratio of transaction costs per total savings is clearly one of the key factors that explain why the CDM approach is not so attractive or viable in the private sector.
Market failures (such as a fragmented market structure), a split interest between stakeholders and imperfections in formation.	Economies of scale play an important role in ensuring that the generation of CER is adequate to cover at least the fixed costs. Moreover, the demand of CERs is decreasing and market pricing fluctuates.

Table 5.5 (Continued)

Problems	Details
Behavioral and organizational barriers (such as ignorance and lifestyle).	A lack of management vision of clean and green methodologies for facilitating the implementation of CDM projects.
Information barriers.	A lack of information and understanding of the importance of CDM implementation in relation to climate change.
Political and structural barriers (such as a lack of guidelines, tools, or expertise).	The complexity of the CDM process from TGO submission to project registration and the associated cost are causing organizations to lose interest. Moreover, BOI investment policy and revenue tax that discourages small and medium organizations to implement CDM.

5.5 Discussion of Results for CERs Future

According to UNFCCC, the total CER supply potential from registered projects for the period 2013 to 2020 is estimated to amount to 4.7 billion CERs. This estimate is based on projects that were approved by UNFCCC as of April 2017 and reflects the current regulatory requirements of the CDM and the current knowledge about the status and operation of CDM projects. It does not indicate the possible actual expected supply under current market conditions, however it represents the number of CERs that would be issued if new demand arises and project homeowners have comfortable incentives to continue or resume GHG abatement and monitor emission reductions.

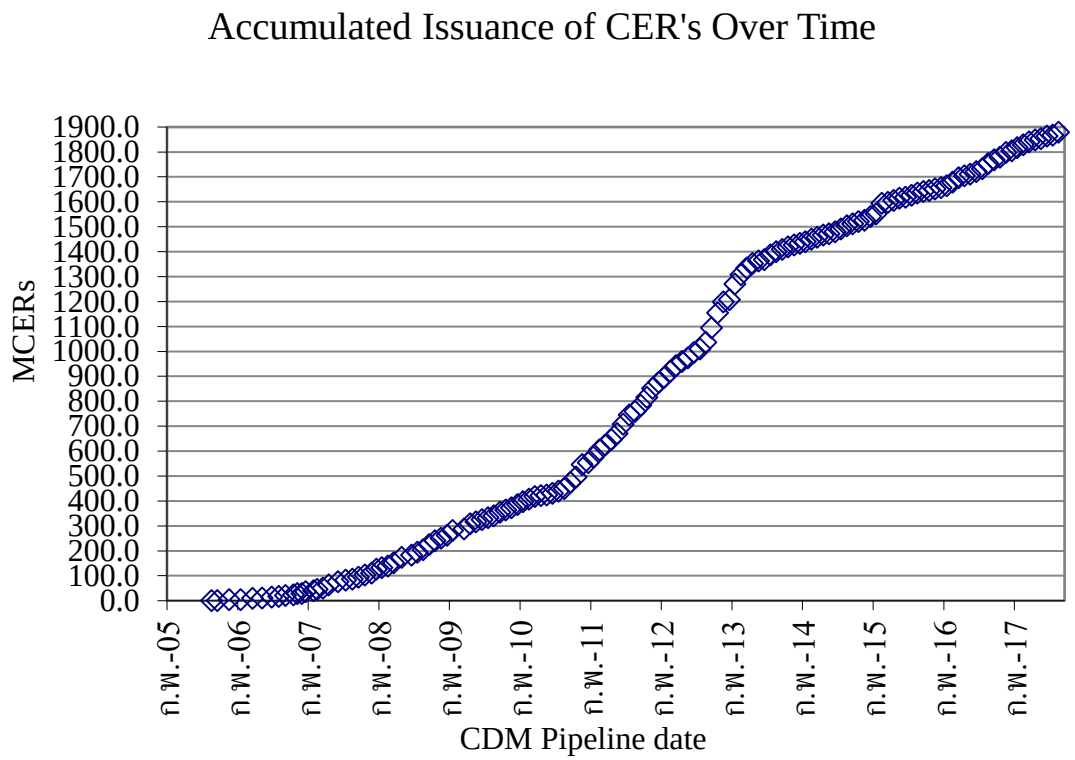


Figure 5.7 Accumulated Issuance of CER's

Source: UNFCCC, 2018 and TGO, 2018.

The total CER potential is considerable, specifically compared to current levels of issue and demand. The potential conditioned emotional response provides for the CER amount from 2013 to 2020 to exceed over double the whole amount of CERs so far issued, up to 1.9 billion, and exceed over 10 times the CERs issued for the second commitment period up to 337 million (Warnecke et al., 2017). It is also abundantly larger than the seemingly remaining demand within the commitment period that has been calculable by the UNFCCC secretariat, to the quantity of 77 million CERs each year up to 2020 (UNFCCC, 2018). This result is significantly positive for earth’s atmosphere and the environment globally.

Table 5.6 CERs Supply Potential for the Period 2013 to 2020

Study	CER supply potential (billion CERs)	Notes
UNFCCC (2017)	7.6	For the period from 2000 to 2020, excluding non-approved crediting periods
World Bank (2016)	3.5	From the period 2016 to 2020

Source: Warnecke et al., 2017.

Warnecke, et al (2017) considers several aspects that could promote and limit the ability to issue CERs, in particular the implementation and operational status of projects and how CDM requirements for renewal in the crediting period can influence the ability to issue CERs. Findings from this study indicate that financial benefits and political structure will affect CDM implementation in Thailand. Both studies use the same survey data, but differ in several other aspects, which level each other out. For example, the non-consideration of methodological effects due to the renewal of crediting periods leads to a higher estimation, while this study considers a larger number of registered projects due to an increase in the CDM project portfolio between September 2015 and April 2017 (Warnecke et al., 2017).

The conditions of CDM activities vary considerably between project types, regions and individual countries. For example, the current rate of regular operation of GHG abatement activity for existing CDM projects is understood to vary considerably, from methane avoidance projects to energy generation efficiency projects. The variation between countries is even more foremost; just the existing CDM projects in India are understood to have been operating their GHG abatement activity in a regular fashion in 2014, compared to projects in China in the same period. However, data shown in Table 5.7 is illustrating a huge growth of CDM in China. Even the conditions and outlook of specific project sorts vary significantly between countries; a number of the most effective performing projects are in Asia, in

terms of continuing rates of normal operation in renewable energy. Because of a lack of supporting restrictive conditions, and because of not being targeted for international support schemes, Thailand is among the bottom for who can potentially supply CERs by 2020 as promised in the Kyoto protocols.

Table 5.7 CERs Supply Potential for the Period 2013 to 2020 in Asia

Country	**2016 Population (millions)**	**GDP 2016 current USD (billions)**	**2016 total GHG emissions (M t CO_2e)**	**2017 Total Registered CDM projects**	**CDM emission reduction potential 2013-2020 (M t CO_2 e)**
China	1,379	11,191	10,432	3,853	4,681
India	1,321	2,274	2,534	1,978	758
Vietnam	94	205	206	258	134
Indonesia	261	932	530	153	123
Malaysia	31	296	160	149	65
Thailand	**68**	**411**	**271**	**163**	**53**

Note: Adapted Warnecke et al., 2017; UNFCCC, 2018; World Bank, 2018 and European Commission, 2018.

The regional distribution of the potential CER supply is conquered by the Asia-Pacific region for CER supply potential. 60 % of the total CER supply potential comes from China alone, which is similar to its share of 59% of the CERs issued in the first commitment period (World Bank, 2018).

Table 5.8 CDM Results in Thailand

Thailand CDM (2004 - 2016)	Findings
CO_2 Emission	• 3,187,239.83 (kt/CO_2eq)
Number of CDM Projects	• 163
Emission Reduction Potential	• 12,817 kt/CO_2eq (0.04%)
Financial Outlay	• US$ 2.69 Billion

5.6 Recommendations

5.6.1 Implications to Public Administration

The findings have necessary implications for policy makers deliberating on programs or policies that purchase or recognize CERs. First, the findings help assess whether or not demand created by such CDM programs or policies may well be met with proper offers. Second, the analysis helps assess GG emissions implications from establishing programs or policy that make new demand for CERs. The current market scenario is characterized by a powerful imbalance between offer and demand. In this situation, making new demand for CERs does not essentially trigger more emission reductions, since most registered CDMs in Thailand continue GHG abatement, whether or not the organization issues and sells CERs. Making new demand for CERs would solely trigger more emission reductions to the extent that:

1) Projects that are vulnerable of discontinuing GHG abatement are enabled to continue GHG abatement.

