

# Public Participatory Disaster Management Model: A Case Study of the Asian Cities Climate Change Resilience Network in Hat Yai, Songkla Province, Thailand

## รูปแบบนโยบายสาธารณะกับการจัดการภัยพิบัติ กรณีศึกษา: โครงการ เครือข่ายเมืองในเอเชียเพื่อรับมือกับ การเปลี่ยนแปลงสภาพภูมิอากาศ อ.หาดใหญ่ จ.สงขลา

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### บทคัดย่อ

งานวิจัยในครั้งนี้เป็นการศึกษาเชิงนโยบายสาธารณะที่เกี่ยวข้องกับการมีส่วนร่วมของชุมชนโดยมุ่งเน้นการนำเสนอตัวแบบสำหรับการจัดการภัยพิบัติอย่างยั่งยืนสำหรับอำเภอหาดใหญ่ จังหวัดสงขลาของประเทศไทย กระบวนการวิจัยได้แบ่งออกเป็น 3 ขั้นตอน โดยขั้นตอนแรกเป็นการเก็บรวบรวมข้อมูลจากข้อมูลที่เป็นเอกสารวิชาการต่างๆ ที่เกี่ยวข้อง การสัมภาษณ์เชิงลึกกับผู้ให้ข้อมูลหลัก (Key informants) และการจัดทำสนทนากลุ่มกับผู้ที่มีส่วนได้เสีย (Stakeholders) ขั้นตอนที่สองเป็นกระบวนการพัฒนาตัวแบบนโยบายสาธารณะในการจัดการกับปัญหาภัยพิบัติ และขั้นตอนที่สามเป็นการรวบรวมข้อมูลความคิดเห็นที่มีต่อตัวแบบจากการนำเสนอในงานสัมมนาวิชาการที่เกี่ยวข้อง ผลการศึกษาแสดงให้เห็นว่า ปัจจัยที่เป็นตัวกำหนดความสำเร็จของตัวแบบนโยบายสาธารณะประกอบด้วยมิติที่สำคัญ 8 ประการ ประกอบด้วย มิติด้านสังคม การจัดการ กระบวนการจัดการ มิติการมีส่วนร่วม การจัดการความสัมพันธ์ทางการเมือง ด้านความเป็นอันหนึ่งอันเดียวกับนโยบาย ด้านการมุ่งผลสัมฤทธิ์ และด้านการประสานงานและความร่วมมือ นอกจากนี้ ปัจจัยที่จะทำให้การนำนโยบายไปสู่การปฏิบัติให้ประสบผลสำเร็จประกอบด้วย ความเหมาะสมของพื้นที่ การสื่อสารอย่างมีประสิทธิภาพสู่กลุ่มเป้าหมายและสาธารณะ ความร่วมมือกับหน่วยงานต่างๆ ที่เกี่ยวข้อง และการพัฒนาสารสนเทศและฐานข้อมูลองค์ความรู้ที่เหมาะสมต่อการตัดสินใจเชิงนโยบาย

**คำสำคัญ:** การจัดการภัยพิบัติ นโยบายสาธารณะ อำเภอหาดใหญ่ การมีส่วนร่วมของชุมชน

### ABSTRACT

This research is a public participatory policy study which aims at proposing a model for sustainable disaster management in Hat Yai district, Songkhla province, in Thailand. The research methods were divided into three steps: the first step was the data collection from relevant documents, in-depth interviews, and focus groups with stakeholders and key informants; the second step was the process of

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developing a model of public policy for disaster management; and the third step was data collection from seminars and group discussion with the public and at conferences. The results revealed eight dimensions in developing a public policy model with regard with the study. They included social involvement, organization establishment, management procedures, the participatory dimension, political relationship management, the unity of public policy, the result-oriented dimension, and networking and coordination. Furthermore, the key success factors for the sustainable disaster management of policy implementation included policy that suited the context of the area, effective communication with the target groups and the public, cooperation with the concerned agencies, and the development of an information and knowledge database for proper decision making.

**Keywords:** Disaster management, Public policy, Hat Yai, Participation, Community

## INTRODUCTION

Climate change is currently occurring around the world both at local and global levels and tends to increase the occurrence and severity of natural disasters. It has been reported that water plays a major role in 70% of the disasters worldwide (Brooks, 2003), especially flooding, which is the most severe natural disaster. In Thailand, there are various forms of natural disasters. Each of them causes immense damage to life and property and also contributes to climate change, which in turn leads to an annual rise in temperature. In 2057, the temperature will potentially be higher than 35 degrees Celsius for more than 100 days in almost all regions of Thailand. More importantly, the risk of flooding and drought in the monsoon season will increase (AmnartChidthaisong et al., 2010). Climate change policy has been addressed in the National Master Plan on Climate Change Impact but the political fluctuation has made the government unable to establish practical policy for the relevant ministries, departments, and agencies to be implemented in a timely manner. Moreover, the research related to urban disaster policy has received relatively little attention and there is still a lack of continuity in actual implementation. Thus, it is essential to develop

