วารสารการจัดการสิ่งแวดล้อม ปีที่ 6 เล่มที่ 1 มกราคม-มิถุนายน 2553 หน้า 1-17
JOURNAL OF ENVIRONMENTAL MANAGEMENT Volume 6 / Number 1 / January-June 2010

การเปรียบเทียบเทคนิคการระบุผู้มีส่วนเกี่ยวข้องในกระบวนการตัดสินใจทางสิ่งแวดล้อม: กรณีศึกษาการจัดการน้ำแบบบูรณาการในจังหวัดสมุทรสงคราม

Comparison of Stakeholder Identification Techniques in Environmental Decision Making: A Case Study of Integrated Water Management in Samut Songkhram Province

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บทคัดย่อ

การวิจัยเชิงคุณภาพนี้มีจุดประสงค์เพื่อศึกษาเปรียบเทียบเทคนิคในการระบุผู้มีส่วนเกี่ยวข้องและทำการประเมินเทคนิคในการระบุผู้มีส่วนเกี่ยวข้อง ซึ่งเทคนิคที่ใช้มีความแตกต่างกันจำนวน 4 เทคนิค ประกอบด้วยการระบุผู้มีส่วนเกี่ยวข้องโดยวิธีเมตริกซ์ การระบุจากผู้เชี่ยวชาญ วิธีการลูกโซ่ และกระบวนการสนทนากลุ่มย่อย โดยใช้กรณีศึกษาเรื่องการจัดการน้ำเชิงบูรณาการในพื้นที่แม่น้ำแม่กลอง จังหวัดสมุทรสงคราม โดยผู้วิจัยได้กำหนดให้ประสิทธิภาพของผลลัพธ์ เวลา ค่าใช้จ่าย และสิ่งสนับสนุนเพิ่มเติมเป็นเกณฑ์ที่ใช้ในการประเมินประสิทธิผลของแต่ละเทคนิคดังกล่าวข้างต้น

ผู้วิจัยพบว่า ผลลัพธ์ที่ได้จากการระบุผู้มีส่วนเกี่ยวข้องที่มีความคล้ายคลึงกันในทุกเทคนิค คือ กลุ่มของเกษตรกร ชาวประมง ชาวบ้านในพื้นที่ และหน่วยงานราชการ สำหรับกลุ่มอื่นๆ พบว่าแต่ละเทคนิคให้ผลลัพธ์ในการระบุที่แตกต่างกัน ส่วนกลุ่มผู้มีส่วนเกี่ยวข้องที่เกิดจากการระบุโดยแต่ละเทคนิคโดยเฉพาะมี 15 กลุ่ม สำหรับประสิทธิภาพของแต่ละเทคนิคพบว่า เทคนิคเมตริกซ์ให้รายละเอียดในแง่ของอิทธิพลและความสำคัญได้ แต่ก็ควรคำนึงในเรื่องเวลา ค่าใช้จ่าย และความพยายามในการดำเนินการเมื่อผู้ศึกษามีความรู้ไม่เพียงพอเกี่ยวกับกรณีศึกษาและมีข้อมูล

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น้อย สำหรับเทคนิคอื่นๆ ประสิทธิภาพของผลลัพธ์จะขึ้นอยู่กับผู้ดำเนินการวิจัย นอกจากนี้ การระบุโดยเทคนิคผู้เชี่ยวชาญและวิธีการลูกโซ่พบว่า ใช้เวลาและค่าใช้จ่ายน้อย ส่วนกระบวนการสนทนากลุ่มย่อยจะใช้ค่าใช้จ่ายมากที่สุด