2) The implementation of newcomers is triggered through the program or policy.

3) The demand from all programs and policies would exceed the potential emotion offered from registered schemes.

To maintain a high GHG mitigation impact, policy makers could therefore consider prioritizing the trading scheme of CERs, either from new projects implemented after the adoption of the policy or CDM program, or from project types

considered vulnerable to discontinuing GHG abatement. Reducing greenhouse gas emissions will have a positive impact on the environment, society, and world economy because of rising global temperatures. It has changed because of human activity, which impacts ecosystems, if greenhouse gas emissions are reduced, it will be beneficial to the world. The Thailand Greenhouse Gas Management Organization (TGO) is the main agency responsible for reducing greenhouse gas emissions, and there are other government agencies involved. To summarize the recommendations to government:

The main objective of TGO is to analyze, screen and comment on greenhouse gas emission reduction projects under Clean Development Mechanisms. TGO monitors and evaluates projects that have been certified, promotes project development and certifies greenhouse gas trading mechanisms. It acts as an information center on the greenhouse gas situation, creates a database of accredited projects and the sale of certified greenhouse gases, promotes and develops potential, and advises government and private sectors on greenhouse gas management.

However, TGO activities are focused on promoting certified projects. Projects that have not been certified or have not yet received certification will not be promoted. On the subject of monitoring the project, there is a lack of agencies to review the projects. It is the responsibility of the project owner to hire a Designated Operational Entities (DOE) unit to monitor and confirm the reduction of greenhouse gas emissions. In practice, the DOE's responsibility in these steps is to check the project documentation, project registration, greenhouse gas reduction confirmation and greenhouse gas reduction certification, these steps are all happening at the time of application.

Project certification from the TGO does not have the task of verifying the project after the certification has been received, and no agency is available to review the project after receipt. The lack of coordination and cooperation among related organizations such as TGO and the Board of Investment (BOI) is critical. The problem with promoting and solving the problems is among the highest ranking of concern in this study.

The top-down approach is not as successful as it should be. In terms of decentralization, the function of promoting and supporting the reduction of

greenhouse gas emissions without decentralization falls to local government organizations. As a result, other greenhouse gas reduction projects that do not seek certification do not benefit from carbon credits under Clean Development Mechanisms. In the absence of legal force, the government does not take into account the importance of reducing the greenhouse gas emissions that are causing global warming today. It should be specifically enacted in this regard. In promoting greenhouse gas reduction activities that will have a positive impact on the environment in the future, there is a lack of serious promotion of energy conservation, renewable energy, processing of clean energy, and progressive waste water treatment that will develop into carbon credits.

The Thai government should promote policies regarding the use of clean energy, renewable energy, promoting energy efficiency towards greenhouse gases are required in order to control emissions. Limits of emissions can be released at specified quantities. If required to discharge more than the prescribed amount, a carbon tax must be paid. In the event of an environmental offense under the Clean Development Mechanism, the organization committing the violation in this environmental policy is a criminal offender. A penalty should be set which can include imprisonment and fines for those with intentional negligence.

In addition, there should be promotion or support of clean energy. Promoting energy efficiency and renewable energy solves global warming by limiting greenhouse gas emissions. It should also reduce tariffs on solar panels or tax-free products. Nowadays, solar panels are capable of generating electricity from sunlight and electricity to produce clean energy to make it easier for people to use solar energy to help solve this problem.

5.6.2 Implications to the Business Sector

CDM has been the main effort under the Kyoto Protocol to involve developing countries in reducing GHG emissions and provide flexibility for developed countries to reach their emission reduction targets at low costs. While CDM projects had a slow beginning, around 2012 the mechanism gained momentum. Within 5 years, up until the conference of the Asia Pacific Carbon Forum 2016, CDM registered 8409 projects worldwide, issuing a total of 910,556,907 kCERs, distributed among 114 countries.

Most projects correspond to renewable energy developments exploiting hydro, wind and biomass (71%) (UNFCCC, 2018).

An organization with ecological sustainability is conceptually fully consistent with the overall objective of competitiveness, i.e. creating an environment where productivity supports a high standard of living. CDM within the sustainable development dimension can lead to social, economic, and environmental benefits. According to Porter, the author's hypothesis identified the synergistic relationship of these two aspects:

1) Tough environmental regulations can lead companies to become more productive.

2) Tough environmental regulations can trigger innovations that provide companies with competitive advantages.

Organizational benefits can exist through the costs of CDM activities, especially for activities exposed to global competition. Organizational competitiveness and business sustainability have many connections. Achieving higher levels of business sustainability requires innovation. An original innovation will only happen if harmonizing transformations are made across distinctive sustainability dimensions in the business environment. The policy challenge is to set the steps and combinations of the policies in avenues that balance environmental and economic goals in the implementation of CDM.

Competitiveness and sustainability have to be pursued to maximize the organization's capacity. Thailand's environmental record is moderately solid, but more a reflection of its overall report than of specific policies in the past on ecology problems. Issues in areas like air quality and the pollution in industrialized zones nationwide have been growing over time.

The competitive strategy for business sustainability needs to integrate policies across different business environment dimensions. A focus on Thai organizations will not be sufficient; the global competition in this space is becoming persistent. Environmental policy like CDM needs to be an important tool for achieving environmental and business sustainability.

5.6.3 Implications to Academic Society

According to Blair, the CDM project concludes that there is an influential connection between external forces of and transparency in the process of organizational operation. Understanding this relationship between predictor and linkage will enable organizations to plan strategic support in order to facilitate CDM technology integration. Potter concluded that competitive advantage of a firm has a motivational influence on the intent of effective operations and relationships with an eco-friendly conscious. According to the triangulate analysis, a new policy implementation model of CDM activity in Thailand has been discovered, which has 6 statistically significant factors. The intent of the conceptual framework was to examine the factors that affect the CDM implementation of SD activities that require organizations' use of clean technology in the private sector in Thailand. The literature review and qualitative results have discussed several factors that incorporate a policy implementation model that have been found to influence the CDM use behavior of organizations. The factors that influence CDM technology uses by the private sector in a corporate setting have been identified in the UFCCC reports.

The new model contains constructs that have origins in several theoretical models and are discussed in detail with policy implementation theory by Mazmanian and Sabatier. The new integrated model is useful to indicate which environmental policy constructs have to be registered. The constructs of performance expectancy, effort expectancy, social influence, and facilitating conditions are included in the CDM implementation model. It is the organization who makes the decision to integrate clean technology into the operation, and it is the intention that has been investigated in this research.

In Path Analysis, the correlation is equal to the sum of the contribution of all the pathways through which the eight variables are connected. The strength of each of these contributing pathways is calculated as the product of the path-coefficients along that pathway (Tabachnick & Fidell, 1997). The arrows of the model indicate hypothesized relationships between the construct and dependent variable of CDM implementation and are explained along with the research questions. The relationships indicated in the new model are moderated by the seven independent variables of the diagram in the new model. The structural equation of the CDM implementation model in Thailand is illustrated as follows:

$$\begin{aligned} CDMSD = {} & - 0.051 + 0.166*SOEC + 0.189*ASSI + 0.280*TRAC + \\ & 0.187*NAVI \\ & \qquad (2.250) \qquad (2.736) \qquad (5.321) \\ & (2.520) \\ & + \ 0.191*TRAN + 0.132*ENVO + e \\ & \quad (2.555) \qquad (2.193) \end{aligned}$$

$R^2 = 0.801$ SEE = .035 F = 67.794 Significant = .000

There are 6 variables which are statistically significant, which are: value of the socio-economic benefits, material variables, contractual variables, non-statutory variable, transparency and environmental benefits. These lead to a path analysis which intends to find the causal relationship of value of CDM implementation in Thailand.

5.7 Limitations

As discussed in the previous chapter, an organization's acceptance of CDM technology as a sustainable development intention is a mature field of research; however, there are limited research findings on the actual results from CDM project outcomes in terms of financial performance, and the present research has also measured implementation obstacle factors. Since these issues are sensitive and emotional in nature, the respondents might give the answers not in accordance with fact or reality because of business confidentiality issues.