preparedness plans for disaster, including policy establishment, communication, the decision-making of local authorities, and disaster surveillance in communities. In the previous policy, there was little communication during the process of policy formulation. However, some local administrative organizations have placed importance on natural disaster issues and have taken action to reduce the impact of climate change for several years (Department of Disaster Prevention and Mitigation, 2008). In terms of the policy formulation in Thailand, it was found that each governmental agency has its own policy. Local administrative organizations adopt decentralization policies but they unfortunately do not take an active part in disaster management. Therefore, this present research discusses the development of a model of public policy on disaster management in Hat Yai District, Songkla Province, Thailand. Nowadays, Hat Yai is a tourist destination with rapid urban expansion, which is the cause of frequent flooding. However, its lack of collaboration has resulted in limited disaster assistance that cannot be thoroughly distributed. In addition, Hat Yai still has no effective mechanism for long-term recovery management related to the area development, which is crucial to sustainable disaster management.

As a consequence, the present study aimed to develop a model of public participatory policy for disaster management in Hat Yai District, Songkla Province and to present an appropriate approach for sustainable disaster management in that area. This study has linked and integrated knowledge from relevant parties. The impacts and adaptation measures for all sectors were taken into account in order to formulate the developed model into the public policy for a sustainable disaster management solution. This is considered an important principle and concept of knowledge organization, which can be further studied and applied in accordance with different contexts in the future.

## LITERATURE REVIEW

### Definition and Theoretical Concept of Flood Management

Yala's Disaster Prevention and Mitigation Office defined a flood as a natural hazard occurring from an overflow of sea water and river water onto land. Floods can submerge people's houses and cause great loss of life and property damage. Natural floods can be summarized into 5 categories (Department of Environmental Quality Promotion, n.d., cited in TewartManeechai, 2007), which are: (i) river floods caused by high tides; (ii) flash floods due to prolonged heavy rains in high headwater areas, tropical cyclones, monsoon troughs, strong monsoons, and thunderstorms; (iii) storm surges, which are caused by tropical cyclones; (iv) drainage flooding which arises from tropical cyclones, monsoon troughs, strong monsoons, and thunderstorms; and (v) tsunamis, which are caused by earthquakes, volcanic eruptions, and landslides.

Considering the past flooding, PallopKritayanawach (2012) studied the report of Centre for Research on the Epidemiology of Disasters (CRED)

and found that flooding in 2010 alone caused damage to many countries and affected as many as 178 million people. Flood disasters have constantly occurred in various countries around the world and caused great loss of life and severe damage to houses, property, and the economic status of each country during the past century. The International Strategy for Disaster Reduction (ISDR) reported that more than 7,486 hydro-meteorological events occurred in the last century. According to the EM-DAT disasters database, the flood disasters that generated the greatest loss of life during the previous century mostly occurred in Asia, followed by America and Africa. China was found to have the highest number of flood disaster victims in the world.

### Major Flood Events in Hat Yai

ThanitChalermyanont et al. (2013) studied flood conditions and damage in the area of the U-Tapao Canal Basin, in which Hat Yai is the major economic city with serious flood problems and where the most economic damage was caused. Hat Yai City has been found to have consistently grown and expanded in every aspect, resulting in relatively higher flood damage. According to the past records, Hat Yai has regularly experienced flooding for more than 20 times. The major floods that caused severe damage included the flood events in 1988, 2000, and 2010. The details are as follows.

1) The flood of 1988: On November 22, 1988, Hat Yai municipality and neighboring areas were severely damaged by a flood. The water level in U-Tapao Canal rapidly rose, and Hat Yai's municipal area had been under high flooding for almost a week. The water depth in some roads was recorded at 1.5 meters. All means of transportation, including planes, trains, automobiles, and even phone connections, were cut off. In some

areas, the water was 2 meters deep. About 90% of Hat Yai municipality was submerged under water. The damage to the business and tourism sectors there was estimated at 1,000 million baht.

2) The flood of 2000: On November 22, 2000, Hat Yai's municipal area was hit by a flood, which was caused by the following 3 factors: heavy rains in specific areas and small communities, water flooding the lowlands around the municipal area, and a river flood overflowing the banks of U-Tapao Canal. This flood left 32 people dead, 9 missing, and 32 injured. The total damage was estimated at 18,162 million baht.

