ตัวแบบนโยบายกลไกการพัฒนาที่สะอาดของประเทศไทย[*]
A Model for Clean Development Mechanism Policy in Thailand

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บทคัดย่อ

วัตถุประสงค์ของการศึกษา คือ การสำรวจและตรวจสอบแบบจำลองสำหรับกลไกการพัฒนาที่สะอาด (CDM) ด้วยวิธีการวิจัยแบบผสม โดยการวิเคราะห์จากเอกสารและใช้แบบสอบถามความคิดเห็นจำนวน 125 ชุด วิเคราะห์ข้อมูลโดยใช้โปรแกรม สถิติ ผลการวิจัย พบว่า ปัจจัยห้าประการเป็นสาเหตุที่สามารถอธิบายผลการดำเนินงานตามนโยบายของ CDM แสดงให้เห็นว่า รูปแบบนี้มีข้อมูลอย่างเหมาะสม อนาคตของโพสต์-2012 นโยบาย CDM ในประเทศไทย การศึกษาพบว่าโครงการ CDM จะต่อเนื่องแต่อาจเปลี่ยนไปเป็นความสมัครใจและไม่ได้ผลผูกพันตามกฎหมาย

คำสำคัญ: นโยบายสาธารณะ, กลไกการพัฒนาที่สะอาด, CDM

Abstract

The purpose of this study was to explore and examine a model for Clean Development Mechanism (CDM) policy in Thailand with mixed methodology research. According to unit of analysis, the questionnaires were sent to CDM project developers who submitted Letter of Agreement (LoA), totally 125 participants. The data was analyzed using Statistical packages (Moment Structures). They presented the path diagram for correlations between the critically causal factors (predictors) and the CDM policy performance. CDM policy process model in Thailand aimed to identify attractive factors and elements which were positive force necessary to implement CDM

project, meanwhile naming barrier factors which were negative force to suppress growth rate of CDM project in Thailand. Both types of factors were through investigated and sorted by statistical ranking. Causal factors in this study on the basis of relevant literatures, they were summed up into 5 main categories as follows: (1) Economic and social condition, (2) Policy condition, (3) Policy Resources, (4) Communication, and (5) Policy disposition respectively. On the other hand, CDM policy performance as policy output, was examined with exploratory factor analysis. It was measured in terms of following issues: (1) Outcome of taxation policy, (2) Outcome of financial provision, (3) Outcome of technological support, and (4) Policy Impact, respectively. As a result of R^2, the five causal factors as could explain the CDM policy performance of 70.1 %. In consequence of AMOS outputs, they totally showed that the model in the figure fitted data appropriately. The future of post-2012 CDM policy in Thailand, the study revealed that CDM would be ongoing. However, it might transform to be voluntary, and not legally binding.

Keywords: public policy, clean development mechanism, CDM

Introduction

According to the Kyoto Protocol obligation, Clean Development Mechanism (CDM) was a flexible mechanism had been interested for developing countries by hopefully gained in global carbon credit market. Thailand had recognized and encouraged the reduction of GHG emission projects by issuing policy and implementing into national development programs. The main objectives of this study were from doubtful problem of public policy which Thai government afforded to implement CDM projects to private sector, forestry sector and energy sector. Furthermore, there were problems for incentives and barriers for CDM project developers including CDM information should be available to access. The issue remaining as far as institutional framework was concerned related to the establishment of sustainable development criteria that were essential for approving further CDM projects in Thailand. Finally, a model for CDM policy implementation in Thailand should be developed in term of relationship between policy success and causal factors. In case of the CDM policy performance, what were compositions affected to policy performance? Eventually, Thomson Reuters Point Carbon (2011) notified that at the end of 2012, it was a major deadline for the CDM market, the EU would not accept credits from CDM projects registered after that date, unless they came from least developed countries (LDCs). CDM Policy of post-2012 might be reviewed and determined for new step forward in Thailand.