สรุปคือเทคนิคแต่ละเทคนิคมีจุดแข็งและจุดอ่อนที่แตกต่างกัน ไม่มีเทคนิคใดที่ดีที่สุดเมื่อพิจารณาตามเกณฑ์ของเวลาและค่าใช้จ่าย ดังนั้น ไม่ว่าจะเลือกใช้เทคนิคในการระบุผู้มีส่วนเกี่ยวข้องเพียงเทคนิคเดียวหรือหลายเทคนิคร่วมกันจึงขึ้นอยู่กับจุดประสงค์ของการศึกษา ความซับซ้อนของปัญหา เวลา และค่าใช้จ่ายเป็นสำคัญ

คำสำคัญ: ผู้มีส่วนเกี่ยวข้อง การระบุผู้มีส่วนเกี่ยวข้อง การจัดการน้ำแบบบูรณาการ จังหวัดสมุทรสงคราม

Abstract

This qualitative research is aimed to investigate efficiency of four different stakeholder identification techniques, i.e., identification by using the importance-influence matrices, identification by the experts, snowball sampling, and focus group discussion. Evaluation criteria involved effectiveness of the results, time spent, expense, and requirements of additional supports. A case study of integrated water management was conducted on the Mae Klong river in Samut Songkhram province.

For the stakeholder identification outcomes, the similarities among the outcomes of all techniques are apparently shown in farmers and fishermen, local villagers and government officers categories. For other categories, different techniques provided different results. There were fifteen stakeholder groups that were suggested by each particular technique. For the effectiveness of each technique, the stakeholder identification by using the matrices implicitly provided degrees of significance of stakeholders in terms of importance and influence. However, it could be time, cost, and effort consuming process when the examiner had inadequate knowledge about the case study and there was very little information available. For other techniques, the results were likely subjec tive. In addition, for the identification by the experts and snowball sampling techniques, a great deal of time and cost was spent on travelling. A focus group discussion could be considered as the most cost consuming for arrangement.

In a conclusion, each technique was found to have different strengths and weaknesses. To choose the most appropriate stakeholder identification technique for each case study, complexity of the problem, time, budgets, as well as information availability should be taken into account.

Keywords: stakeholder, stakeholder identification, integrated water management, Samut Songkhram province

1. Introduction

In recent years, public participation apparently increases its importance in decision making involving environmental sustainability from local to international scales (Grimble and Chan, 1995; Grimble and Wellard, 1997; Brown et al., 1998; 2000; 2001; Webler et al., 2001; Hemmati, 2002; Reed, 2008). Public participation involves the bottom-up approach, i.e., provides opportunity to local people and local agencies that will be affected by the proposed policy program to play their roles in every steps of decision making from sharing information and concept, setting goals and relevant criteria for the problem solving, and evaluating alternatives to establishing a management plan. This can lead to better decisions, i.e., they could be able to solve problems and in addition respond to real needs of local people (Beierle and Cayford, 2002). There are then many laws, regulations, and policies enforcing public participation to be involved in the environmental decision-making such as Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA). Hence, there is need for decision makers to recognize who should be involved in the decisions. To understand that, it is known as stakeholder analysis.

The stakeholder approach was first developed in the business and management sectors for solving problems in complex social systems (Phillips et al., 2003). Today, Stakeholder Analysis (SA) is also recognised as a powerful tool for sustainable natural resources management (Grimble and Chan, 1995; Grimble and Wellard, 1997; Brown et al., 1998; 2000; 2001; Turner et al., 2000; Hemmati, 2002). Grimble and Wellard (1997) define SA as 'a holistic approach or procedure for gaining an understanding of a system, and assessing the impact of changes to that system, by means of identifying the key actors or stakeholders and assessing their respective interests in the system'. In environmental management, Reed et al. (2009) define stakeholder analysis as 'a process that defines aspects of a social and natural system affected by a decision or action, identifies individuals and groups who are affected by or can affect those parts of the system and prioritize these individuals and groups for involvement in the decision-making process'. Stakeholder analysis consists of i) identifying stakeholders; ii) categorizing stakeholders; and iii) investigating relationships between stakeholders.