3) The flood of 2010: On November 1-2, 2010, there was a great flood in Hat Yai District and surrounding areas. Almost all of those areas were inundated by water. The approximate depth of the water was recorded at 1.50-3.0 meters. The roads were totally impassable and the electricity was cut off. Additionally, phone connections were difficult to make. The damage was estimated to be higher than the previous flood events in 1988 and 2000.

Regarding the causes of the floods in Hat Yai, it was found that many areas in the Songkla Lake Basin were affected by flooding, including Hat Yai municipality in the U-Tapao Canal Sub-Basin and the eastern part of Hat Yai- Phatthalung Road (Songkhla Lake Basin Development Master Plan, 2005 cited in ThanitChalermyanontet *al.*,2013). Hat Yai- Phatthalung Road was reported to have obstructed flood flows during the major flood events in 1988 and 2000, which consequently caused tremendous economic damage. The main causes of flooding in Hat Yai can be summarized as follows.

1) Construction of roads obstructing flood flows: The roads that had been constructed to connect each district in Songkla and Phatthalung

provinces were the major cause of flooding, as they obstructed flood flows. Moreover, the drainage pipes under the roads were too small and inadequately provided.

2) Rainfall amounts: High amounts of rainfall could be another cause of flooding during some years. According to a study analyzing the flood management plan and environmental impact of the Royal Irrigation Department (Royal Irrigation Department, 2002 cited in ThanitChalermyanontet *al.*,2013), it was found that when the rainfall amounts in urban areas exceed 40 millimeters per hour, it can cause flood problems in some areas. In case there was heavy rainfall over large catchment areas, the flood problems would be severer. This is because the water runoff would flow downstream to Songkla Lake through several urban areas, including Hat Yai municipality.

3) Songkla Lake overflow: Normally, the water level in Songkla Lake ranged from 0.25 meters above mean sea level to +0.25 meters above mean sea level, which had no effect on the drainage of U-Tapao Canal or other canals. However, if a large amount of water runoff from the sub-basins rapidly went to Songkla Lake when the water level in the lake reached +2.00 meters above mean sea level due to rising sea level in the Gulf of Thailand, the water from U-Tapao and other canals would not be able to flow to Songkla Lake but would overflow the banks and inundate the communities on both sides of the canals.

4) Land filling or polder system implementation: Land filling, which was performed in order to construct buildings or roads in flood drainage areas, could reduce the drainage profiles, making the water level increase.

5) Land use changes: The forest areas in the basin were decreasing and changed to farmland, such as rubber planting, which affected the flow

rate of water. Most of the rainwater would flow along the ground and overflow the watersheds below the catchment area.

### Concepts of Flood Management

SirichaiMongkolkiatsri (2012, Online)collected information regarding flood management in the Netherlands,which is a country that has established legal measures specifically for flood prevention. The Netherlands has larger low-lying coastal areas compared to other countries in the European Union. This factor has made the Netherlands frequently experience flood problems for a long time. The worst flooding in the Netherlands was the storm surge disaster in 1953, which caused the most severe flooding crisis in Dutch history. The strong storm that moved through the northwest immensely affected the north coast of Rotterdam. The high tide resulting from this storm caused a deadly flood that killed 1,836 people, left over 100,000 temporarily homeless, and destroyed 4,500 houses. At that time the sea dykes and dams were already prepared to deal with the high tide, but they were not numerous enough to disproportionate the high tide and handle the storm surge , which was higher than expected. In addition, the communication technology in those days was not effective enough. The telephone was not widely used and the disaster warning was announced only through radio and telegraph. Therefore, the people were not able to cope with or escape from the disaster in time. After this catastrophe, the Dutch government reviewed the damage from the flood and analyzed the flooding tendency, which they thought might reach crisis levels in the future if no prevention plan or flood management measure were put in place (SirichaiMongkolkiatsri, 2012: Online).

Concerning the flood management in the

Netherlands, twenty days after the flood of 1953, the Dutch government and the Delta commission met and cooperatively discussed solutions for long-term flood prevention. The key characteristics of the Delta Works project (Belang van de Deltawerken) can be summarized as follows.

1) The Delta Works project could contribute to the maintenance of freshwater and seawater balance for agricultural purposes, which would prevent freshwater from entering the seawater because it might cause ecological changes, such as the death of sea creatures.

2) The Delta Works project could increase the potential for eliminating pollution and excessive waste from freshwater by using different sluice gate mechanisms. The project constructions could also enhance the transportation between the islands and the peninsula and the connection among the islands, such as the construction of Zeeland Bridge and the Westerschelde tunnel.

3) The Delta Works project could support international water transportation. In 1976, Belgium and the Netherlands signed an international collaboration agreement on the transport of goods between the ports of Rotterdam and Antwerp in order to facilitate private maritime operations and trade cooperation between the two countries. This project could develop natural areas into tourist attractions and also draw tourists to the delta, which was considered another way to generate income for the country. Apart from Delta Works, the Dutch government also developed specific laws to promote and support the mechanisms of the project and established guidelines for long-term flood prevention as well (SirichaiMongkolkiatsri, 2012: Online).