Second, the criteria of selecting the sample organizations may produce inequity to organizations that have less financial resources or technology access compared to larger organizations. Last, this study is restricted in terms of time constraint for observing all of the respondents of other GHG reduction activities, which are Joint Implementation (JI) and the available resources to provide enough evidence.

In addition, the sample size might be criticized as small, or might not represent the overall population in order to collect as much useful data for the quantitative study as possible. As a result, these limitations may have affected the outcomes when

obtaining and interpreting the quality data collection and the accuracy of data analysis.

5.8 Future Research

Future studies should directly examine the relationship of particular large or small organizations. CDM project types also should be classified for causal effects of policy implementation. Research in CDM and a firm's competitive strategy is implicitly aligned toward examining a firm's performance in fulfilling certain requirements and expectations of specific stakeholders of the firms. Most of the empirical research in CDM and firm performance applies to serious incompatibility of control variables, where the connections are done without careful discretion and they are not linked in theory, regardless of policy study.

In consequence, there is much that remains to be studied in future research, study should firstly consider the importance of each stakeholder in order to measure a particular firm's strategy or behavior toward CDM implementation. Second, future research in CDM implementation could carry on in a number of orientations, for instance, more comprehensive research should consider investigating the causal factors associated with CDM and a firm's competitive performance. Lastly, study should investigate more on the empirical relationships between a business or corporation and competitive advantage strategy and civil society, either by interviewing, observing, or surveying at the executive level because it's at the executive level where the decision makers are who can guide the organization to successful environmental practices and business sustainability. The organization that shows social responsibility becomes valuable to the community, society and business, and more competitive in the global arena.

BIBLIOGRAPHY

Adith Itslangkul Na Ayudhaya; Chaiyasit Anuchitworawon and Prarinyarath Lengchareon. 2011. **A Study of Promoting CDM Implementation.** Thailand Development Research Institute. (In Thai)

Allen, I. and Seaman, C. 2007. Statistics Roundtable: Likert Scales and Data. **Quality Progress.** 40 (July): 64-65.

Babbie, E. R. 2007. **The Basics of Social Research.** New York: Wadsworth.

Benecke, G.; Friberg, L.; Lederer, M. and Schröder, M. 2008. **From Public-Private Partnership to Market: The Clean Development Mechanism (CDM) as a New Form of Governance in Climate Protection.** Berlin: DFG Research Center (SFB).

Beneke, G. 2009. Varieties of Carbon Governance: Taking Stock of the Local Carbon Market in India. **Journal of Environment and Development.** 18 (December): 346-370.

Blair, T. 2007. **Britain Drafts Laws to Slash Carbon Emissions.** New York Times Online.

Bond, B. J. and Gebo, E. (2014). Comparing the Implementation of a Best Practice Crime Policy Across Cities. **Administration & Society.** 46 (May): 371-394.

Carbon Neutra Life. 2018. **Carbon Neutra Life: Landfill Gas to Electricity Project.** Retrieved August 3, 2019 from https://carboneutralife.com/climate-projects/bangkok-kamphaeng-saen-east-landfill-gas-electricity-project/

DeLeon, P. 1999. The Missing Link Revisited: Contemporary Implementation Research. **Policy Review.** 16 (August): 311-338.

DeLeon, P. and DeLeon, L. 2002. What Ever Happened to Policy Implementation? an Alternative Approach. **Journal of Public Administration Research and Theory.** 12 (October): 467-492.

Dye, T. R. 1978. **Policy Analysis: What Governments Do, Why They Do It?** Alabama: University of Alabama Press.

Eco-Ideal Consulting Sdn. 2018. **Eco-Ideal Consulting SDN: Kamphaeng Sean West and East Landfill.** Retrieved September 29, 2018 from http://ecoideal.com.my/2016/06/16-mw-renewable-energy-from-landfill-gas-enough-for-100000-homes/

Etzioni, A. 2010. Is Transparency the Best Disinfectant? **The Journal of Political Philosophy.** 18 (March): 389-404.

European Commission. 2018. **Joint CO2 Research Centre.** Retrieved August 10, 2018 from http://edgar.jrc.ec.europa.eu/overview.php?v=CO2andGHG1970-2016&sort=des8

Fenhann, J. 2017. **The Proposed New (Baseline & Monitoring) Large Scale Methodologies.** Denmark: UNEP DTU Partnership.

Ghosh, S. and Sahu, S. K. 2011. **The Indian Clean Development Mechanism: Subsidizing and Legitimizing Corporate Pollution.** West Bengal: Sasanka Dev, DISHA.

Goggin, M. L.; Bowman, A.; Lester, J. P. and O'Toole, L. J. 1990. **Implementation Theory and Practice: Toward a Third Generation.** Glenview: Scott Foresman/Little, Brown.

Gonsalves, J. B. 2006. **An Assessment of Projects on the Clean Development Mechanism (CDM) in India.** Geneva: United Nations Conference on Trade and Development.

Hair, J. F.; Black, B.; Babin, B.; Anderson, R. E. and Tatham, R. L. 2006. **Multivariate Data Analysis.** 6th ed. New Jersey: Pearson Prentice Hall.

Hallegatte, S. 2017**. Report of the High-Level Commission on Carbon Prices.** Washington, DC: 2017 International Bank for Reconstruction and Development and International Development Association: World Bank.

Kachigan, S. K. 1991. **Multivariate statistical analysis: A conceptual introduction.** New York: Radius.

Kline, R. B. 1998. **Principles and Practice of Structural Equation Modeling, Methodology in the Social Sciences.** New York: The Guilford.

Likert, R. 1932. **A Technique for the Measurement of Attitudes. Archives of Psychology.** 140 (June): 5-55.

Liu, F. and Maitlis, S. 2010. Nonparticipant Observation. In **Encyclopedia of Case Study Research.** Albert J. Mills, Gabrielle Durepos and Elden Wiebe, eds. Retrieved June 2, 2018 from http://srmo.sagepub.com/view/encyc-of-case-study-research/n229.xml

Lohmann, L. 2006. **Carbon Trading - A Critical Conversation on Climate Change, Privatization and Power.** Uppsala: Dag Hammarskjöld Foundation.

Matland, R. E. 1995. Synthesizing the Implementation Literature: The Ambiguity-Conflict Model of Policy Implementation. **Journal of Public Administration Research and Theory.** 5 (April): 145-174.

Mazmanian, D. and Sabatier, P. A. 1989. **Implementation and Public Policy.** Latham: University Press of America.

Miles, M. B. and Huberman, A. 1994. **Qualitative Data Analysis: An Expanded Sourcebook.** 2nd ed. California: Sage.

Ministry of Environment & Forests. 2014. **CDM Incentive.** Retrieved June 12, 2014 from http://moef.nic.in/sites/default/files/cc/initiatives.htm

Nagel, E. 1965. Types of Causal Explanation in Science. In **Lerner, Cause and Effect.** Daniel Lerner, ed. New York: The Free Press. Pp 11-32.

NESDB. 2017. **12th NESDB Policy.** Retrieved May 14, 2014 from http://www.nesdb.go.th/Portals/0/home/interest/kro55/data_0315080514.pdf

Nhan, T. N.; Ha-Duong, M.; Sandra, G. and Michael, M. 2011. **Implementing the Clean Development Mechanism in Vietnam: Potential and limitations.** Retrieved May 14, 2014 from https://halshs.archives-ouvertes.fr/halshs-00654294/document

Niramon Sutummakid; Supawat Sukhaparamate and Sarun Pravitrangul. 2009. **Study of Thailand's Carbon Market Prototypes.** Bangkok: Thailand Greenhouse Gas Organization (TGO). (In Thai)

Nunnally, J. C. 1978. **Psychometric Theory.** New York: McGraw-Hill.

O'Toole, L. J. 2004. The Theory-Practice Issue in Policy Implementation Research. **Public Administration.** 82 (May): 209-329.

Oliver, C. 1997. Sustainable Competitive Advantage: Combing Institutional and Resource Based View. **Strategic Management Journal.** 18 (October): 697-713.

Olsen, K. 2007. **The Clean Development Mechanism's Contribution to Sustainable Development.** New York: UNDP RISO.

ONRE. 2010. **The Second National Communication of Thailand: Under The Policy Guidance from the National Climate Change Committee**. Bangkok: Office of Natural Resources and Environmental Policy and Planning.