There is no universal method of applying stakeholder analysis (Grimble amd Chan, 1995; Grimble and Wellard, 1997; Friedman and Miles, 2006; Reed et al., 2009). The approach is needed to be adapted to particular purposes, study contexts and also stages of the analysis. It can involve comparative analysis of the perspectives, objectives, and interests of stakeholders at several levels (Grimble and Chan, 1995; Grimble and Wellard, 1997; Phillips et al., 2003). Currently, models of stakeholder analysis

apply a range of tools on both qualitative and quantitative data to understand stakeholders, their positions, influences with other groups, and interests in a particular reform (Friedman and Miles, 2006; Reed et al., 2009).

This research is aimed to investigate and evaluate techniques for identifying stakeholders (the first step of stakeholder analysis). A case of water management was chosen because water-related problems had been still serious in Thailand. These include not only water shortage or flood but also problems in terms of water quality. The problems cause severe damage and adverse impact economically and also socially. According to announcement by Department of Water Resources (2008), there was a serious case of very poor water quality found in the Lower Tha Chin basin. A case study of the Mae Klong river basin in Samut Songkhram province was then selected. In the area, water resource is vital because it is used for sanitary uses, agriculture, fisheries, industries, as well as transporta tion. There are water gates built to block the salt intrusion. Unfortunately, it changes the flow regime of the canals leading to ecological imbalances, as well as socio-economical problems (Piumsomboon, 2000). To solve the problem, the integrated water management plan has to be proposed and to achieve that relevant stakeholders should be involved in the decision making process.

2. Methodology

Research methodology can be divided into three main steps as described in the following sections.

2.1 Defining Scope of the Research

This study focused on evaluating effectiveness of four well-known stakeholder identification techniques; (1) identification by using the importance-influence matrices (developed by ODA; 1995), (2) identification by the experts, (3) snowball sampling, and (4) focus group discussion. Overview of each stakeholder identification technique is described in Table 1. The case study chosen is a decision making on managing water of the Mae Klong River in Phrak Nam Daeng sub-district, Amphawa district, Samut Songkram province.

Table 1 Processes and examiners involving in each stakeholder identification technique

Techniques	Processes	Examiner(s)
1. Identification by using the impor tance-influence matrices	The significance of each stakeholder is considered by the degrees of importance and influence with respect to that stakeholder.	examiner/ researcher
2. Identification by the experts	Experts will be asked to identify stakeholders.	a group of experts with relevant experence and/or knowledge in relevant fields
3. Snowball sampling	An initial stakeholder (specified by the examiner) is asked to address other two or three stakeholders (the second and third stakeholders are spared, in case that the first and second stakeholder could not be found and interviewed), the first stakeholder suggested by the initial stakeholder is then asked to identify other two or three stakeholders and the processes will be repeated until the stakeholder addressed is replicated.	samples of stakeholders
4. Focus group discussion	A group of relevant stakeholders (identified by the examiner) is asked to brainstorm to address relevant stakeholders.	samples of stakeholders

2.2 Applying the Stakeholder Identification Techniques to the Case Study

2.2.1 Identification by Using the Importance-Influence Matrices

Each relevant person from a list of possible stakeholders made by the researcher, as the examiner, were plotted onto a two dimensional matrix according to his/her significance in terms of the degrees of importance and influence. Importance refers to the significance of the problem/study area for each stakeholder. Hence, an important stakeholder would be who lives in the study area or whose livelihood depends on

the natural resources in the area. Influence is related to the power (e.g., due to ownership or legal authority) that stakeholders have to control the uses of, and access to resources. The assessment was undertaken underlying information from literature reviews; field survey; and interviews with the villagers, the village leaders, and the farmers in the area.

2.2.2 Identification by the Experts

A group of relevant experts was interviewed for their opinions towards a group of people that played significant roles in the case study. Semi structured- interviews were applied. A total of nine experts including three local people, three government officers, and three academics were selected for the interviews. Local people were a village headman, and two villagers who were well-respected as having a lot of knowledge about the study area. Experts from the government were an officer of Samut Songkhram Agricultural Office, an officer from the Ministry of Natural Resources and Environment, and the Royal Irrigation Department officer. Academic experts were three lecturers of the Faculty of Environment and Resource Studies, Mahidol University.

