An Integrated Sustainable Development ModelforEffective Disaster Management Policy of Khlong-U-Taphao Basin in Thailand

Somporn Siriporananon and Parichart Visuthismajarn

Abstract— *This research aimed to examine the success factors for the implementation of public disaster management policy in Khlong U-TaphaoBasin and to develop the sustainable development model. The qualitative methods employed were in-depth interview, focus group discussion with those involved in policy implementation, and literature review. The results suggested that the sustainable development model for effective disaster management in Khlong U-TaphaoBasin, Songkla Province, consisted of 2 main components, which included 1) 4 success factors for policy implementation and 2) 8 factors for proactive and integrated disaster management with community-based approach. In addition, it was found that the sustainable success of policy implementation also related to the following 3 factors: 1) a balance between personal gain and public interest, 2) participation of private sector, and 3) overcoming obstacles to effective policy implementation. The sustainable development model for effective disaster management in Khlong U-TaphaoBasinresulted from this study could be applied to other areas with appropriate context in the future.*

Keywords— **Public Policy Management, Disaster Management, Success Factors, Sustainable Development.**

1. INTRODUCTION

Khlong U-TaphaoBasin is the 7th sub-basin of the 21st basin (Songkla Lake Basin), which is the biggest one among 5 basins in Songkla Province. It is located between7 degrees 14 minutes North Latitude and 100 degrees 28 minutes East Longitude. It has an approximate area of 2,840 square kilometers, covering parts of 7 districts, 35 sub-districts, and 252 villages, which include Sadao District, Na Mom District, Hatyai District, Khlong Hoy Khong District, Bang Klam District, Rattabhumi District, and KuanNiang District. There are 7 municipalities in this area, which are Hatyai, Ban Phru, Sadao, Padang Besar, Pang La, Patong, and Prik. Khlong U-Taphao is the main source of water and also the largest canal in Songkla Province (Rak U-Taphao, 2015).

Khlong U-TaphaoBasinarea is about 130 kilometers long. Its total water catchment area is 2,200 square kilometers. The water catchment area above HatyaiCity, which is the key economic zone, is 2,000 square kilometers. Khlong U-Taphao has an ability to drain 35 million cubic meters of water per day but the water drainage capacity can be 50 million cubic meters per day, in case of inundation. The average temperature is 26.6 to 29.6 degrees Celsius. The highest temperature usually appears in April and the lowest temperature is in February. The average rainfall is recorded at1,916.4 millimeters. The highest rainfall occurs in November.

Khlong U-Taphao is the main canal,which originated from the watershed forest in Sadao District on the border with Malaysia. Sadao reservoir with storage capacity of 56.741 million cubic meters is the significant reservoir in Khlong U-TaphaoBasin area. It functions as kaem ling (water storage canal) in the rainy season anddistributes the water out in the dry season. The watershed forest in this area is the source of many rivers, canals, and streams formingKhlong U-Taphao. It is full of natural resources and woodlands that have nurtured Songkla Province from the past to present day.

The economic structure of the provinces in Khlong U-TaphaoBasin consists of agricultural, industrial, and service sectors. The key agricultural sector is associated with rubber, wet season rice, fish, and giant tiger prawn. Theindustrial sector continues to expand its manufacturing capabilities, for examples, rubber processing products have been sold to tire manufacturers in Japan, the United States, and China, rubber gloves have been exported to the United States market, andprocessed rubber wood has been increasingly exported to China and Hong Kong. Regarding the seafood industry, its growth rate is likely to slow down because the operators are faced with trade barriers and high competition in international markets. As for the tourist industry, it is continuously growing due to the attractiveness of festivals such as New Year festival, Chinese New Year festival, Hari Raya festival, and Songkran festival. The private and governmental organizations also support the tourism industry by holding various promotional activities to attract more Malaysian and Singaporean tourists. Apart from this, the private organizations mainly invest in canned seafood manufacturing, cold storage, rubber gloves factories, and rubber processing plants.