Considering the implementation of new technology for flood prevention, KhamnaiAphipratyasakul (2011) studied the flood management

in the Netherlands and found that a manual for “Water Management in the Netherlands” was developed and published in February, 2011 by the Dutch government. This manual provided readers with information about the water management concept, design guidelines, construction, good governance, including the history of water management, freshwater element management systems, national water management, beyond-design basis safety for water management, water shortage management, salinity management, water quality, the future development of project management, the impacts of global warming on flooding, water management laws, disaster warning systems, information on flood prevention projects nationwide, soil characteristics, the responsibilities of the National Water Commission, construction plans for a flood prevention system, the flow of river water, and a national water management system, which was considered a good public information system.

As for flood management in Thailand, Pallop Kritayanawach (2012), who collected information related to flood management at national, governmental, municipal, and urban levels, stated that a holistic approach to resolving the flooding crisis problem should be urgently established. Integrated Flood Management (IFM) should be developed in order to enhance the efficiency of all relevant work systems, which include geographic and hydrographic information systems, flood prevention infrastructure and drainage systems (dams, earthen dykes, rivers, canals, swamps, water pumps, and others), a flood height model and warning system, a weather and flood forecasting system, a flood response planning and integrated emergency management system, a disaster communication system, an emergency evacuation assistance system, food and beverage management, a health service and public health system,

a restoration and rehabilitation system, as well as an urban planning system and building innovation, which could effectively prevent flooding in the future. It was also suggested that the great flood suffering that might occur in the future could be mitigated only by certain preparedness, effective solution planning, and systematic flood measures of the government, public and private agencies, as well as the cooperation of the general public.

### **Asian Cities Climate Change Resilience Network (ACCCRN)**

The ACCCRN project is supported by the Rockefeller Foundation and the Thailand Environment Institute with the perception that the impact of climate change in urban communities with large living areas and high population density can inevitably cause severe damage to life and property. This project is committed to strengthening the capacity of 10 Asian cities in Thailand, Vietnam, Indonesia, and India to preparing for, withstanding, and recovering from the impacts of climate change. A coordinating network has been formed to enhance the collaboration between local parties on strategy and measure development in order to prepare for and deal with the consequent impact which may affect the cities, population at risk, and vulnerable groups in need of priority assistance. The main objective of this project is to promote knowledge and understanding of climate change and to enhance the capacity needed for climate change resilience in the city.

The work processes and evaluations of the project are divided into four phases as follows.

- Phase 1 City Selection.
- Phase 2 City Engagement and Capacity Development: Developing strategies, measures, action plans, project proposals, and pilot projects suitable for the risks

and conditions of the city in order to prepare for and cope with the emerging impact.

- Phase 3 Project Implementation: Implementing projects according to the proposal developed in Phase 2.
- Phase 4 Project Replication: Promoting knowledge sharing between the member cities, countries, and relevant parties and creating a collaborative network to operate such work.

In Thailand, out of 10 candidate cities, Hat Yai and Chiang Rai have been selected as the pilot cities. As for Hat Yai, the main agency responsible for this project is the Hat Yai Municipality Office, which needs to work with other public organizations, local administrative organizations, as well as the academic, private, and civil society sectors in the area, namely Prince of Songkla University, the Chamber of Songkla, the Southern Meteorological Center (East Coast), the Office of Water Resources Sector 8, Songkla's Office of Disaster Prevention and Mitigation, the Songkla Irrigation Project, the Kho Hong Municipality Office, the KlongHae Municipality Office, the Kuan Lang Municipality Office, Patong Municipality Office, Songkhla Community Foundation, Chumchonchai Foundation, and Songkhla Lake Basin Development Committee.

## RESEARCH METHODOLOGY

This study applied a qualitative research method, focusing on understanding, interpreting, and analyzing the data in order to draw conclusions and seek truth from interviews and observations in order to find the relationships between the issues of interest and the contextual environment. In-depth interviews, participatory and non-participatory observations, secondary data reviews, data recording, and content analysis were also employed

to collect the data for this research.

### Sample

This present study used purposive sampling, which is a sampling method with neither a strict structure nor complicated procedure, to draw the samples. The main purpose of using this method was not to determine the representative samples but to select the most appropriate samples and to ensure that the researchers thoroughly examined and explored the studied issues in various aspects. The data resources that could provide information related to the research questions and could respond to the research objectives were selected for the study. The sample size was not previously fixed. The research focused on data quality rather than quantity. Hence, purposive random sampling method was applied to obtain the sample group, not for representing the population, but for involving the most appropriate sample. The following inclusive criteria were used: (i) being participation in the flooding projects, (ii) having relevant experiences from their organizations, and (iii) having contribution to the disaster management to the society continuously for not less than 3 years. The researchers contacted related organizations to request the name lists and selected the key informants whose characteristics matched the target population and criteria. Finally, the 10 key informants were selected from the representatives of relevant organizations in Hat Yai District, Songkhla Province. The details are shown in Table 1.