2.2.3 Snowball Sampling

Initially, a farmer, as the first stakeholder named by the researcher, was asked, by means of the semi structured- interviews, to address other two stakeholders and the first stakeholder addressed was then asked to identify other two stakeholders. The processes were repeated until the first stakeholder recommended was replicated. Final results were summarized by the researcher. For this research, the interviews were conducted with six people from four different occupations.

2.2.4 Focus Group Discussion

A total of twenty-four participants including a group of villagers, farmers, and government officers were invited for the discussion. These were then divided into four sub-groups for a focus group discussion. Each sub-group consisted of all different careers and a moderator (i.e., researcher or assistants). The group was asked to brainstorm on the subject of identifying stakeholders, and conducted by the moderator.

2.3 Evaluating the Techniques

Criteria employed to evaluate effectiveness of the stakeholder identification techniques for this research were integrated between the suggestion by Simon (1960); Rauschmayer and Risse (2004), and Rowe and Frewer (2000). The criteria are the effectiveness of the results, time spent, and expense. Amount of time spent involved in the identification processes itself (e.g., interviews and discussions), and the preparation process (e.g., making appointments). Expenses included cost for both undertaking the identification

processes and travelling. In addition, supports in terms of supplementary information and advice from the outsiders such as the experts and researchers were also investigated.

3. Results

The results of this study can be divided into two parts: stakeholder identification outcomes and the effectiveness of the techniques. Each part can be described below.

3.1 Stakeholder Identification Outcomes

As seen in Table 2, the similarities among the outcomes of all techniques are apparently shown in farmers and fishermen, local villagers, and government officers categories.

In farmers and fishermen category, the stakeholders identified by every technique are snakeskin gourami fish farmers, shrimp farmers, paddy field farmers, and orchard and vegetables farmers. For government officers, the officers of the Royal Irrigation Department, Department of Water Resource, Pollution Control Department, Samut Songkhram Agricultural Office and Sub-district Administration Organization were addressed by all four techniques. In addition, saving group of Phrak Nam Daeng sub-district, pig farm owners and factories were identified as stakeholders by all techniques.

Stakeholders that were suggested from three techniques out of four are sub-district headman, village headman, and the officers of Department of Fisheries (not recommended by snowball sampling), Mae Klong Lover Group (not suggested by the focus group discussion), and the officers of Department of Livestock (not specified by the matrices).

With respect to the differences, from Table 2, there are fifteen stakeholder groups that were suggested by every particular technique. Academics were particularly recommended by the matrices. Similarly, some of the government officers, i.e., the officers of Water Resources Office Section 7, Samut Songkhram Waterwork, Samut Songkhram Land Development Office, Samut Songkhram Community Development Office, Samut Songkhram Chamber of Commerce, and Coordination Center for Rural Research were only appeared in the matrices. Samut Songkhram Health Center was considered as relevant by the experts. The stakeholders only identified by snowball sampling were local waterway users and local fishermen. The focus group discussion recommended garbage dumpers, non-local fishermen, students, and researchers as relevant.