Pallant, J. 2001. **SPSS Survival Manual.** New South Wales: Allen & Unwin.

Porter, M. E. 1990. **The Competitive Advantage of Nations. Harvard Business Review.** 68 (March): 74 - 91.

Porter, M. E. and Kramer, M. R. 2006. Strategy & Society: The Link Between Competitive Advantage and Corporate Social Responsibility. **Harvard Business Review.** 84 (December): 78 - 94.

Relly, J. E. and Sabharwal, M. 2009. Perceptions of Transparency of Government Policymaking: A Cross-National Study. **Government Information Quarterly.** 26 (January): 148–157.

RISO UNEP. 2014. **CDM Projects by Host Region.** Retrieved May 15, 2014 from http://cdmpipeline.org/cdm-projects-region.htm#2

Rubin, H. and Rubin, I. 1995. **Qualitative Interview: The Art of Hearing Data**. London: Sage.

Sabatier, P. and Mazmanian, D. 1989. **The Implementation of Public Policy: A Framework of Analysis.** Lanham: University Press of America.

Schneider, M.; Holzer, A. and Hoffmann, V. H. (2008). Understanding the CDM's Contribution to Technology Transfer. **Energy Policy.** 36 (January): 2930-2938.

Shrivastava, P. 1995. Environmental Technologies and Competitive Advantage. **Strategic Management Journal.** 16 (January): 183-200.

Spalding-Fecher et al. 2012. **Assessing the Impact of the Clean Development Mechanism.** Retrieved May 15, 2014 from https://www.sei.org/ publications/ assessing-the-impact-of-the-clean-development-mechanism/

Stavins, R. N. 1998. What Can We Learn from the Grand Policy Experiment? **The Journal of Economic Perspectives.** 12 (April): 69-88.

Stern, N. 2006. **Stern Review on the Economics of Climate Change.** London: The Centre for Climate Change Economics and Policy.

Streck, C. 2007. The Governance of the Clean Development Mechanism. **Environmental Liability Journal.** 15: 91-100.

Suchart Prasith-Rathsint. 2014. **Application of Statistical Methods in Research.** Bangkok: Samlada Limited Partnerships.

Tabachnick, B. and Fidell, L. 1997. **Using multivariate Statistic.** Upper Saddle River, NJ: Pearson.

TGO. 2014. **About TGO.** Retrieved May 15, 2014 from http://www.tgo.or.th/ english/index.php?option=com_content&view=category&id=25&Itemid= 28

TGO. 2018. **Organization Structure.** Retrieved May 15, 2014 from http://www.tgo.or.th/2015/english/content.php?s1=28

UNDP. 2004. **Public Sector Transparency and Accountability in Selected Arab Countries: Policies and Practices.** New York: United Nations Development Program.

UNDP. 2014. **Corporate Social Responsibility as an enabler of Green Growth and Climate Action.** New York: United Nations Development Program.

UNDP. 2018. **The Clean Development Mechanism: A User's Guide.** Retrieved August 1, 2018 from http://www.undp.org/content/dam/undp/library/ Environment%20and%20Energy/Climate%20Change/cdmchapter2.pdf

UNEP RISO. 2014. **CDM Projects by Host Region**. Retrieved May 15, 2014 from http://cdmpipeline.org/cdm-projects-region.htm#2

UNFCCC. 1998. **Kyoto Protocol.** Retrieved May 15, 2014 from http://unfccc.int/ resource/docs/convkp/kpeng.pdf

UNFCCC. 2018. **UNFCCC Website.** Retrieved April 23, 2016 from http://www4.unfccc.int/ndcregistry/PublishedDocuments/Thailand%20First/Thailand_INDC.pdf

Vichitbhan Plantation. 2018. **Palm Oil Plantation.** Retrieved September 18, 2019 from http://www.irplus.in.th/Listed/vpo/ir-en/misc/ar/20150615-vpo-ar2014-en.pdf (In Thai)

Wangyao, K. 2018. **Waste-to-Energy in Thailand.** Retrieved September 28, 2018 from https://www.iitk.ac.in/ime/anoops/for14/PPTs/Day%20-%204%20Bangkok/Waste-to-Energy%20in%20Thailand%20Dr.%20Komsilp% 20Wangya.pdf

World Bank. 2004. **The Clean Development Mechanism: Talking a Proactive and Sustainable Approach.** Washington, D.C.: The World Bank.

The World Bank. 2012. **Green Investment Climate Country Profile - Vietnam.** Washington D.C.: The World Bank.

The World Bank. 2013. **Green Infrastructure Finance: Green Investment Climate Country Profile - China.** Washington D.C.: The World Bank.

World Bank. 2014. **East Asia Pacific.** Retrieved May 7, 2014 from http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/EASTASIAPACIFICEXT/EXTEAPREGTOPENVIRONMENT/0,,contentMDK:20266329~menuPK:537827~pagePK:34004173~piPK:34003707~theSitePK:502886,00.html

World Bank. 2018. **The World Bank Data.** Retrieved August 20, 2018 from https://data.worldbank.org/country/china

APPENDICES

APPENDIX A

STATEMENT OF INFORMED CONSENY

You are being invited to take part in a research project. Please take some time to read the information presented here and you are free to ask any questions about any part of this project that you do not fully understood. You will be required to respond to open ended questions to the best of your ability, however, you are free to talk over what you want to discuss within the subjects. Evidently, your participation is distinctly voluntary and you have the right to withdraw from the research at any time and this will not affect you negatively in any way whatsoever.

With respect to confidentiality and data protection issues, information obtained from this interviews and discussions was included in this study without any reference to the participants' names, positions or firms. The data collected and usage, afterwards, will be accessed and transcribed only. Furthermore, only short direct quotes will be used without any reference to the participant's name, position or firm in order to exemplify data analysis process.

The main purpose of this research is to gain a better and deeper understanding of management' perceptions of how Clean Development Mechanism affected sustainable development objective and how CDM implementation can led to competiveness strategy of the company. Furthermore, this study is also design to discover CDM implementation issues in Thailand.

Thank you for your time and co-operation,

Danai Jeanpinitnan
Doctoral candidate
National Institute of Development Administration (NIDA)
Phone: 085-649-4934
danai.j@hotmail.com

APPENDIX B

COP 21 PARIS AGREEMENT DETAIL

- Reaffirm the goal of limiting global temperature increase well below 2 degrees Celsius, while urging efforts to limit the increase to 1.5 degrees;
- Establish binding commitments by all parties to make "nationally determined contributions" (NDCs), and to pursue domestic measures aimed at achieving them;
- Commit all countries to report regularly on their emissions and "progress made in implementing and achieving" their NDCs, and to undergo international review;
- Commit all countries to submit new NDCs every five years, with the clear expectation that they will "represent a progression" beyond previous ones;
- Reaffirm the binding obligations of developed countries under the UNFCCC to support the efforts of developing countries, while for the first time encouraging voluntary contributions by developing countries too;
- Extend the current goal of mobilizing $100 billion a year in support by 2020 through 2025, with a new, higher goal to be set for the period after 2025;
- Extend a mechanism to address "loss and damage" resulting from climate change, which explicitly will not "involve or provide a basis for any liability or compensation;"
- Require parties engaging in international emissions trading to avoid "double counting;" and
- Call for a new mechanism, similar to the Clean Development Mechanism under the Kyoto Protocol, enabling emission reductions in one country to be counted toward another country's NDC.