**Table 1** Key informants from relevant organizations

Sector/Group	Types	Number
Public sector	Division of department	1
	Academy	1
	Local government	1
Private sector	Stake holder	2
	Social entrepreneur	1
Non-Profit organization	NGOs	2

### Data Collection

The data collection for this research can be divided into the following 3 steps.

*Step 1 Exploratory research:* Collecting data from academic journals and literature, including documents published by the public and private sectors, textbooks, articles, research studies, as well as international and domestic reports relevant to successful flood management and prevention, especially in the Netherlands. The obtained data was used as fundamental information for designing the research framework. This was the main process of gathering all of the information related to the objectives of this study.

*Step 2 In-depth interview:* Using a semi-structured questionnaire with the key informants or experts, who provided profound information on related issues and were regarded as important primary sources. The quality research employing in-depth interviews allowed the informants to profoundly express their thoughts, opinions, and experiences. Moreover, the semi-structured questionnaire was used to collect significant information missing from the literature review and was used to examine the consistency of the data gained from the document studies as well. In-depth interviews are among the most appropriate

techniques for exploratory research. The study made an appointment before meeting and introducing themselves to the key informants and experts recommended by the research advisor.

*Step 3 Additional data collection:* Conducting participatory and non-participatory observations to gain complete information. Lessons-learned sessions were held in order to learn from experienced professionals and stakeholders in all sectors, including individuals, groups, organizations, and agencies previously affected by flood disaster. Data codification, synthesis, and analysis fitting the context of each community were also carried out. A public forum was also held to discuss and criticize the proposed policies with experts and relevant stakeholders in 3 pilot communities (PrathanKiriwat Community, Ton lung Community, and Hat YaiNai Community), which had received the most impact from the disaster. The obtained data were analyzed and then used to revise and develop better proposed policies.

### Instrumentation and Validity

In Step 1 of the data collection, the research instrument was record form, which was used to record the data essential for developing the conceptual framework and semi-structured questionnaire, which was accordingly used to collect the

data in Step 2 and 3. Moreover, during the process of data collection, the researchers had constantly examined the collected data using the content analysis method. If any data were found to be unclear or incomplete, additional data were further collected. Then, the accuracy and consistency of the data, which were gained from the in-depth interviews, the secondary data review, and observations, were verified using the data triangulation technique in order to ensure that the obtained data were reliable, unbiased, and consistent before they were analyzed according to the research framework.

#### **Data Analyses and Duration of the Study**

This present study employed the analytic induction method (Denzin & Lincoln, 2011), which involves inferring general conclusions from particular instances, and the constant comparison technique, which is a process in which any newly-collected data are compared with previous data that were collected in one or more earlier studies in order to find similarities and differences contributing to the research conclusion.

The researchers collected the data from the key informants and experts in relevant organizations by using in-depth interviews from August 2013 to August 2014.

## **RESULTS**

The literature review and in-depth interviews were carried out to study the factors affecting the policy formulation through the three process variables, which were policy statement, organization competence, and policy accomplishment (Gunn, 1976). In order to develop a public policy model, the theoretical concept of Gerston (2010), focusing on policy integration and implementation, was applied to targeting success for ultimate results. In addition, the policy-making process and inte-

grated theory on policy implementation (Waradech, 2008) were used to establish missions of flood prevention policies in Hat Yai District, Songkla Province, as follows.

1. To integrate an action plan with other associates in Songkla Lake Basin and geared towards water management mechanisms at the national level.

2. To develop a water resource management system in order to cope with/adapt to the climate change situation in U-Tapao Canal Basin.