Table 2 Stakeholder Identification Outcomes

Stakeholders	Techniques			
	Identification by Using the Matrices	Identification by the Experts	Snowball Sampling	Focus Group Discussion
1. Farmers and Fishermen				
Snakeskin gourami fish farmers	/	/	/	/
Shrimps farmers	/	/	/	/
Paddy field farmers	/	/	/	/
Orchards and vegetables farmers	/	/	/	/
Local fishermen			/	
Non-local fishermen				/
2. Local villagers				
Local Villagers	/	/	/	/
Sub-district Headman and Village Headman	/	/		/
3. Government officers				
The Royal Irrigation Department	/	/	/	/
Department of Water Resource	/	/	/	/
Pollution Control Department	/	/	/	/
Department of Livestock		/	/	/
Ministry of Natural Resources and Environment	/	/		
Water Resources Office Section 7	/			
Sub-district Administration Organization and Provincial Administration Organization	/	/	/	/
Samut Songkhram Agricultural Office	/	/	/	/
Samut Songkhram Waterwork	/			
Samut Songkhram Land Development Office	/			
Samut Songkhram Community Development Office	/			
Samut Songkhram Chamber of Commerce	/			
District Chief Officer		/		/
Governor		/		/

Table 2 Stakeholder Identification Outcomes (cont'd)

Stakeholders	Techniques			
	Identification by Using the Matrices	Identification by the Experts	Snowball Sampling	Focus Group Discussion
Provincial Industry		/		/
Samut Songkhram Health Center		/		
Coordination Center for Rural Research	/			
4. Academics				
Lecturers at Kasetsart University	/			
Lecturers at Mahidol University	/			
Lecturers at Silpakorn University	/			
5. Other				
Mae Klong Lover Group	/	/	/	
Saving group of Phrak Nam Daeng Sub-district	/	/	/	/
Pig farm Owners	/	/	/	/
Fisheries Agency	/	/		/
Factories	/	/	/	/
Local waterway users			/	
Garbage dumpers				/
Students and Researchers				/

Due to the nature of the stakeholder identification process that is likely subjective, different results could be caused by many reasons. Different point of views towards the case study; and different levels of knowledge, experiences, and familiarity with the study area could cause the different opinions. For example, the outcomes of the matrices assessed by the researcher showed the concern about the role of the local government officers and academics more than other techniques. On the other hand, the outcomes of snowball sampling and focus group discussion mostly undertaken by local people and local officers who are closer to the problem rather concerned specific groups of people, i.e., the local waterway users, fishermen, and garbage dumpers.

3.2 Effectiveness of the Techniques

Considering the evaluation criteria described earlier, the effectiveness of each technique can be assessed as below.

3.2.1Effectiveness of the Results

As the stakeholder identification by using the matrices is likely robust, the results provided were likely tangible. The technique provided a good platform to not only identify stakeholders but also specify key stakeholders. Degrees of significance of stakeholders in terms of importance and influence were implicitly revealed, while details regarding relationships and conflicts between stakeholders were explicitly shown. In contrast to the remaining techniques, the stakeholders were mainly identified base on either direct experiences and knowledge or assumption of the experts, the interviewees, and the discussion members. Hence, the results were likely subjective. However, relationships or conflicts between stakeholders could be expressed during the interviews or the meetings.

3.2.2 Time

This research took into account amount of time spent for the whole identification processes including preparation. As a result, time consumed by different techniques was varied. However, it could be noticed that the most of the time was spent on travelling.

For the identification by the experts and snowball sampling techniques, a great deal of time was spent on travelling. The further interviewees are, the higher travelling time spent. For this research, the experts were in different places, i.e., local villagers and local government officers were in or close to the area of case study, but the academics were outside the case study area. Therefore, most of the time was spent for travelling to undertake the interviews, while the interviewing time could be controlled, i.e., took approximately an hour per person. A total of eight days was spent: two days for the interviews with the local people, one day for the government officers, three days for the academics (a day for each academic), and another two days for analysing the results. For snowball sampling, fortunately, the interviewees recommended the stakeholders whom were all in or close to the study area. A total of five days was then spent, i.e., two days for the interviews and another three days for result investigation.

For a focus group discussion, although the meeting can be completed in a day, the preparation and analysis processes could be a little time consuming. A total of four and a half days were spent for a group discussion: one day for making appointments with different groups of participants, half a day for the discussion, and other two days for analysing the results. Similarly, the identification by using the matrices itself is not a time consuming process as the assessment mainly depends on the examiner, i.e., no travelling

required. However, a great deal of time could be taken if the examiner has inadequate knowledge about the case study and there was very little information available. For this research, a total of eleven days were spent; ten days for collecting all relevant data (from literatures, interviews, and field survey) and one day for the assessment.