Research objectives

The study was carefully examined in compliance with research questions to achieve

the following research objectives:

1. To explore the main rationales, attractive factors and barrier factors for CDM project developers,

2. To examine the relationships between CDM project developer's attributes and rationales of CDM project implementation,

3. To explore causal factors impact on CDM policy implementation,

4. To study the CDM policy performance,

5. To determine a model of CDM policy in Thailand, and

6. To study future of post-2012 CDM policy in Thailand.

Literature Review and Theoretical Framework

Clean Development Mechanism (CDM) is one of three mechanism under Kyoto Protocol which allows emission reduction projects that assist developing countries in achieving sustainable development with 'certified emission reductions (CER)' that has been benefit for both of Annex I parties and non-Annex I parties. Yamin (2005, p. 265) stated that the CDM's potential contribution to sustainable development in host countries had generally centered on main objectives of CDM project activities.

Literature review and theoretical framework in this study concerned about public policy process: policy making, policy implementation, policy evaluation, and policy feedback by focusing on CDM policy delivered to participants in Thailand.

Van Meter and Van Horn (1975, p. 474) introduced their process model, it comprised of six variables as follows; (1) Policy standards and objectives, (2) Policy resources, (3) Interorganizational communication and enforcement activities, (4) The characteristics of the implementing agencies, (5) Economic, social and political conditions, and (6) The disposition of implementers. Edwards (1980, p. 9) proposed four critical factors in implementing public policy: communication, resources, disposition or attitudes, and bureaucratic structure. The four factors were operating simultaneously and interacting with each other to aid or hinder policy implementation. Thomas and Grindle (1990, p. 1164) found the model, that pointed policy to reform in three phases as follows: Agenda phase, Decision phase and Implementation phase. Implementation was seen as what happened after the decision phase, and successful implementation was viewed as a question of whether or not the implementation institution was strong enough for the task.

Conceptual Framework

Theoretical framework in this study concerned about public policy process, Thailand Greenhouse Gas Management Organization (Public Organization)-TGO who had provided policy making and delivered CDM policy, policy implementation, policy evaluation and policy feedback respectively. Hereby, the researcher would like to express CDM policy process by the model as follows:
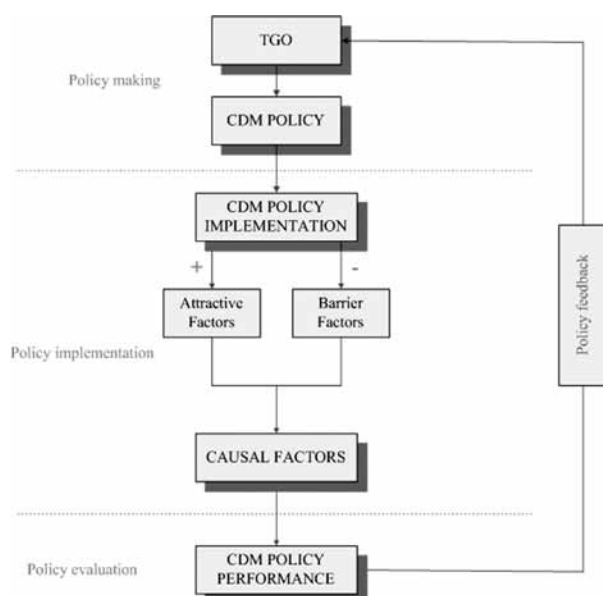
Figure 1 CDM Policy Process Model in Thailand

Based on Van Meter and Van Horn Process Model, Edwards Model, and Thomas and Grindle Model, those above mentioned models presented the relationship among some causal factors to policy performance. Obviously, communications, policy resources, dispositions, organization structure, policy condition and economic, social and political conditions which influenced policy implementation.