Khlong U-Taphao Basin area has a significant impact on the environmental, economic, and social development of Thailand. However, the climate change has currently caused harmful natural phenomena such as greenhouse effect, global temperature rise, and change of sea level, consequently resulting in weather fluctuation and natural disasters. All of those phenomena caused by climate change are considered as global threats that all relevant agencies including the World Metrological Organization

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(WMO) have paid attention on. The disasters can be divided into various categories, including man-made disasters such as nuclear bomb, natural disasters such as flood, storm, and drought, geophysical disasters such as earthquake, volcanic eruption, tsunami, and biological disasters such as contagious epidemics (Environmental Research and Training Center, 2013). Recently, these disasters have frequently occurred and caused enormous damage around the world.

According to Songkhla Lake Basin Development Master Plan 2005 (ThanitChalermyanont et al., 2013), there are many watershed areas in Songkla Lake Basin such as Hatyai municipality in Khlong U-Taphao Sub-Basin and the eastern part of Hatyai - Phatthalung Road. This Hatyai - Phatthalung Road is found to obstruct flood flows during the major flood events in 1988 and 2000, which subsequently caused tremendous economic damage. The main causes of flooding at Hatyai City in Khlong U-Taphao Basin can be summarized as follows.

1) Construction of roads obstructing flood flows: The roads, which have been constructed to connect each district in Songkla and Phattalung provinces, are the major cause of flooding as they obstruct flood flows. Moreover, the drainage pipes under the roads are too small and inadequately provided.

2) Rainfall amounts: High amounts of rainfall can be another cause of flooding in some years (ThanitChalermyanont et al., 2013). It is 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 water catchment areas, the flood problems will be severer. This was because the water runoff will flow downstream to Songkla Lake through several urban areas, including Hatyai municipality.

3) Songkla Lake overflow: Normally, the water level in Songkla Lake ranges from -0.25 meters above mean sea level to +0.25 meters above mean sea level, which had no effect on the drainage of Khlong U-Taphao and other canals. However, if a large amount of water runoff from sub-basins rapidly flows to Songkla Lake when the water level in the lake reaches +2.00 meters above mean sea level due to rising sea level in the Gulf of Thailand, the water from Khlong U-Taphao and other canals will not be able to flow to Songkla Lake.Instead, it will overflow the banks and inundate the communities on both side of the canals.

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

5) Land use changes: Forest area in the basin is decreasing and changed to farmland such as rubber plantation, which affects the flow rate of water. Most of the rainwater will flow along the ground and overflow the watersheds below the catchment area.

Hatyai is the major economic city with serious flood problems, causing the most economic damage. Hatyai City is found to have consistently grown and expanded in every aspect, resulting in relatively higher flood damage. According to the past records, Hatyai has consistently experienced flooding for more than 20 times. The major floods that caused severe damage includethe flood events in 1988, 2000, and 2010. The details are described below.

Hatyai City in Songkla Province is one of the cities withthe most serious flood problemsthat cause great economic damagein Thailand (SuphatVongvisessomjai, 2011). In 2000, there was a big flood in Songkla Province, covering the area of 330 square kilometers out of the total area of 2,400 square kilometers in Khlong U-Taphao Basin. The total damage to the government, private and individual sector was estimated at more than 17,000 million baht. More recently in 2010, there was a great flood in Khlong U-Taphao Basin, which affected about 80% of Hatyai City and 30,000 households.The total damage was estimated at more than 10,000 million baht.

Due to the flood situations originated from Khlong U-Taphao Basin, that have constantly occurred in Hatyai City, the concept of participatory disaster management is established. The Rockefeller Foundation held the project called Asian Cities Climate Change Resilience Network (ACCCR) to develop the capacity and readiness for handlingthe impacts of climate change in disaster vulnerable areas. The collaborative network and cooperation between various local parties has been formed to developeffective strategies and measures to deal with the consequent impacts of climate change, which may affect the cities, population at risk, and vulnerable groups in need of priority assistance. The participatory role of the local leaders as well as governmental, private, and social sectors are also defined so that they can better understand the problems and actual recommendations for disaster preparedness such as preventive planning, disaster warning, defensive system development, flood response planning and procedures, flood operations, emergency evacuation system, disaster communication system, food and beverage management, post-disaster management, and restoration and rehabilitation system.