3. To improve the quality of life of vulnerable groups affected by climate change in terms of water resources.

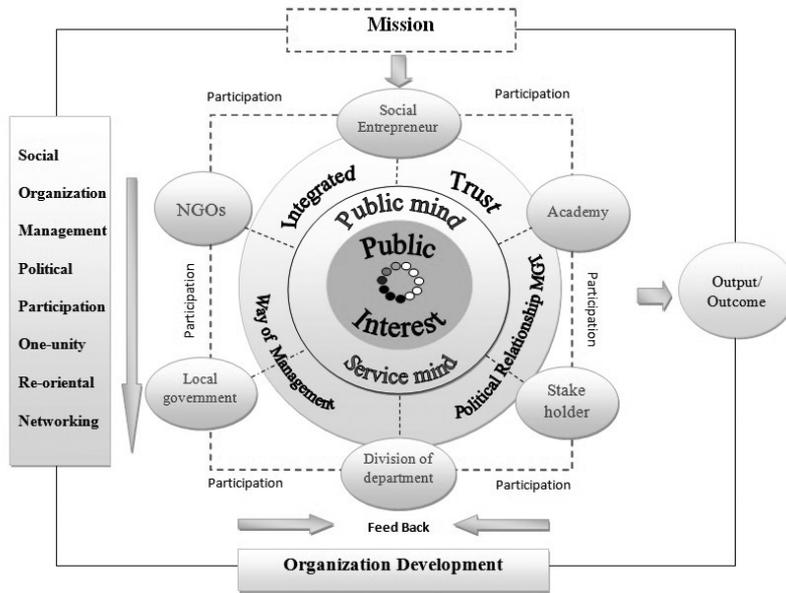
4. To develop Hat Yai into a healthy city according to the development approach to environmental and natural resource conservation and restoration.

5. To create mechanisms supporting and driving climate change management in Hat Yai and in Songkla Lake Basin.

In addition, it was found that the key components of efficient disaster management in Hat Yai District, Songkla Province, consisted of the following.

1. The important factors: (i) Focal point was the main agency that took care of overall operations and possessed both administrative powers and resources; (ii) Cooperation between policy and operational agencies; (iii) Collaboration between the central government and the local government with consistent and compliant local, provincial, and national development plans; and (iv) Willingness of all relevant parties.

2. Proactive organization management, which integrated and allowed all sectors to participate in every phase of community-based disaster management. The details are illustrated in Figure 2.



**Figure 2** Model of the relationship between the organizations and related factors.

According to Figure 2, the model consisted of 8 key dimensions. The details of each dimension are summarized as follows.

**Dimension 1: S = Society**

This dimension included the societies and social capital connecting people to social networks based on trust, belief, and public mind. It included 2 main elements, social capital and human capital. Social capital was used to drive individuals and the network of social groups to collaboratively work under mutual trust. Social capital currently played an important role in the society because it involved a positive attitude, a good service mind, and creativity contributing to public interest. It could be built according to new technologies and various developments. Sustainable social capital could be developed through the collaboration of relevant organizations, brainstorming of experts and associates, pushing onto the national agenda (Grindle, 1980), and appointing an operating commit-

tee to establish organizational visions and missions, focusing on concrete benefits for society. An effective disaster management policy required clear goals and missions. The local administration was a key factor in identifying a development framework to promote the cooperation of all sectors and developing regular social capital evaluation and monitoring. The focal point was clearly set.

**Dimension 2: O = Organization**

This dimension involved the organizations or associates with systematic management and methodical planning and control under organizational structure, which focused on administration management, decentralization, achievement-oriented management, efficiency, and accountability. The organizational structure and executive committee were clearly determined in order to take responsibility and make an immediate decision according to the severity of each disaster. A one-stop service for problem-solving and integration

among organizations for the optimization of natural resources should be implemented (Daniel, 1989) because the previous system lacked unity and clarity in giving orders and instructions. A local responsible organization should be clearly set according to the context of each community. All relevant parties should directly participate in analyzing problems, identifying directions and primary goals, conducting regular disaster management activities, and continually implementing organization development.

The organizational dimension can be divided into the following 6 groups.

1. Social entrepreneur: Private business entrepreneurs and Chamber of Commerce

2. Academy: Researchers and academic institutions that have conducted research, learned case studies, and reviewed and synthesized existing knowledge to ensure that effective disaster management was properly carried out with a knowledge-based system and could be expanded and achieve sustainability.

3. Stakeholder: The stakeholders of the public policy can be categorized into 2 groups as follows.

3.1 Key stakeholders were those that directly received either positive or negative effects from the disasters, those that either supported or opposed the public policy, and those that took part in policy formulation, including the people living in the 3 pilot communities (PrathanKiriwat Community, Ton lung Community, and Hat YaiNai Community) and the organizations relevant to local policy formulation such as the local administrative organization.

3.2 Secondary stakeholders were those affected by the operations and involvement of other stakeholders. They perceived the situation and took part in decision-making, which was another

factor contributing to policy achievement and leading to the mutual acceptance of all relevant parties. The secondary stakeholders included the communities surrounding the pilot communities and the groups of people in disaster-prone areas.

4. Division and department: Governmental agencies such as the Office of Water Resources Sector 8, the Office of Public Works and Town & Country Planning, the Provincial Waterworks Authority, the Regional Irrigation Office 16, and the Southern Meteorological Center (East Coast).