APPENDIX C

QUESTIONNAIRE

This questionnaire consists of 10 Parts

Section: 1 Organization background and general information

Section: 2 Information of factors which lead to CDM implementation

Section: 3 Problems and concerns of CDM implementation

Section: 4 Information of factors impacts consideration of environmental benefits

Section: 5 Information of factors impacts ability to policy implementation

Section: 6 Information of non-statutory factors impacts policy implementation

Section: 7 Information of factors impacts consideration of Socio-economic benefits

Section: 8 Information of factors impacts Sustainable development

Section: 9 Result of CDM project implementation

Section: 10 Opinion and recommendation

Definition of technical vocabulary in this questionnaire

- **Thailand Greenhouse Gas Management Organization (TGO)** means public organization responsible for analyzing, screening, and commenting on the greenhouse gas emission reduction projects under Clean Development Mechanism
- **Clean Development Mechanism (CDM)** means economic mechanisms set up under the Kyoto Protocol to help industrialized countries reduce greenhouse gas emissions during 2008 - 2020 by buying carbon credits from CDM projects in energy-intensive countries to reduce the amount of greenhouse gas emissions of Thailand.
- **Sustainable development (SD)** refers to development that improves the quality of human life under the potential of the ecological system of the world. There are three basic components: economic components society and environment
- **Sustainable development of better business practice** refers to products and services that have a social and environmental friendly value. It reflects organization in developing an internal process that is in line with the CSR concept, so that it can create products or services that are sustainable for the organization and society

- **The benefit to community economy means** the benefits of the operation that affect the local economy or community with a holistic approach to the quality of life and well-being of people in the community, such as employment, utility systems and energy security**.**
- **Globalization** refers to the impact of information and communication technology as a social force. The flow of information from one area to another area is fast. Globalization affects the flow of environmentalism, corporate governance and business philosophy.
- **Transparency in the process** means the ability to display promises to stakeholders to know what action is being taken. How successful you are? Or what changes? It also demonstrates the transparency in the process and how those can enable stakeholders to see economic, social and environmental development**.**
- **Sustainable Competitive Advantage** means creating a business advantage by making a difference in the products and services that meet the needs of consumers with quality and service at a reasonable price at the right price while products and services do not affect the environment.

Please answer the questionnaire by mark √ in front of ☐ text or fill in the blank space. Please answer all questions. **Researchers promise that the information contained in this questionnaire will be kept confidential and used for educational purposes only.**

Section 1: Company Background and General Information

1. Company name _____

2. Your position in the company

☐ President ☐ Executive Director ☐ Board of director

☐ General Manager / Managing Director ☐ Director

☐ Manager ☐ Other, please specify _____

3. How long your company has been established?

☐ 1 – 5 Years ☐ 6 – 10 Years ☐ 11 - 15 Years

☐ 16 - 20 Years ☐ Greater than 20 Years

4. How many full-time employees do you have?

☐ 1 – 100 Employees ☐ 101 – 200 Employees

☐ 201 – 300 Employees ☐ 301 – 400 Employees

☐ 401 – 500 Employees ☐ More than 500 Employees

5. Currently, your company enrolls in **Clean Development Mechanism (CDM) project** or not?

☐ CDM Member please specify _____

☐ Used to be CDM Member please specify _____

☐ Never Enroll (Please answer section 3 and 10)

6. What type of CDM technology you have enrolled with TGO and UNFCCC?

☐ Solar ☐ Wind ☐ Hydro ☐ Biomass

☐ Landfill ☐ Methane Avoidance

☐ Other, please specify _____

7. What type of CDM size for your project (UNFCCC category)?

☐ Small Project ☐ Large Project

Section 2: Factors towards CDM implementation

5= Highest 4 = High 3= Neutral 2= Low 1 = Lowest

1. Please identify all relevant factors in determining eligibility for the Clean Development Mechanism (CDM) project. (Please select the relevant item and indicate the weight level on the right-hand side.)		**Level**				
		5	**4**	**3**	**2**	**1**
☐	1.1 External factors affect environmental policy, such as global warming, community demands and business competition (Material Variables).					

☐	1.2 Internal factors influence environmental policy, such as consistency of corporate goals and management support (Structural Variables).					
☐	1.3 Other non-legislative factors, such as the impact of business operation and social responsibility (Contractual Variables).					
☐	1.4 Globalization impacts CDM implementation, such as, Good governance					
☐	1.5 Environmental benefits influence CDM implementation					
☐	1.6 Socio-Economic, such as, increase employment and support local business lead to CDM implementation					
☐	1.7 Transparency in the process, such as, environmental report and availability of information impact CDM implementation					
☐	Other factor, please specify _____					

Section 3: CDM Implementation obstacles and concerns

5= Highest 4 = High 3= Neutral 2= Low 1 = Lowest

2. Please identify all relevant issues and obstacles to participating in the CDM project from the government sector (Please select the relevant items and indicate the weight level on the right-hand side).		**Level**				
		5	**4**	**3**	**2**	**1**
☐	2.1 Clarification of Greenhouse Gas Reduction Policy					
☐	2.2 Clarification of CDM policy					
☐	2.3 Investment Support Policy					

☐	2.4 Policy on collecting income tax from the carbon trading scheme					
☐	2.5 Access to clean technology					
☐	2.6 Approval process*					
☐	2.7 Problem with communication with government agency*					
☐	Other problem, please specify _____					

*In case select 2.5, what is/are the obstacles in approval process (can answer more than 1 choice)

☐ Initial application process ☐ Letter of Acceptance (LoA)

☐ Environmental Impact Assessment (EIA) ☐ Reviewing duration of TGO Board

☐ Sustainable Development Assessment (IEE SD)

☐ Other problem, please specify _____

* In case select 2.6, what is/are the problem and obstacle of coordination from government agency? (Can answer more than 1 choice)

☐ TGO ☐ Local administration ☐ Provincial industry office

☐ Provincial Administration Organization ☐ Pollution Control Department

☐ Bureau of Investment Promotion (BOI)

☐ Other problem, please specify _____

3. The issues and obstacles to participate in the CDM project in other areas (please select the relevant items and indicate the weight level on the right-hand side).		**Level**				
		5	**4**	**3**	**2**	**1**
☐	3.1 CDM expertise					

☐	3.2 Shortage of human resources					
☐	3.3 Risk assessment data *					
☐	3.4 Ability to access to investment fund					
☐	3.5 Compensation from carbon trading scheme					
☐	3.6 Support from management to CDM project					
☐	Other problem, please specify _____					

* In select 3.3, please specify the risk of the CDM project (can be more than one option)

☐ Access to technology ☐ The project was not approved.

☐ Understanding of people in community ☐ Government policy change

☐ Economic Risks ☐ Investment risk

☐ Other problem, please specify _____

If you do not participate or decide to leave the project, what factors affect your decision the most?

☐ Problems and obstacles by government sector. Please specify _____

☐ Other problems and obstacles please specify _____

In case these problems are fixed, will you consider joining the CDM program?

☐ Consider joining the project.

☐ Do not consider joining the project. Please provide a reason. _____

Section 4: Information of factors impact consideration of environmental benefits

5= Strongly Agree 4 = Agree 3= Neutral 2= Disagree 1 = Strongly Disagree

4. Factors affect the consideration of environmental benefits.	**Level**				
	5	**4**	**3**	**2**	**1**
4.1 Globalization has influenced your decision to consider environmental benefits.					

	4.2 Transparency in the implementation of CDM has the potential to address environmental concerns.					

Section 5: Information of factors impact ability to policy implementation

5= Strongly Agree 4 = Agree 3= Neutral 2= Disagree 1 = Strongly Disagree

5. Factors affect policy implementation ability	**Level**				
	5	**4**	**3**	**2**	**1**
5.1 Globalization affects ability of your environmental policy performance					
5.2 Top executives are aware of environmental issues in implementing policies.					
5.3 Transparency in the operation and communication of information to the public can help reduce conflicts in policy implementation.					

Section 6: Factors impact non-statutory of the problem for policy implementation

5= Strongly Agree 4 = Agree 3= Neutral 2= Disagree 1 = Strongly Disagree

6. Other non-legislative factors affect policy implementation.	**Level**				
	5	**4**	**3**	**2**	**1**
6.1 Environmental effect of business performance impacts on environmental policy.					
6.2 Socio-economic benefits are the main goal of environmental policy.					

Section 7: Factors affect the consideration of economic and social benefits

5= Strongly Agree 4 = Agree 3= Neutral 2= Disagree 1 = Strongly Disagree

7. Factors Affect Economic and Social Benefits	Level				
	5	**4**	**3**	**2**	**1**
7.1 Globalization allows you to consider the economic and social benefits of implementing a policy.					
7.2 Transparency of CDM communication results in economic and social benefits.					