Consequently, the researcher proposed a model for development of CDM policy with exploring correlation among causal factors and CDM implementation success as follows:
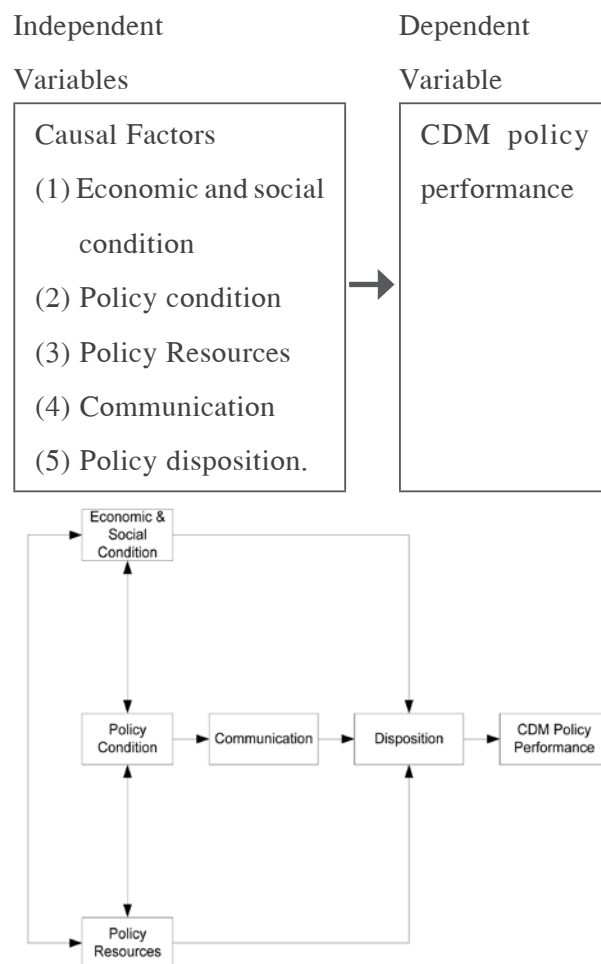

Figure 2 Proposed CDM Policy Implementation Model

Thus, multi-variables statistic was taken into analyzing correlation and testing hypotheses. Especially, structural equation modeling (SEM), and factor analysis would be analyzed carefully in order to identify the underlying factors that could explain the CDM policy implementation model.

Hypotheses of the Study

Null hypotheses were defined as follows; there was no association between CDM project developer's attributes and rationales of CDM implementation

Research Methodology

The research design employed in this study was mixed methodology that had been a combination of qualitative and quantitative research. The researcher gathered primary data by sending questionnaires to all CDM participants in Thailand who submitted Letter of Agreement (LoA) and approved by TGO, totally 125 participants. It carried out twice in 4 months, the first round was conducted during the beginning of February, 2011 to the end of March 2011 and the second round was conducted at the beginning of April 2011 and waiting till the end of May 2011.

The questionnaire was divided into 3 parts as follows: Part 1 was respondent's attributes and perception of rationales, attractive factors, barrier factors and CDM information accessibility (20 questions), Part 2 was the perception of CDM project developers for causal factors influenced CDM policy performance (34 questions), and Part 3 was the perception of CDM project developers for CDM policy performance measure (15 questions).

Research Finding and Discussion

CDM project developer's attributes in this study were determined in terms of size of CDM projects, CDM project types, CDM project groups, energy power technologies, crediting period of CDM projects, and CDM project investment respectively. As a result of research finding, it could be summarized as follows;

Respondents presented the reasons for CDM project developers to implement their projects with ranking from the most to least preferences in below table 1:

Table 1

Rationales of CDM implementation

Rank	Description	%
1	Due to carbon market price	25.7
2	By voluntary from organization executives	21.7
3	Mitigation of global warming	21.7
4	Utilizing excess energy or resources	19.1
5	Contributing community resources	7.2
6	Compliance with head quarter policy	2.0
7	Subsidizing from CERs investor	1.3
8	Other reasons	1.3
	Total	**100**

Note: Standard deviation = 15.991

Certainly, in the point of view of CDM project developers as business investment, they also intended to make profit of business from carbon market price (25.7 %) and utilize excess energy or resources (19.1 %) respectively. Praiseworthily, some CDM project developers who had been implementing CDM projects in Thailand award of mitigation of global warming and voluntary from organization executives equally (21.7 %) of each. The Chief Operating Officer of TBEC (Pajon Sriboonruang, personal communication, May 19, 2011) further affirmed that CDM project depended upon energy sources, operating cost, uncertainty of CDM project, and return on investment. The higher investment in CDM project, the longer rate of return would take time. In fact, the aim of CDM project implementation closely involved business benefit.

As a result of significant p-value which was greater than .05, that meant null hypothesis (H0) was acceptable. Therefore, the CDM project

attributes as follows: Size of CDM projects , CDM project types, CDM project groups, and Energy power technologies were not statistically significant difference within their groups for rationales of CDM project implementation. Only the CDM project attributes as follows: Crediting period of CDM projects and CDM project investment were statistically significant difference within their groups for rationales of CDM project implementation.