5. Local government: The members of the Municipal Council, Hat Yai Municipality Office, and Office of Disaster Prevention and Mitigation.

6. NGOs: Non-governmental organizations with a work philosophy aiming at the public interest, community foundations, and private development organizations.

### ***Dimension 3: M = Management***

In this context, the management dimension refers to disaster management in the organizations that adopted public policy by way of management. The missions and assignments were determined and communicated to public and private agencies and communities, which were considered as disaster management organizations according to the principles of disaster management application, which used community-based organizations to achieve sustainability. The evaluation was divided into the following 3 stages.

Stage 1: The capacity to reduce the severity of the disaster.

Stage 2: The capacity of the communities to recover and resist loss during and after the disaster.

Stage 3: The capacity to reduce disaster losses, resist natural disasters, and cause the least damage to the life and property of the people in the communities, which was thought to reduce

dependence on external factors. In other words, the communities needed to forecast disasters in advance and find preventive solutions in order to reduce the damage that might occur. Surveillance and evaluation measures needed to be implemented at all levels, including both operational and management staff (Levin, 1981). The knowledge and experience of the people in the communities should be used as a mechanism for handling disaster management at individual, family, and community levels so that all relevant parties have the capability to cope with disasters and provide basic assistance using evacuation routes or maps of the disaster mentor. Each community prepared for disaster management differently according to the context of each area. The disaster management should be comprehensively implemented and emphasize the participation of the people in decision-making and each working procedure in order to optimize disaster risk reduction.

#### ***Dimension 4: P = Participation***

Participation was a part of the management of target group and policy-related parties. It could drive the organizations or networks forward and create a sense of shared pride in disaster reduction, leading to good collaboration as well as smooth and effective operations (Kerr, 1976). A gathering of individuals resulted in strong power, driving activities to achieve the common goals of the networks. Participatory working was essential at the family, community, local, and international levels. It created a sense of ownership and strongly affected stakeholders' compliance and commitment (Little, 2002). Therefore, it should be applied to develop high-quality participatory disaster management.

#### ***Dimension 5: P = Political relationship management***

Political relationship management enabled the local authorities to work effectively and independently, develop an action plan without having conflict with the central goals and objectives, allocate the budget according to financial plan, and receive support from the central and local governments.

#### ***Dimension 6: O = One-Unity***

When every part of each organization, including the management team, the operational staff, and the people in the communities, were united into one-unity, all of them would think and act in the same direction, coordinate with each other, focus on participation, support each other, and believe in and realize their own duties. The local people, who thoroughly understand the context of their community regardless of religion, ethnic group, class, or age, should take part in the problem-solving process, which could create and sustain good relationships among all parties.

#### ***Dimension 7: R = Result orientation***

Result orientation focused on efficiency and effectiveness evaluation according to the organizational missions and objectives, provided resources, clear and transparent success indicators, the community's involvement in policy formulation, operational monitoring and tracking, and participation in decision-making on disaster management and performance report (Canadian International Development Agency; CIDA, 1999).

#### ***Dimension 8: N = Networking***

This dimension involved network building with nearby communities or other relevant organizations in order to gain operational support, create social activities, and communicate useful information. A strong network and good relationships would lead to sustainable relations between the relevant organizations and communities.

Among all 8 dimensions, networking was

considered the heart of successful public policy implementation.

### DISCUSSION AND RECOMMENDATIONS

From the proposed model illustrating eight dimensions of disaster management according to public policy principles and concepts of integration and participation, the key success indicators of public participatory policy for disaster management include the following 4 factors.

1. The policy and context of each area
2. Communication with target groups and the general public

3. Cooperation with the government sector
4. Development of information and knowledge management for decision-making

The processes of disaster management policy formulation and the activities enhancing the community's potential to contribute to sustainable disaster management are shown in Figure 3.