The policy implementation of this project is hierarchically carried out, which is considered the government management style. The public policies for disaster management in Thailand are generally communicated with only “Top-Down Concept”, which resulting in limitations of knowledge sharing among relevant sectors. The local parties, who are directly affected, should be especially alert and become self-reliant in the future. One of the essential factors for long-term sustainability of disaster management is creating a collaborative network between public, private, and social sectors through various kinds of activities. This can make the society becomes constantly alert and aware of disaster problems and potential solutions.

The above limitations make the researchers interested to systematically study this problem and create know-how from a case study that can be applied to the other areas with similar contexts, which will be beneficial to people in general. The lessons from Hatyai ACCCRN, the project received Thailand Public Service Award 2012

in an *excellent integrated service* categoryfrom the Office of the Public Sector Development Commission (Office of the Public Sector Development Commission, 2012), which are discussed in this study include cooperation among all relevant parties, collaborative network between social, public, private, educational, and media sectors, cooperative commitment to solve the problems, disaster awareness, and network development for comprehensive knowledge sharing. This project is a good case study to investigate disaster management public policy. The results can be used as the guideline for Hatyai City and Khlong U-Taphao Basin to handle upcoming disasters and the fundamental model for disaster management in other contexts. The different fields of knowledge should be integrated to achieve successful disaster management in all dimensions, including environmental, economic, and social aspects.

2. RESEARCH OBJECTIVES

To examine the success factors of sustainable development model for effective disaster management policy implementation in Khlong U-Taphao Basin, Thailand, by applying a case study of Hatyai ACCCRN (Asian Cities Climate Change Resilience Network) in order to further knowledge on sustainable public policy management.

3. LITERATURE REVIEW

Concept of public policy

Someresearchers previously defined public policy as an important tool for the government to run the country (Dye, 2012; Anderson, 1994) and a guideline for governmental activities. In other words, public policy is practically an option built by the government to solve, mitigate, and prevent the problems according governmental obligations. The goals of public policy need to truly serve the needs of people and lead the country to better development. In addition, public policy needs to have organized, structured, and systematic operations and also legal, consistent, and progressive activities, which contributes to practical implementation (SombatThamrongthanyawong, 2007). The conditions of good public policy include (Chanidtha Choosuk, 2010) the ability of policymakers, the understanding and ability of those who adopt the policy, effective management system, and attitudes of those who are relevant to the policy (PrachumRodprasert, 1996).Public policy is either a broad guideline for decision-making of administrators and agencies or a general statement suggesting appropriate administrative decision-making (SiriwanSerirat, 1996).

Public policy process consists of 5 steps (TodsaphornSirisamphan, 2011), which are 1) Public policy formation: this step needs to answers the question why each public policy is needed. Normally, the formation begins with the public problems in community, 2) Public policy alternative development and decision making: the problematic situation is analyzed to find out and decide the possible policy options, 3) Public policy implementation: this is the key step to turn policy into action, to define the performance indicators of policy implementation, and to control the operation according to determined plan and policy, 4) Public policy evaluation: the achievement level of each project and operation need to be evaluated so that the policy can be modifiedin accordance with changing situations, 5) Public policy maintenance, succession, and termination: a successful public policy needs to have a mechanism to maintain its continuity. If a public policy is not well-received, it has to be terminated or replaced with an alternative policy. This is considered the reverse process of the policy formation.

According to Mazmaniana andSabatier (1989), there are 5 main conditions of policy implementation, which are 1) causal relationship and valid reason, 2) policy clarity, 3) political determination, 4) organizational support, 5) external situation that has no opposition to policy. If only one condition is missing, the policy implementation may have problems and obstacles, which finally leads to failure.

Anderson (1994) suggests that public policy evaluation is an activity that aims to examine the achievement and result of a policy. The actual performance will be compared with the expected outcome in every step of operation. Dunn (2004) focuses on whether there is any social change after policy implementation or not. Social problem-solving and social response, which are a part of policy analysis, are taken into account. The consequence of policy implementation is paid attention to during policy evaluation. James and Blaine (2010) state that human societies have choices and the best choice is evaluated and selected by self-perception. In addition, House and Howe (2000) suggest that policy evaluation is an activity to build understanding and acceptance. It does not force or manipulate people to believe. It simply focuses on utilization of evaluation result and acceptance after implementation.