In conclusion, the results of hypothesis test for association between above-mentioned CDM project attributes and rationales of CDM implementation were summarized in Table 2

Table 2

Summary of association between CDM project attributes and rationales of CDM implementation

No	CDM Project Attributes	p-value	Hypothesis test	
			H_0	H_1
1	Crediting period of CDM projects	.021*		✓
2	Size of CDM projects	.090	✓	
3	CDM project investment	.008		✓
4	CDM project types	.068	✓	
5	CDM project groups	.121	✓	
6	Energy power technologies	.137	✓	

Note. * The Chi-square statistic was significant at the 0.05 level.

The table 3 presented the most to least important attractive factors influenced the CDM

project implementation were prioritized as follows; (1) CERs and/or VERs price , (2) Utilizing residue resources to value added, (3) CERs demand in carbon market increasing, (4) CDM promotion policy , and (5) Technological transfer dependency respectively.

Table 3

Attractive ranks of CDM project implementation

Attractive Factors	Rank	Mean Rank
CDM promotion policy	4	2.71
CERs demand in carbon market increasing	3	3.38
CERs and/or VERs price	1	3.76
Utilizing residue resources to value added	2	3.56
Technological transfer dependency	5	1.63

As a result, the most important attractive factors influenced the CDM project implementation was CERs and/or VERs price (3.76 of mean rank), it could be explained by TBEC executive interview. He also addressed that CDM project developers had concerned about return on investment and profits (Pajon Sriboonruang, personal communication, May 19, 2011).

Pablo (2007, pp.1367-1368) claimed the barrier factors for CDM projects, in general, faced three major groups: (1) Transaction costs, (2) Additional risks for investors, and (3) Other barriers such as financing of projects, institutional/ organizational barriers, low CER prices, and size matters.

Table 4

Barrier ranks of CDM project implementation

Barrier Factors	Rank	Mean Rank
Uncertain CDM promotion policy	2	7.05
No facilitation of tariff policy to CDM project	3	6.57
Lack of technical support from government agency	4	6.45
Scarcity of financial sources or difficulty to access financial support	7	5.05
Fluctuated CERs and/or VERs price in carbon market	5	6.38
Legal obstacles	1	7.26
Technology transfer dependency	6	5.19
Lack of resources to implement CDM project	8	4.44
Location influences CDM project	10	3.37
Environmental, health and safety influence community	9	3.60

As a result, the most to least important barrier factors influenced the CDM project implementation were prioritized as above-mentioned. Focusing on the top rank, Legal obstacles (7.26 of mean rank), TBEC executives explained that local governments determined regulation focusing on environmental impact protection because of pollution prevention (Pajon Sriboonruang and Ratchar Pathamapongsar, personal communication, May 19, 2011). None of them had pointed that investment promotion regulation such as BOI privilege regulation would be the legal barrier. An executive board of TGO (Panat Tasneeyanond, person communication, February 7, 2012) also addressed that CDM projects in Thailand had to perform strictly under enforcement of Factory Act B.E.2535 (A.D.1992) and Environment Protection and Conservation Act B.E.2535 (A.D.1992).

On the bases of relevant models from literatures as above-mentioned, causal factors affected to CDM policy implementation were categorized into 5 main factors that covered their initial stages of the policy execution as follows; (1) Economic and social condition, (2) Policy condition, (3) Policy Resources, (4) Communication, and (5) Policy disposition respectively. CDM project developers agreed to 3 causal factors led to CDM policy performance as follows; Policy Resources (3.7080 of mean), Economic and social condition (3.6611 of mean), and Communication (3.6628 of mean). On the other hand, both of Policy disposition (3.3555 of mean) and Policy condition (3.4031 of mean) were uncertain to the CDM policy performance.

Theodoulou and Kofinis (2004, pp. 193-194) identified four generic types of the most commonly used policy evaluation typologies and they were: process evaluation, outcome evaluation, impact evaluation, and cost-benefit analysis. Process evaluation of CDM policy accounted for the number of CDM projects registered to CDM EB (37 projects) and the number of CDM projects with CERs issued (5 projects). However, documented research presented the number of CDM projects in Thailand came after China, India and Vietnam respectively.