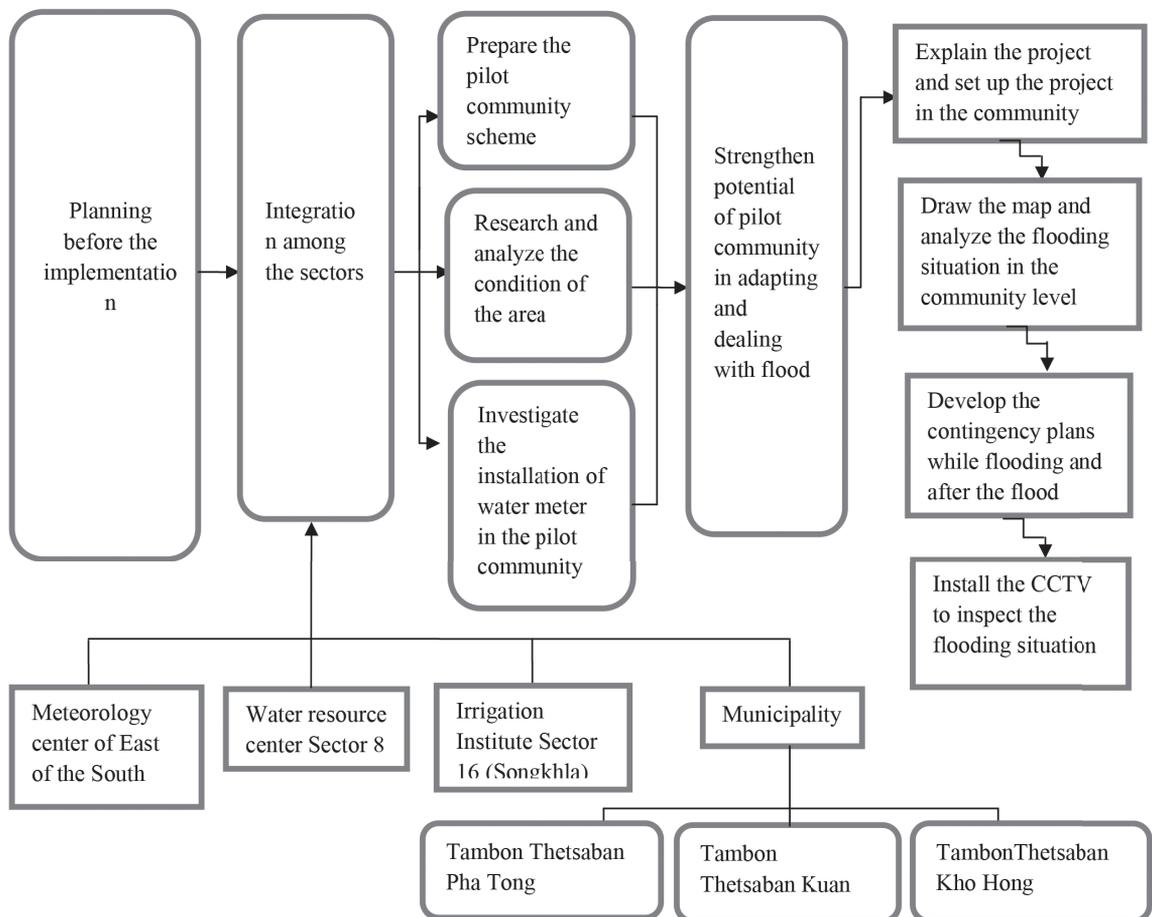


Figure 3 Processes of Public Policy Formulation for Sustainable Disaster Management.

The main elements of sustainable disaster management can be summarized as follows.

1. Integration among associates and networks with common goals and commitments to resolve disaster management problems, public consciousness, belief in the use of local resources, and sharing knowledge between the government and public sectors.

2. Self-reliance that can be adapted according to the context of each area without dependence on governmental operations.

3. Comprehensive disaster management covering preparedness, prevention, response, resilience, use of technology to rapidly communicate information, and collaboration with academic agencies to carry out human resource management congruent with central resources and policies.

4. Good administrative management that clearly identifies the duties, roles, and responsibilities of leaders and personnel and also possess adequate resources, volunteers, training courses, and support policies.

5. Lessons learned, research, and communications needed for future development.

The context of the target areas and the needs of stakeholders should be analyzed and applied to policy formulation in order to reduce losses, enhance safety with reference to the life and property of the people, and resolve disaster problems with a public participation mechanism. This participation should be carried out in the form of collaborative integration, focusing on achieving balanced development in terms of the environment, the economy, and technology (Reissman, 2008). In addition, the proposed model has been complied with the concept of policy

formation stipulated by Gerston (2010) and (Gunn, 1976). As a consequence, the reliability of the model seems to be high and fitted with this context.

The stakeholders should participate in decision-making regarding the direction of development. The relevant organizations should also build good relationships with each other. Additionally, a participation and integration system would enable each organization to clearly understand its roles and also reduce conflicts and disparity in organizational roles, leading to efficient and consistent collaboration. Good policy formulation and a good planning framework will ultimately contribute to sustainable development.

The findings of this study can be used to design and develop community-based disaster management in order to reduce losses after a disaster according to the local context and the community's way of life. As a consequence, the benefits of the study, but not limited to, include:

1. Existing social capital can be used to enhance the community's self-reliance when facing natural disaster;

2. The developed disaster management model is congruent with the community's needs and the current state of society;

3. Accessible media channels, learning sources, and technologies are provided;

4. Strong leadership has been developed, especially in local organizations;

5. Budget and financial support is provided to facilitate flexible and quick management, and

6. The communities and stakeholders feel satisfied, have belief and faith, and continually collaborate in disaster management model development.

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