Section 8: Factors affect sustainable development in the dimension of economic sustainability

5= Strongly Agree 4 = Agree 3= Neutral 2= Disagree 1 = Strongly Disagree

8. Factors affect sustainable development	Level				
	5	**4**	**3**	**2**	**1**
8.1 Environmentally friendly business practices impact on corporate sustainability.					
8.2 Businesses that take into account the economic and social benefits lead to sustainable development.					
8.3 CDM projects lead to organizational sustainable development					

Other factors that affect the organization's sustainability, please specify _____

9. Identify the benefits of CDM projects that contribute to the sustainable development of your organization / company. (can select more than one)

9.1 Environmental benefits

☐ Reduce air pollution ☐ Reduce water pollution ☐ Reduce noise pollution

☐ Improve soil quality ☐ Reduce industrial waste.

☐ Other (please specify) _____

9.2 Socio-economic benefits

☐ Promote the local economy ☐ Improve ecological in the community

☐ Generate Renewable energy ☐ Create good relationship with the community.

☐ Increase employment in the area. ☐ Other (please specify) _____

Section 9: Information on the performance of CDM project

10. How much money do you invest in the CDM project (Million Baht)?

☐ Less than 10 M, please specify _____ ☐ 10 M to 20 M ☐ 20 M to 30 M

☐ 30 M to 40 M ☐ More than 40 M, please specify __

11. Please estimate revenue from the income of your CERs (Million Baht per year)

☐ Less than 1 M, please specify _____ ☐ 1 M to 5 M ☐ 5 M to 10 M

☐ 10 M to 15 M ☐ More than 15 M, please specify __

12. Revenue from carbon trading scheme increase your company income in what level?

☐ Highest ☐ High ☐ Neutral ☐ Low ☐ Lowest

13. How does CDM project enhance your company competitive advantage?

☐ Highest ☐ High ☐ Neutral ☐ Low ☐ Lowest

14. How many CO_2 emissions reduction does your company reduce? (tCO_2-e or CERs)

☐ 1- 100,000 ☐ 100,001 – 1,000,000 ☐ 1,000,001 - 10,000,000

☐ More than 10 Million tCO_2, please specify _____

15. How does CDM enhance your business competitive advantage? (Can select more than one)

☐ Reduce cost of goods and services. ☐ Innovation of Eco-friendly product

☐ Increase safety in production process ☐ Products and services which has social and environmental value.

☐ Corporate Social Responsibility

☐ Add value to your products and services.

Other advantages please specify _____

Section 10: Comments and Suggestions

Remark: This section is designed for business owners, top executives and executives to provide advice and suggestions. Please provide your comments on the selection and implementation of the CDM project freely.

What causes CDM to be interesting or not interesting for your business?

_____

_____

_____

_____

Do you have any recommendation for government agencies to make CDM policy more effective?

_____

_____

_____

_____

_____

_____

_____

If you have any comments or suggestions on this questionnaire or topic, please refer to this section.

_____

_____

_____

_____

_____

_____

After completing the information, please return the completed questionnaire to the post office that appears on the attached envelope. Please specify if you want the results of this study. Please provide the name and address of the researcher.

☐ No need for the result ☐ Want the result

Name _____

Address

_____

_____

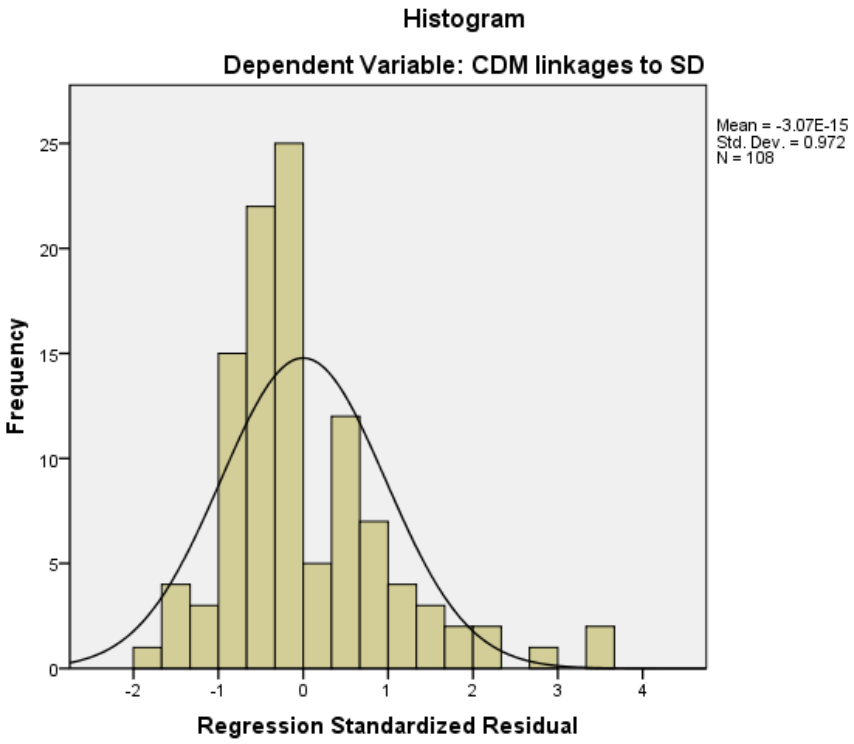
_____

Danai Jeanpinitnan Tel 085-649-4934 Email danai-j@hotmail.com

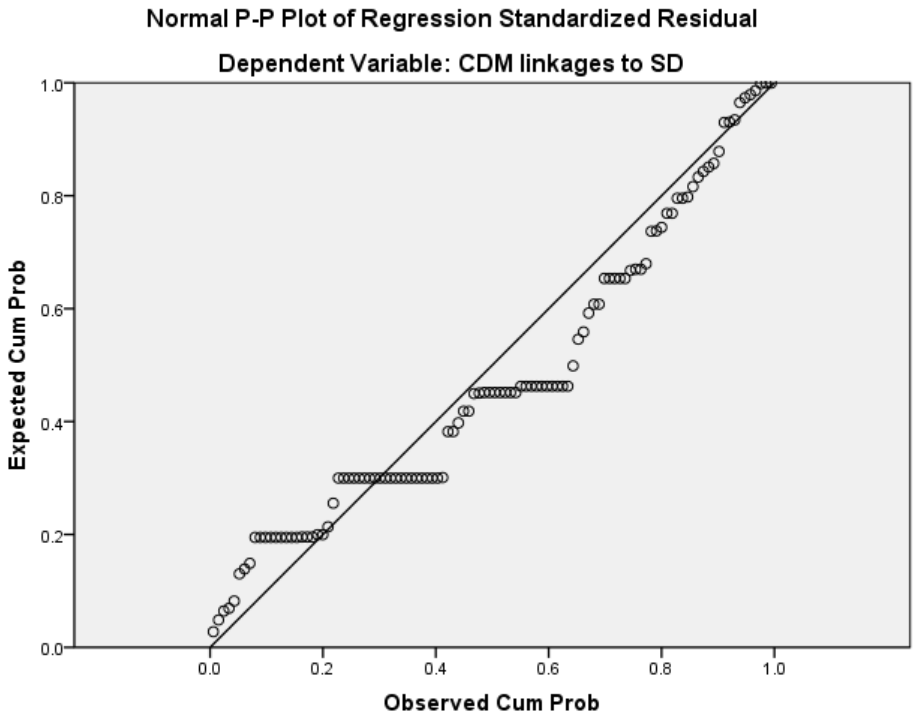
Thank you very much for your cooperation in answering the questionnaire.