Consequently, the result of CDM policy implementation could be assessed in term of outcome and impact. OECD (2002) defined "outcome" as the likely or achieved short-term

and medium-term effects of an intervention's outputs (a result from intervention). Impact was defined as follows: Positive and negative, primary and secondary long-term effects produced by a development intervention, directly or indirectly, intended or unintended.

The researcher defined some questions were categorized as "policy impact" because their results from CDM policy implementation affected to community surrounding CDM project location. Other questions of CDM policy performance were factorized in order to classify their outcomes influenced CDM project developer's perception to implement their further projects. Factor analysis was used to summarize the interrelationships among the variables in a concise but accurate manner as an aid in conceptualization (Gorsuch, 1998, p. 2).

As a result of the KMO value was .636, and the p-value of Bartlett's test of sphericity was .000, it also implied there was significant correlations between variables. Both of diagnostic results as above mentioned, it concluded the datasets were further appropriate to factor analysis

Due to result of factor analysis, it was concluded that three factors of outcome, which could explain 69.106 % of variance cumulatively were further obtained to the CDM policy performance. In conclusion, CDM policy performance comprised of outcomes and impact as follows; (1) Outcome of taxation policy, (2) Outcome of financial provision, (3) Outcome of technological support, and (4) Policy impact respectively.

In order to construct a model for confirmation of variables, confirmatory factor analysis (CFA) was an instrument to describe that particular

relationship for variables. The researcher decided to adopt AMOS for confirmatory factor analysis. The result of AMOS graphic was shown path diagram for correlations between the critically causal factors (predictors) and the CDM policy performance include covariation between the predictors, which was also modeled. It was presented schematically in Figure 3
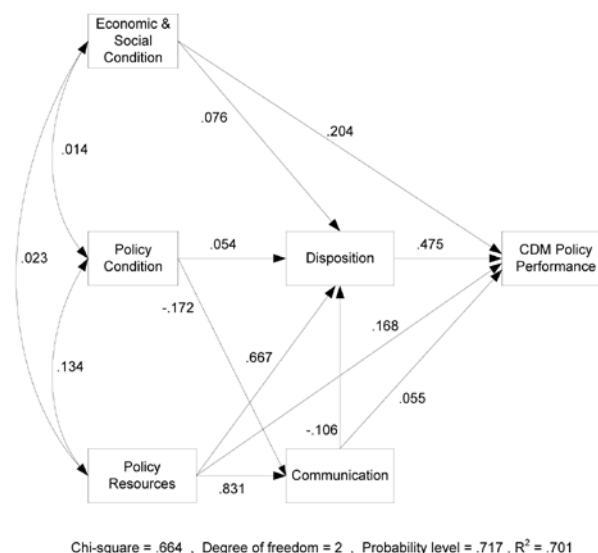

Chi-square = .664 , Degree of freedom = 2 , Probability level = .717 , R^2 = .701

Figure 3 Path Diagram for Value Model

As a result of R^2, the five causal factors could explain the CDM policy performance 70.1 %. Furthermore, standardized coefficients were calculated, the relationship between causal factors (independent variables) and CDM policy performance (dependent variables) could be shown;

$$Z = .475 (X_1) + .204 (X_2) + .168 (X_3) + .055 (X_4)$$

Where Z : CDM policy performance

      X1 : CDM policy disposition

      X2 : Economic and social condition

      X3 : Policy resources

      X4 : Communication

AMOS reported all details of correlations, covariance, and many fit indices of model. Indices

of model such as p-value of Chi-square, χ^2 / df, Normed-fit index (NFI), Incremental fit index (IFI), Comparative fit index (CFI), and Root mean square error of approximation (RMSEA) fitted to the data appropriately (see table 5).

Table 5

Indices and Criteria of Model Fit

Indices	Criteria	Result
Chi-square , p-value	$\geqslant 0.05$	.717
c^2 / df	0-2	.332
Normed-fit index (NFI)	$\geqslant 0.95$	.994
Incremental fit index (IFI)	$\geqslant 0.95$	1.012
Comparative fit index (CFI)	$\geqslant 0.95$	1.000
Root mean square error of approximation (RMSEA)	< 0.05	0.000

As a result of above outputs, they totally presented the model in figure closely fitted data. Anyways, the reason affected to fit model might be from many factors such as number of variables, small sample size, normality of distribution, or model complexity. Byrne (2001, p. 88) also indicated that fit indexes did not reflect the plausibility of a model and the judgment rested squarely on the shoulders of the researcher. Finally, Reise et al. (1993, p. 554) concluded that " no CFA model should be accepted on statistical grounds alone; theory, judgment, and persuasive argument should play a key role in defending the adequacy of any estimated CFA model".