3.2.3 Expense

Similar to the time spent, expense involved the cost for the whole identification processes including arrangement. As a result, arranging a focus group discussion cost most. This is because there were extra cost for arranging the meeting, despite the travelling cost, i.e., hiring a meeting place and equipments, food, souvenirs, and compen sation for the participants. In addition to that, there might be cost for hiring moderators. For the remaining techniques, most of the cost was travelling cost. For the identification by the experts and snowball sampling, the further interviewees were, the higher travelling cost spent. To identify by using the matrices, the expenses could be varied depending on expertise of the examiners and availability of information. For this case, there were some cost for field survey and interviews to obtain supplementary information.

3.2.4 Additional Supports

The stakeholder identification by using the matrices could be considered as the most supports consuming for a case that the examiner had inadequate knowledge and/or experiences with the case study. For that, additional supports in terms of information are highly required for making an appropriate decision. For the identification by the experts, similarly, supplement information may be required for the most effective decision making. On the other hand, snowball sampling and the focus group discussion require less supports because the participants mostly have adequate experience and/or knowledge. However, moderating skills and interviewing skills are important for conducting the discussion and snowball sampling, respectively.

Summary of the effectiveness of each stakeholder identification technique in terms of the effectiveness of the results, time, expense, and additional supports required is presented in Table 3.

Table 3 Effectiveness of the stakeholder identification techniques

Techniques	Effectiveness of the Results	Time	Cost	Additional Supports Required
1. Identification by using the matrices	Results are tangible; key stakeholders can also be specified	Depending on background data/ information available and expertise of the examiner	Depending on information required	Supplementary information and advice from relevant people may be required depending on expertise of the examiner
2. Identification by the experts	Results are subjective depending on knowledge and experience of the experts	Depending on number of the experts and their location	Depending on number of the experts and their location	Supplementary information may be required depending on expertise of the experts
3. Snowball sampling	Results are subjective depending on knowledge and experience of the interviewees	Depending on number of the interviewees and their location	Depending on number of the interviewees and their location	-
4. Focus group discussion	Results are subjective depending on knowledge and experience of the participants	Controllable but there is some additional time required for preparation	High	Moderators for the meeting

4. Conclusions

Stakeholders identified by four different techniques are mainly similar but slightly different in details. However, the best technique for identifying stakeholders cannot be revealed. Each technique was found to have different strengths and weaknesses, as briefly presented in Table 4. The stakeholder identification by using the matrices implicitly provided degrees of significance of stakeholders in terms of importance and influence. However, it could be time, cost, and effort consuming process when the examiner has inadequate knowledge and/or experiences about the case study; and there was very little information available. For other remaining techniques, the results were likely subjective. For the identification by the experts and snowball sampling techniques, a great deal of time and cost was spent on travelling. For the identification by the experts, supplement information may be required for the most effective decision making. In contrast, snowball sampling and the focus group discussion require less supports in terms of information, but interviewing and meeting moderating skills. A focus group discussion could, however, be considered as the most cost consuming for arrangement.

Table 4 Strengths and Weaknesses of the Stakeholder Identification Techniques

Techniques	Strengths	Weaknesses
1. Identification by using the matrices	- Be able to clearly specify key stakeholders (from their degrees of importance and influence) - Details regarding relationships and conflicts between stakeholders are implicit provided	- Quality of the results mostly depends on the degree of expertise of the examiner - Extra cost, time, and efforts are required if examiner has inadequate knowledge/ experience, e.g., to obtain adequate information
2. Identification by the Experts	- Little information about the case study is required - Details about relation-ships and conflicts between stakeholders can be explicit provided	- Quality of the results mostly depends on the degree of expertise of the experts - Sometimes, additional infor-mation about the case study is needed