APPENDIX D

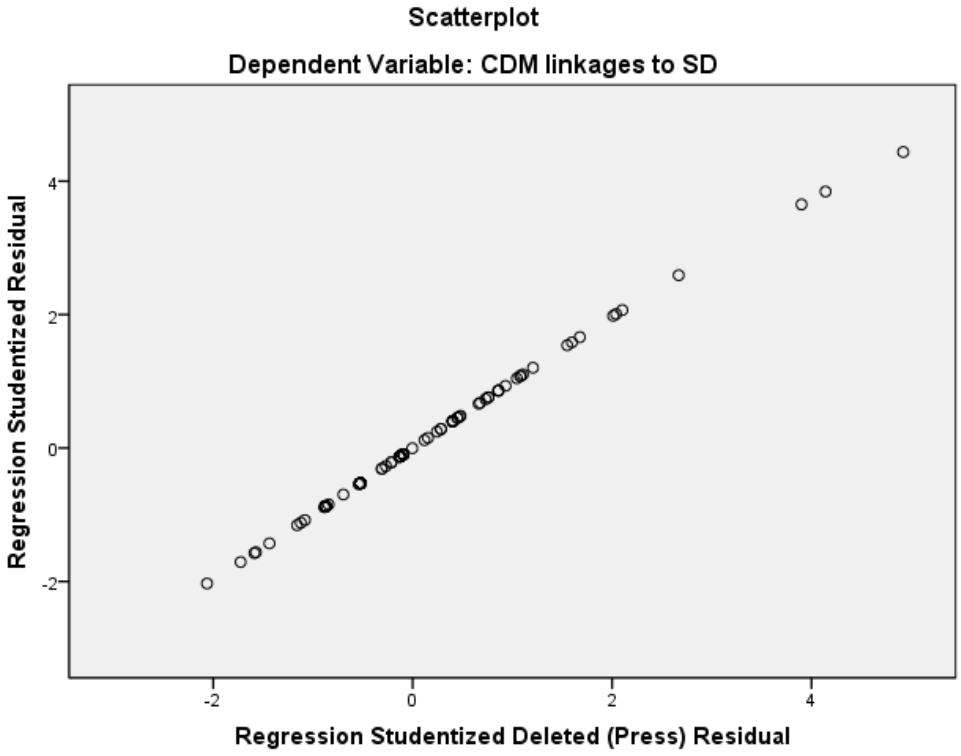
NORMALITY TEST

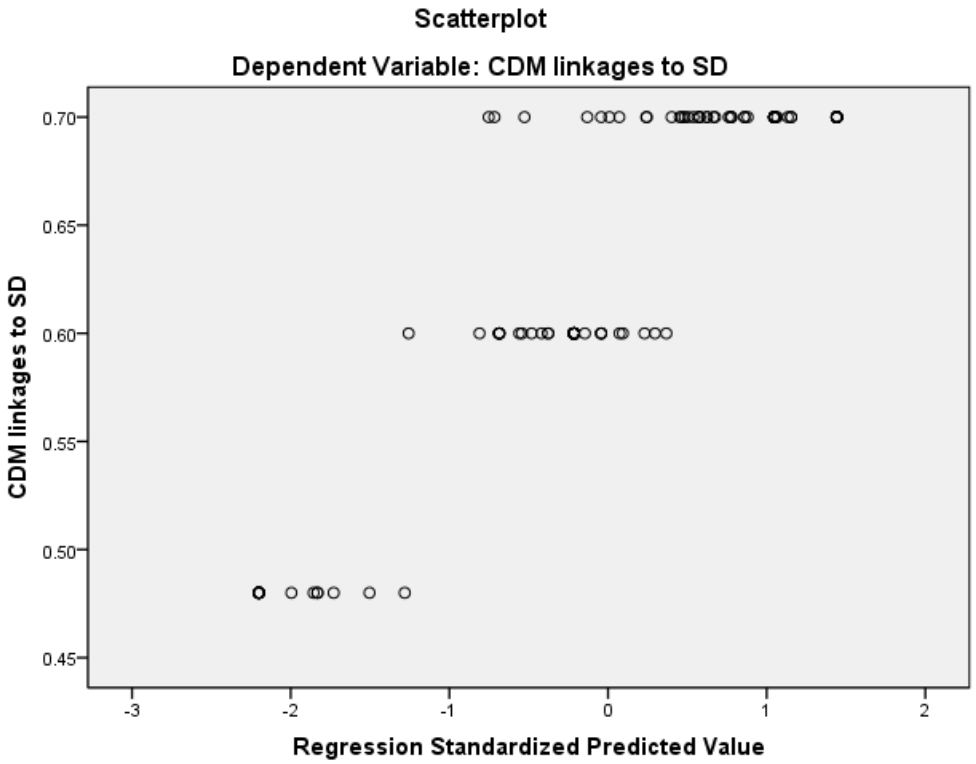


P-P Plot


Normal P-P Plot of Regression Standardized Residual
Dependent Variable: CDM linkages to SD
Expected Cum Prob
Observed Cum Prob
0.0
0.2
0.4
0.6
0.8
1.0

Q-Q Plot


Scatterplot
Dependent Variable: CDM linkages to SD
Regression Studentized Residual
Regression Studentized Deleted (Press) Residual
-2
0
2
4


Scatterplot
Dependent Variable: CDM linkages to SD
CDM linkages to SD
0.70
0.65
0.60
0.55
0.50
0.45
-3
-2
-1
0
1
2
Regression Standardized Predicted Value

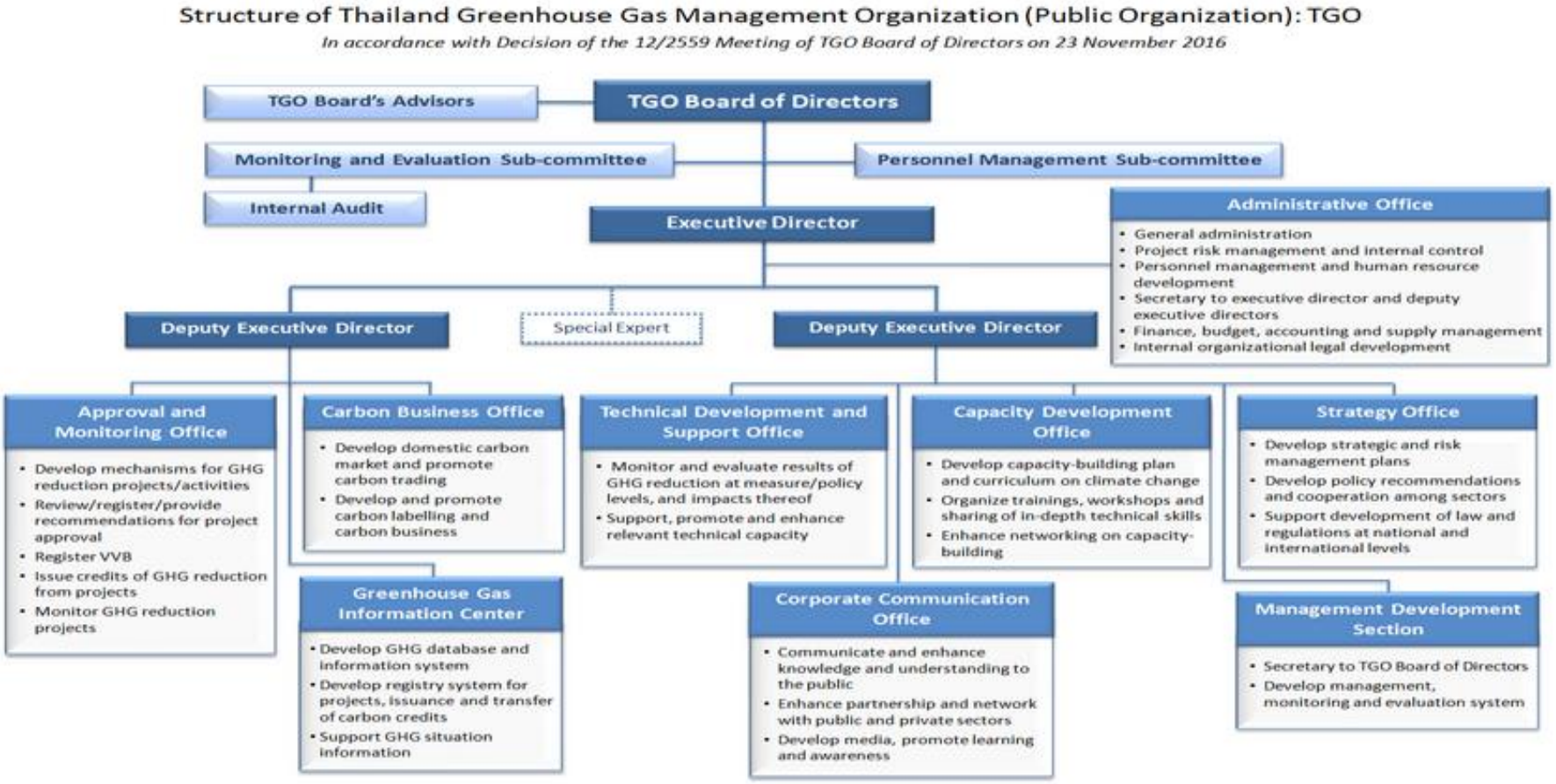
APPENDIX E

ANNEX I COUNTRY LIST

North America	European Union	Asia and Oceania	Economies in Transition
Canada	Austria	Australia	Bulgaria
	Belgium	Japan	Croatia
	Denmark	New Zealand	Czech Republic
	Finland		Estonia
	France		Hungary
	Germany		Latvia
	Greece		Lithuania
	Iceland		Poland
	Ireland		Romania
	Italy		Russian
	Luxembourg		Federation
	Netherlands		Slovak
	Norway		Republic
	Portugal		Slovenia
	Spain		Ukraine
	Sweden		
	Switzerland		
	United Kingdom		

Note: Non-Annex I Countries are those which are not in Annex-I list**.** Majority are developing countries.