According to proposed Policy Process Model, the result of research finding by linkage of each variables as mentioned above could be revised in further figure 4 below;
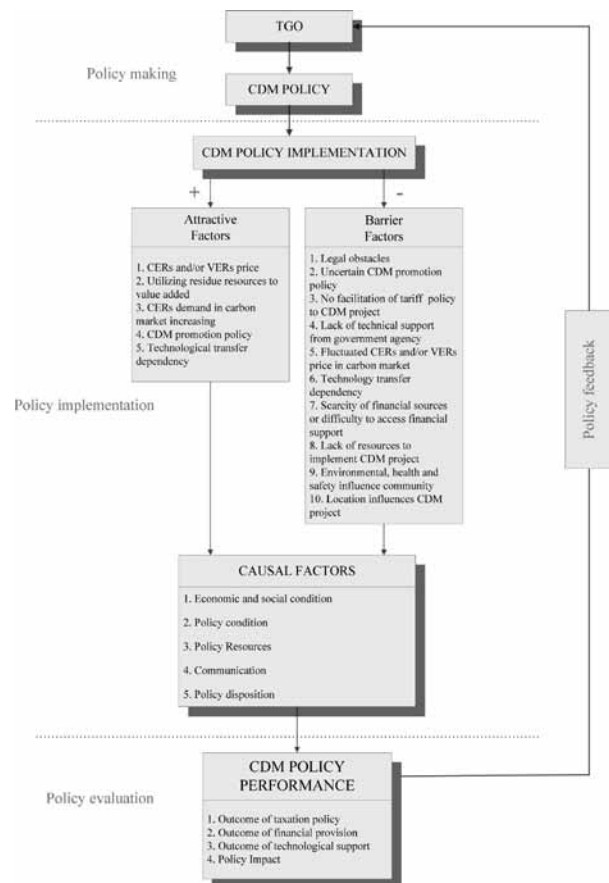

Figure 4 Result of CDM Policy Process Model in Thailand

With regards to AMOS reports, the model was necessary to be revised because of model fit and estimates result as shown in Figure 5.
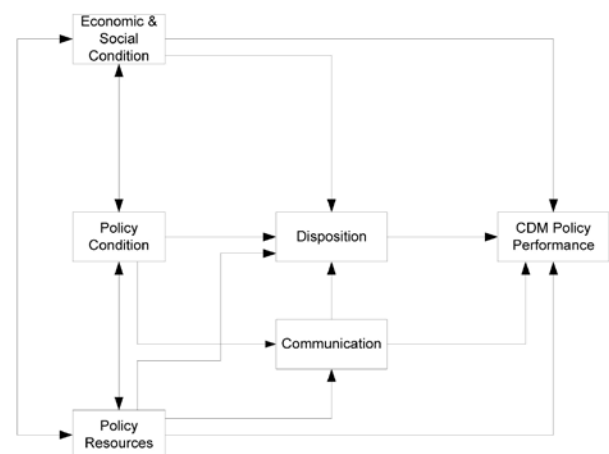

Figure 5 Result of Proposed CDM Policy Implementation Model

After COP15, Copenhagen Accord, CDM post 2012 might be driven to following issues; (1)

Registry process for emissions reductions targets and actions was yet voluntary and not legally binding; an internationally accepted compliance mechanism like the Kyoto Protocol should be needed, (2) Little clarity was provided in respect of new market mechanisms for Post-2012, (3) There was nothing that met the call from business, the financial sector and investors for long-term policy and regulatory frameworks to provide clarity on which to base investment decisions, and (4) No deadline to reach a legally binding agreement. TGO's executives also agreed that CDM should be ongoing, but it might reformed to fit. The CDM policy in Thailand should be Programmatic CDM or Programme of Activities (PoA) increasingly because that way would allow small firms together implementing one CDM project in order to save operating cost. At the point of view from TBEC's executives, they had same comment which CDM would be continued with voluntary and not legally binding.