Table 4 Strengths and Weaknesses of the Stakeholder Identification Techniques (cont'd)

Techniques	Strengths	Weaknesses
		- Some efforts including cost and time are consumed, e.g., for making appointment and travelling for interviews - Extra effort is required in analysing the results and finding the conclusion
3. Snowball Sampling	- Little information about the case study is required - Details about relationships and conflicts between stakeholders can be explicit provided	- Quality of the results mostly depends on the degree of expertise of the sampling - Sometimes, additional information about the case study is needed - Cost, time, and efforts are consumed, e.g., in finding the person to be interviewed - Extra effort is required in analysing the results and finding the conclusion
4. Focus group discussion	- Little information about the case study is required - Details about relationships and conflicts between stakeholders can be explicit provided - Less time spent (less travelling)	- Quality of the results mostly depends on the degree of expertise of the group discussion members - High Expense - A lot of efforts are required since preparing a meeting (e.g., making appointment) until undertaking a meeting (e.g., handling the discussion and analysing the results, finding the conclusion)

In a conclusion, each technique was found to have different strengths and weaknesses. Following Grimble & Chan (1995) and Grimble & Wellard (1997), for the most appropriate application of stakeholder analysis, the approach needs to be adapted to particular purposes and study contexts. However, the research found that complexity of the problem, time, budgets, as well as information availability should also be taken into account in selecting any technique. For a case of complicated problem with adequate information, the matrices might be one of the most appropriate techniques. But, when more details about the relationships among the stakeholders, including views on the problem and possible conflicts are required, a focus group discussion could be a suitable process.

Nevertheless, beyond the aim to identify sufficient diversity of views, the stakeholder identification technique should be able to improve the ability of the technique itself to enhance equity, efficiency, empowerment and environmental sustainability (Agarwal, 2001; Enayati, 2002). Stakeholder approach can be complemented with other approaches to economic and social analysis in order to achieve such goals (Grimble and Chan, 1995; Grimble and Wellard, 1997; Turner et al., 2000).

Acknowledgements

This research work in supported by the grant from the Center for Toxicology, Environmental Health and Management of Toxic Chemicals under Science & Technology Postgraduate Education and Research Development Office (PERDO) of the Ministry of Education. Moreover, author gratefully acknowledged to Dr. Raywadee Roachanakanan and Mr. Patompong Saguanwong Faculty of Environmental and Resource Study, Mahidol University, and Dr. Foyfa Shutidamrong Faculty of Agriculture Kamphaeng Saen, Kasetsart University Kamphaeng Saen Campus for supports and helpful comments.

Bibliography

Agarwal, B. 2001. Participatory Exclusions, Community Forestry, and Gender: an Analysis for South Asia and Conceptual Framework. **World Development**. 29: 1623-1648.

Beierle, T.C. and Cayford, J. 2002. Democracy in Practice: Public Participation in Environ mental Decisions. **Resources for the Future**, Washington, DC.

Brown, K., Adger, N., Tompkins, E., Bacon, P., Shim, D., and Young, K. 1998. **CSERGE Working Paper: A Framework for Incorporating Stakeholder Participation in Marine Resource Management: A Case Study in Tobago**. United Kingdom: University of East Anglia and University Collage of London.

Brown, K., Adger, N., Tompkins, E., Bacon, P., Shim, D., and Young, K. 2000. **CSERGE Working Paper: Trade-off Analysis for Marine Protected Area Management**. United Kingdom: University of East Anglia and University Collage of London.

Brown, K., Tompkins, E., and Adger, N. W. 2001. **Trade-off Analysis for Participatory Coastal Zone Decision-Making**. Overseas Development Group (ODG), UK: University of East Anglia.