Public policy implementation process is carried out after policy formation and procedure analysis. The concept of public policy implementation can be divided into 3 categories (Pulz and Treib, 2007 cited in RuengwitKetsuwan, 2008), which are 1) Top-Down Concept, 2) Bottom-Up Concept, 3) Hybrid Concept. Each concept is different from each other. WoradechJantarasorn (2008) also suggests 12 factors of policy implementation. Therefore, policy implementation requires understanding of problems and circumstances in order to prevent failure and achieve the objectives in the most effective and efficient way.

Concept of public policy engagement

Most public policies are under the concept of linear policy process. The policies are defined from the central government. The people and other sectors are policy environment. This is a limitation of traditional public policy model in which people rarely have chance to take part. Considering citizen engagement in planning, investing, taking action, receiving benefit, it is found that the citizens cannot actually participate in those processes because they and other sectors are in the environment of policy. The model that only focuses on governmental affairs cannot truly respond to the needs of people.

The concept of citizen and stakeholder engagement in public policy is emerged later. PratchyaWesarach (1985) defines citizen engagement in community development as an action that people get involved in community development activities or use their own resources to develop their community. ThaweethongHongwiwat (1984) gives the meaningof community engagement policy as a process that the government encourages, leads, supports, and allows all forms of citizens,including individual, group, club, associate, foundation, and voluntary organizations, to take part in a governmental operation. The definition of citizen engagement also includes an ability of the citizens or community to control resource management for the economic and social benefits of the community members.

Citizen engagement is considered universal principles that international countries place an importance on and also a main issue that the government has to allow the citizens and stakeholders to perceive, consider, and make a decision together according to good governance principles. It helps enhance transparency and making-decision quality of the government as well as mutual acceptance of all relevant parties. The International Association for Public Participation divided the citizen engagement development into 5 levels (Department of Industrial Works, 2015), which are 1) providing information is the lowest and most significant level of citizen engagement because it is the initial stage that the citizens are given chances to participate in the government's operations, 2) listening to opinions is a process that the citizens are allowed to give information and share their opinions useful for the governmental decision-making, 3) engaging is a step that encourages the citizens to take part in governmental activities and suggest practical solutions so that the citizens can be ensured that their opinions and suggestions are taken into consideration for governmental management, 4) cooperating is a process that the civil sector's representatives participate in every step of governmental operations and decision-making, 5) empowering is a stage that the government allow the citizens to play dominant role and make a full decision.

Concept of disaster management

UN International Strategy for Disaster Reduction (UNISDR) (cited inChoowong U-balee, 2008) defines disaster as a serious disruption of the functioning of a community resulting in economic and environmental losses which exceeds the ability of the affected community to cope using its own resources. Disaster is a series of risk situation resulting from combination of hazard, precarious condition, and inappropriately managed risk.

Asian Disaster Preparedness Center states that the impacts of disaster can cause loss of human lives and properties that leads to economic, social, and other relevant damages. Disaster can be divided into 3 categories according to its causes, which are 1) natural disaster such as flood, landslide, and earthquake 2) man-made disaster such as terrorist attack, traffic accident, transport accident, and fire 3) technological disaster such as communication problem and nuclear leak. Moreover, disaster can be defined as an adverse event that happens to people including natural and man-made hazards, causing loss of life and great damage to public and private properties such as fire, flood, hurricane, tsunami, and others (*National Disaster Prevention and Mitigation Committee, 2007).*

The crucial problem of disaster management is the lack of a unified management. There is a lack of collaboration between government organizations, civil society, and stakeholders who work in partnership with each other to drive effective and efficient policy such as local agencies, government and private sectors, and relevant organizations. The importance of civil society stakeholders and their understanding is taken into account. The civil society is encouraged to participate in every step of policy development including policy planning, managing, presenting or opposing.

Disaster problems, including man-made and natural hazards, continue to occur repeatedly. The systematic and effective disaster management can help people to handle and prepare for all phases of disaster.Proven and Milward (2003) suggest that the government needs to create collaborative network in 3 levels, which are community level, organization level, and network level. Each level has its own evaluation criteria, which are different from each other, although the three of them are relatively connected. These 3 levels are called "social network", which refers to an integration of local citizens in the form of an organization to work together with governmental agencies in order to reduce risk and find ways to prevent disaster. Disaster management, preparedness, prevention, and solution can reduce negative impacts on public and private properties and make the related parties ready for systematic disaster response and emergency practices, leading to minimum loss and damage.