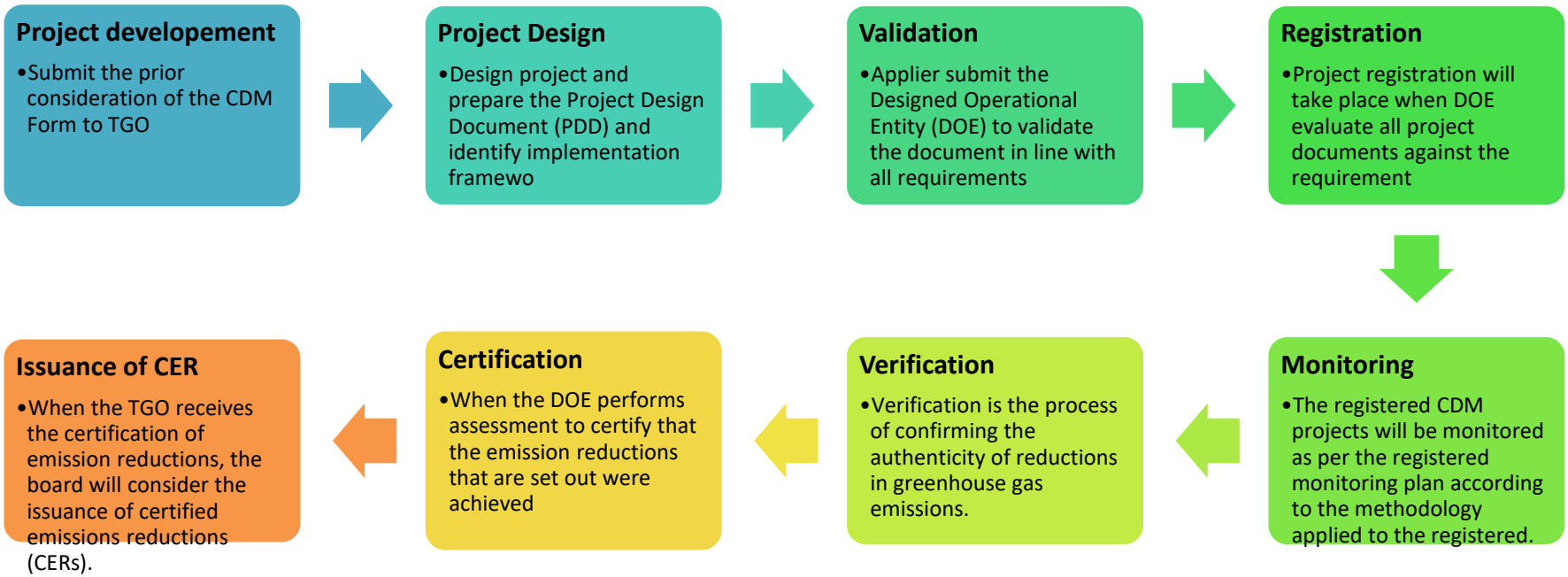
APPENDIX F



Source: TGO, 2018.

APPENDIX G

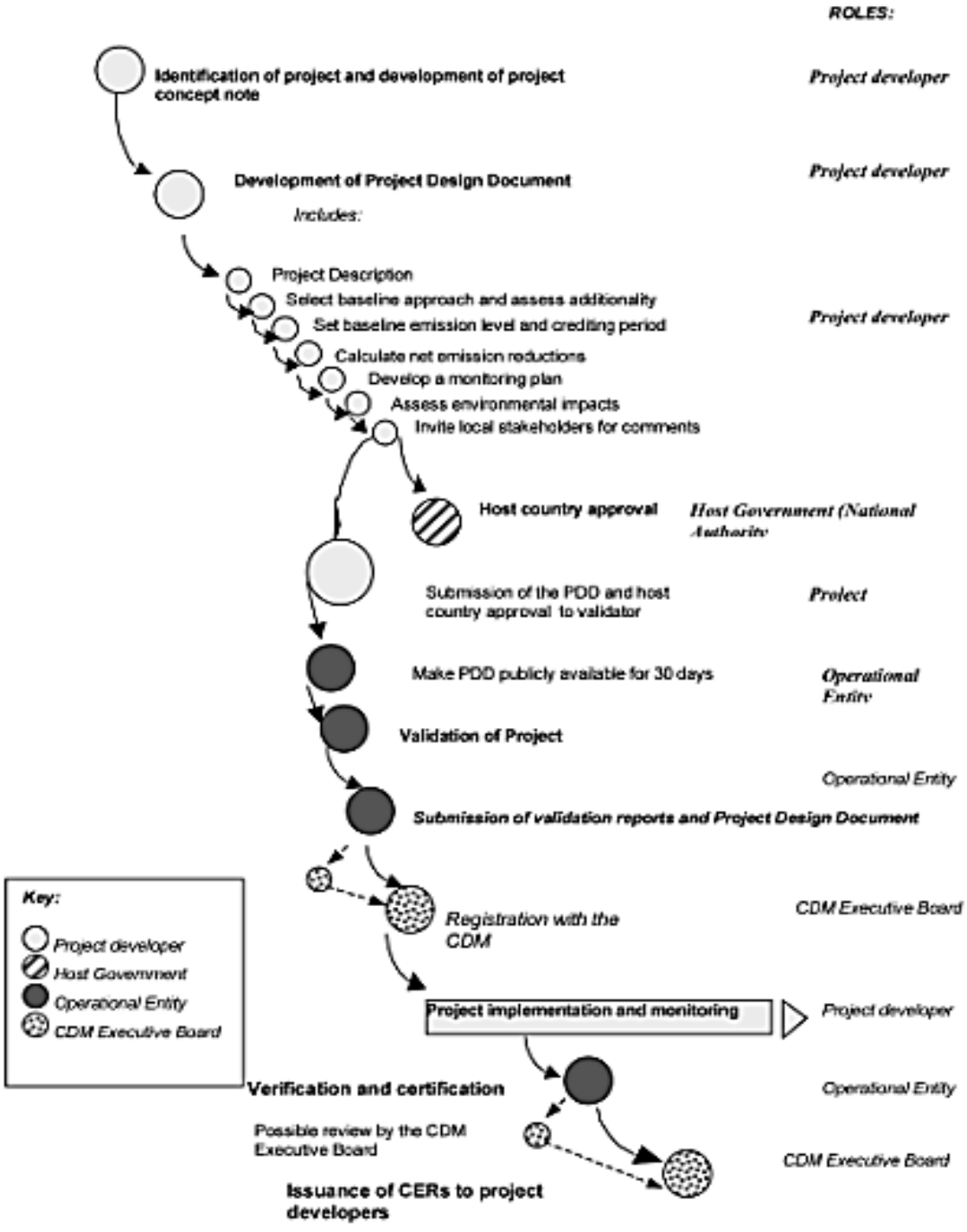
TGO Project Development Process



Source: Adapted TGO, 2017.

APPENDIX H

CDM PROJECT FLOW



Source: UNDP, 2018.

BIOGRAPHY

NAME	Mr. Danai Jeanpinitnan
EDUCATION BACKGROUND	Bachelor of Science Degree with a major in Business Management, minor in Information System, Wilmington University, Delaware, USA in 1999
	Master of Business Administration Management with a major in Management, Wilmington University, USA in 2002
PRESENT POSITION	Deputy Manager at Suzuki Motor (Thailand) Co., Ltd. since 2014
EXPERIENCES	System Specialist at UPS Supplies Chain USA for IT implementation of UPS Supplies Chain system
	Information Technology Manager at Jamatex, Inc. for logistic system with retails stores (Wal-Mart) in USA since 2001
	Lecturer at ABAC for teaching an upper-level course in Information System for Business and E-Commerce, since 2007