Bryson, J., Cunningham, G. and Lokkesmoe, J. 2002. What to do when stakeholders matter: the case of problem formulation for the African American men project of Hennepin County, **Minnesota Public Administration Review**. 62, 568-584.

Chevalier, J. M. 1997. **Stakeholder Analysis and Natural Resource Management**. Ottawa: Carleton University. Retrieved December 8, 2007 from http://www1.worldbank.org/publicsector/politicaleconomy/November3Seminar/StakehIder%20Readings/SA Chevalier.pdf

Department of Water Resources. 2008. **Role in Thailand' water management**. Department of Water Resources.

Enayati, J. 2002. The Research: Effective Communication and Decision-Making in Diverse Groups. In Hemmati, M. **Multi-Stakeholder Processes for Governance and Sustainability: Beyond Deadlock and Conflict**. London: Earthscan Publications.

Friedman, A. and Miles, S. 2006. **Stakeholders: theory and practice**. United Kingdom: Oxford University Press.

Grimble, R., Chan, M.K., Aglionby, J., and Quan, J. 1995. **Trees and trade-offs: a Stakeholder Approach to Natural Resource Management**. London: International Institute for Environment and Development.

Grimble, R. and Chan, M. 1995. Stakeholder Analysis for Natural resource Management in Developing Countries. **Natural Resources Forum**. 19: 113-124.

Grimble, R. and Wellard, K. 1997. Stakeholder Methodologies in Natural Resource Management: a Review of Principles, Contexts, Experiences and Opportunities. **Agricultural Systems**. 55: 173-193.

Hemmati, M. (2002). **Multi-Stakeholder Processes for Governance and Sustainability: Beyond Deadlock and Conflict**. London: Earthscan Publications.

Mitchell R., Agle, B., and Wood, D. 1997. Towards a Theory of Stakeholder Identification: Defining the Principle of Whom and What Really Counts. **Academy of Management Review**, 22(4): 853–886.

Overseas Development Administration (ODA). 1995. **Guidance Note on How to Do Stakeholder Analysis of Aid Projects and Programmes**. UK: ODA.

Phillips, R., Freeman, R., and Wicks, A. 2003. What Stakeholder Theory is Not. **Business Ethics Quarterly**. 13: 479-502.

Piumsomboon A. 2000. **Mae Klong River**.Retrieved December8, 2007 from http://data. ecology.su.semnodeAsiaThailand maeklongrivermaeklong bud .htm

Rauschmayer, F. and Risse, N. 2004. A framework for the selection of participatory approaches for SEA. **Environmental Impact Assessment Review**. 25: 650-666.

Reed, S.M., Graves, A., Dandy, N., Posthumus, H., Hubacek, K., Morris, J., Prell, C., Quinn, H.C., and Stringer, C. L. 2009. Who'in and why? A typology of stakeholder analysis methods for natural resource management. **Journal of Environmental Management**. 90(5): 1933-1949.

Reed, S.M. 2008. **Stakeholder participation for environmental management: a literature review**. Leed: Sustainability Research Institute (SRI), School of Earth and Environment, the University of Leeds. Retrieved February 11, 2009 from http:// www.see.leeds.ac.uk/sri

Rowe, G. and Frewer, L. G. 2000. Public Participation Methods: a Framework for Evaluation. **Science, Technology & Human Values**. 25(1): 3-29. Retrieved March10, 2009 from http://sth.sagepub.com/cgi/content/abstract/25/1/3

Simon, H.A. 1960. **The New Science of Management**. New York: Harper and Row.

Turner, K., van der Bergh, J., Soderqvist, T., Barendregt, A., van der Straaten, J., Maltby, E., and van Ierland, E. 2000. Ecological-Economic Analysis of Wetlands: Scientific Integration for Management and Policy. **Ecological Economics**. 35: 7-23.

Webler, T., Tuler, S., and Krueger, R. 2001. What is a Good Public Participation Process? Five Perspectives from the Public. **Environmental Management**. 27, 435-450.