Recommendations

One of the objectives of this research study is to make recommendations, which contribute to the improvement of CDM policy implementation in Thailand. According to the research's point of view and results of the data gathering, the following recommendations are proposed as follows:

1. With limitation of population size, it is strongly recommend another research expand population size by replace CDM project developers who LoA approval with CDM participants who submit LoI (Letter of Intent) that they are more numbers than LoA participants.

2. It is strongly recommend to study TGO officer perception for disposition of CDM policy.

3. As a result of Table 1, it seems to be praiseworthy for industrialized sectors who intend to mitigate global warming and energy saving in next decade. Thus, another research may extend scope of climate change mitigation for industrialized sectors.

4. Royal Thai government intensively provides appropriate technology resources to CDM project developers. It is not only environmental concerned but safety awareness must not be ignored.

5. In case of barrier factors, legal obstacles are the most important barrier for CDM project developers totally. Hence, concerned government agencies include local governments should review their legal list to contribute CDM project implementation.

Further Recommendation

1. Further research should be investigated in covering to DOE (Designated Operational Entity) who provides validation and/or verification for CDM projects.

2. Further research should be applied to another greenhouse gas (GHG) reduction projects such as carbon footprint, carbon label , that have been potential projects in Thailand.

3. Further research should strongly be focused on CDM and/or GHG mitigation of other interested parties such as community perception, local government contribution, related government agencies with qualitative study in term of field research or focus group interview.

References

Adhikari, S., Dutta, A., Mithulananthan, N., & Mathias, A. J. (2008). Potential of sustainable energy technologies under CDM in Thailand: Opportunities and barriers. *Renewable Energy Journal, 33*, 2122-2133.

Aisen, Z., Li, K. L., & Dejuan, L. (2011). Research on risks of clean technologies introduction under CDM mechanism. *Management Science and Engineering, 5*(3), 27-31.

Babbie, E. (1995). *The Practice of social research*. Belmont: Wadsworth Publishing Company.

Babbie, E., Halley, F., & Zaino, J. (2007). *Adventures in social research data analysis using SPSS 14.0 and 15.0 for Windows* (6th ed.). Thomsons Oaks: Pine Forge Press Publishers.

Bailey, K. (1994) *Methods of social research* (4th ed.). New York: The Free Press.

Barrett, P. (2007). Structure equation modeling: Adjudging model fit. *Personality and Individual Differences, 42*, 815-824.

Barret, S., & Fudge, C. (1981). *Policy action*. New York: Metheum and Co Ltd.

Bryman, A. & Cramer, D. (1995). *Quantitative data analysis for social scientists* (2 nd ed.). London: Routledge.

Bryman, A. (2006). Integrating quantitative and qualitative research: How is it done?. *Qualitative Research, 6*(1), 97-113.

Byrne, B. M. (2001). *Structural equation modeling with AMOS: basic concepts, applications, and programming*. Mahwah, New Jersey: Lawrence Erlbaum Associates, Inc.

Gorsuch, R. L. (1998). *Factor Analysis* (2nd ed.). Hillsdale: Lawrence Erlbaum Associates Inc Publishers.

Organisation for Economic Co-operation and Development. (2002). *Glossary of Key Terms in Evaluation and Results Based Management*. Retrieved from http://www.oecd.org/dataoecd/29/21/2754804.pdf

Pablo, D. R. (2007). Encouraging the implementation of small renewable electricity CDM projects: An economic analysis of different options. *Renewable and Sustainable Energy Reviews, 11*, 1361-1387.

Pressman, J., & Wildavsky, A. (1973) *Implementation*. Berkeley: University of California Press.

Theodoulou, S. Z. & Kofinis, C. (2004). *The Art of the game: Understanding American Public policy making*. Thomsons Oaks: Pine Forge Press Publishers.

Thomas, J. W. & Grindle, M. S. (1990). After the decision: Implementing Policy Reforms Developing Countries. *World Developing, 18*(8). 1163-1181.

Van, M. D. S. & Van, H. C.E. (1975). The Policy Implementation process: A Conceptual Framework. *Administration and Society, 6*(4), 445-488.