Concept of Sustainable Development (SD)

The World Commission on Environment defined Sustainable development as "development which meets the needs of current generations without compromising the ability of future generations to meet their own needs" in the Bruntland Report, Our Common Future. This report suggested the state of global affairs in terms of environmental degradation, international economic inequality and poverty, and the inability of current national and international institutions to deal effectively with the challenges of securing equity for future generations. Global organizations has taken the philosophy of sustainable development into account and has organized the conferences to find out common practices. However, the meaning of sustainable development in the environment and sustainability report is broad and covers a wide range of issues.

The Office of the Royal Society states that sustainable development consists of 3 concepts, which include:

1. Human needs: Sustainable development is associated with human needs which can be either basic needs for living or needs for better living.

2. Environmental limitation: Environmental system has limited resources and waste treatment capacity.
3. Intergenerational and intragenerational equity: Sustainability cannot be stable without development policy that focuses on social and cultural factors so intergenerational and intragenerational equity needs to be taken into account.

The development can be steadily and smoothly conducted, if it cause no undesirable results. However, destruction of natural resources and environment tends to occur whenever the needs of current generations are served. The concept of sustainable development is created to solve this problem. It aims to achieve macro macro-level conservation. In other words, if the sustainable development causes an environmental impact on one area, it has to enhance environmental quality in other areas as a compensation in order to maintain overall quality of the environment.

Sustainabilityconsists of economic, social, environmental pillars, which are interrelated and connected. These 3 pillars need to be taken into account when setting up a new development project. Sustainable development is far beyond environmental conservation. It can change economic and social structure to reduce environmental and resource consumption in a balance manner, which contributes to peaceful and harmonious living between people and nature.

4. RESEARCH METHODOLOGY

To achieve the objectives of this research, the methodology was divided into 2 steps. In the first step, the concepts of policy, public policy, citizen engagement, and disaster management were collected and studied. The second steps included data collection, literature review, and fundamental knowledge development for the operations of ACCCRN. The public policy analysis and qualitative methods were used for content analyses. The focus group discussion with private network and ACCCRN team, in-depth interview based on a case study learned from ACCRN policies and participatory working process, participatory observations were applied to collect data.

Qualitative Research Processes

The case study method, in-depth interview, and focus group discussion with relevant communities were employed. The details of qualitative research methods are as follows.

Population and Sample

The target population of this research was 5 groups of people who are related to disaster management policy in Khlong U-Taphao, Thailand, which were 1) members of governmental and political agencies 2) members of private organizations 3) members of educational institutions and educators in relevant areas 4) journalists from various media 5) representatives of civil society and stakeholders.

The purposive sampling method was used to select 10 informants from each of the group. The total 50 informants were selected to provide information about disaster management in Thailand.

Research Tools

The research tools in this present study included a series of unstructured questions for in-depth interview, which were developed from literature review and collected secondary data to use a guideline to collect information from the informants. The researchers also used field note sheet to record detailed information about circumstances, places, persons, incidents, and speeches based on empirical observations without adding interpretation. Theoretical note was also used to add opinion, emphasize meaning, and set temporary assumption.

Data Collection

This qualitative research employed in-depth interview to collect data from those who workedin management level of public and private organizations associated with disaster management policy formation in Thailand. The primary and secondary data was collected to create the development model for disaster management policy. Then the model wss used to conduct focus group discussion with the communities affected by the policy. The researchers also usedthe participatory observation method to collect dataduring focus group discussion. The content validity was confirmed by the experts.

Data Reliability and Validity Test

A variety of methods were used to test the reliability and validity of data in this research. The researchers took time to mingle with the local population in target areas for years before starting the data collection. Therefore, the researchers were very familiar with the participants and the community. The data triangulation method was applied to verify the data reliability and data sources such as times, places, and informants who provided the secondary data and gave information during in-depth interviews and focus group discussions.

Qualitative data analyses

The researchers applied the grounded theory approach,developed by Strauss and Corbin (1990), to thedata analyses of this qualitative study. This theory is generally used to create new theory and has been widely used for qualitative data analyses in present day. The public policy analysis framework was also applied to develop the sustainable development model for effective disaster management policy in Khlong U-Taphao Basin, Thailand.

After data collection, the completeness of data was examined by content analysis method. The grounded theory approach was applied to insightfully analyze, verify, and interpret the data according to the objectives.

5. RESULTS

The literature review, focus group discussion, and in-depth interview were carried out to study the factors affecting policy implementation achievement and policy formation through 3 process variables, which were

policy statement, organization, and competency. To achieve the objectives of developing public policy model, the integrated theoretical concept suggested by Gerston (2010) regarding public policy implementation was applied to determine the success target contributing to the ultimate results. Policy making process and integrated policy implementation theory (WoradechJantarasorn, 2008) were also used to develop public policy model. The missions of flood prevention policy in Khlong U-Taphao Basin, Songkla Province were listed below.

1. To integrate the action plan with other associates in Khlong U-Taphao Basin and Songkla Lake Basin and gear towards water management mechanisms at the national level.
2. To develop water resource management system in order to cope with/ adapt to climate change situation in Khlong U-Taphao Basin.
3. To improve the quality of life of vulnerable and risky groups affected by climate change in terms of water resource.
4. To enhance urban development according to the eco-development approach of natural resource and environmental conservation.
5. To develop a supportive mechanism driving climate change management in Khlong U-Taphao Basin and Songkla Lake Basin.

In addition, it was found that the key components of efficient disaster management in Hatyai City or Khlong U-Taphao Basin consisted of the following:

1. Main factors: 1) Focal point that was the main agency taking care of overall operations and possessing both administrative powers and resources.The provincial governor, the *director of the local administrative organization, and the district chief had shared-authorization to give command and take action. There was the committee to monitor and assess the water situation. The Regional Administrative Zone 12 was responsible for the monitor focal point, which was set to monitor the water level.* 2) Cooperation between policy agencies and operational team. There were many organizations and practitioners that worked together to develop flood response plan at provincial, district, and sub-district levels. The ACCCRN project was applied to develop flood management plan for the vulnerable communities in Khlong U-Taphao Basin and to carry out water survey, water map development for flood warning, water measurement, and water practitioners networking. The action plan, manual, and communication system, including CCTV, Line application, and operational practices were also provided. 3) Collaboration between the central government and the local government with consistent and compliant local, provincial, and national development plans.The ACCCRN projectfocused on the basin development plan and working group consisting of experts from related organizations. 4) 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 vulnerable communities were the center for establishing “social network” at community, organization, and network levels. The proactive organization management consisted of the following 8 dimensions.

2.1 Society: This dimension includedthe societies and social capital connecting people in social networks based on the basis of trust, belief, and public mind. It included 2 main elements, which were social capital and human capital. Social capital was used to drive collaboration between individuals and social networks under mutual trust. The ACCCRN project enabled the social capital consisting of relevant organizations, networks, and communities in the vulnerable areas to determine effective disaster management policy in order to enhance cooperation among all sectors and to develop the achievement indicators and monitoring and evaluation approach. The individuals with public and service mind from relevant organizations, communities, and network were involved in this process.

2.2 Organization: This dimension involved the organizations or associates with systematic management and methodical planning and controlling under organizational structure, which focused on administration management. The ACCCRN intended to decentralize authority to the local people, especially in the vulnerable communities through working group establishment and operational planning. The achievement-oriented management, efficiency, and accountability were emphasized. The organizational structure and roles of provincial and local executive committee had to be clearly determined in order to give authorized command and make an immediate decision according to the severity of each disaster. The one-stop problem solving and integration among related organizations on the optimization of natural resources should be implemented.

2.3 Management: This dimension referred to disaster management in the organizations that adopted the public policy by way of management. Considering the ACCCRN project, the missions and assignments were determined and communicated to the public and private agencies and communities, which were considered as disaster management organizations,according to the principles of disaster management application and community-based 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 life and property of the people in the communities, which was considered reducing dependence on external factors.

In other words, the communities in risky areas of Hatyai City and Khlong U-Taphao Basin needed to have disaster forecast and assessment system, develop warning system through CCTV, smart phones, banners and flags, SMS, car parade, and press conference, and find preventive solutions to reduce the damage which might occur. The surveillance and evaluation measures needed to be implemented at all levels, including both operational staffs and management team. The knowledge and experiences of people in the communities should be used as a mechanism for disaster preparedness in individual, family, and community levels. The disaster response practice and basic assistance should be trained together with the use of water map, evacuation route, disaster alert network, and the disaster mentor's map in order to cope with the disaster. Each community prepared for disaster management differently according to the context of each area. The disaster management should be comprehensively implemented and focus on the citizen engagement in decision-making andall working procedures in order to optimize disaster risk reduction.

2.4 Participation: This was a part of the operational management of target group and policy-related parties. It could drive the organizations and networks forward and create a sense of shared pride in disaster reduction, leading to good collaboration and coordination as well as smooth and effective operations. The ACCCRN project encouraged a gathering of individuals and networks in form of area-based organizations, private sector organizations, and professional groups. Water map development, data survey, and public forum were used to builda sense of ownership and participation, resulting in a shared public consciousness.

2.5 Political relationship management: This dimension enabled the local authorities to work in an effective and independent manner, develop an action plan without having conflict with the central goals and objectives, allocate the budget according to financial plan, and gain constant supports from the central and local governments. The ACCCRN project helped give operational support, reduce gaps and obstacles, and enhance the achievement of political organizations, contributing to the maximum public interest.

2.6 One-Unity: When all parts ofa community, including organizational executives, operational staffs, andlocal people, were united into one-unity, all of them would think and act in the same direction, coordinate with each other, focus on collaboration, support each other, believe and realize in their own duties. The community's members, who thoroughly understood the context of their community should take part in problem-solving process, regardless of religion, ethnic group, class, and age, in order todevelop and sustain good relationship among all parties. The ACCCRN project applied both formal and informal operations to build unity and also focused on disaster monitoring and warning system, innovative technology, and knowledge management.

2.7 Result orientation: This was a success factor that focused on engagement of the experts and relevant organizations in problem-solving. The members of ACCCRN working team were proficient, knowledgeable, and full of abilities. They had public mind and always worked hard for public interest.

2.8 Networking: This dimension involved establishing a network with nearby communities and other relevant organizations in order to gain operational support and create social activities. The ACCCRN project applied integration approach to build 5 basin networks in the Songkla – Satun area. The useful information was communicated through Line Application. The strong network and good relationship would lead to sustainable relationship between the relevant organizations and communities.

Among all 8 dimensions, networking was considered the heart of successful public policy implementation in Khlong U-Taphao Basin.

The results also suggested that there were another 3 main factors affecting the achievement of disaster management public policy development in Khlong U-Taphao Basin, which included private sector participation, going beyond boundary, and a balance between personal and public interest. The details were as follows.

1. Private Sector Participation

Private sector participation especially required the following social consciousness: 1) Public mindcaused by individual factors including upbringing, organizational value focusing on helping each other, and previously being one of stakeholders affected by the past disasters, 2) Social responsibility resulted from leadership and participation in public organizations that carried out CSR-process such as Provincial Chamber of Commerce, Rotary Club, and other related associations and foundations.

2. Going beyond Boundary

This factor enabled the relevant organizations to work together in form of integrated operations in order to go beyond the individual and organizational objectives and achieve united cooperation. It could result from the following:

1) Organizational Structure: The Community of Practice (COP) was built to horizontally work with flexibility and to collaborate with external organizations. Regardless of their affiliation, all COP members aimed to achieve common goals with expertise, potential, balanced qualifications, leadership, and team working skills. They also applied problem-based approach to make a key decision in every board meeting.

2) Creative Thinking: It was used to find a solution for unsolved problem, carry out activities, and develop warning system. Communication and information technology was also applied to develop innovative, workable, and appropriate systems such as CCTV and disaster warning application that was accidentally discovered.

3. Balance between Personal and Public Interest

A balance between personal and public interest could be developed by the following factors.

1. Team Selection: All team members had public mind, expertise, and high organizational skills. They thought about public interest before personal gain and believed that the reduction of disaster impact could benefit many people in the community.

2. Public Policy Participation: All relevant parties, from operational level to management level,took part in disaster management policy development according to the bottom up concept in order to build collaboration, solve the problems based on the decentralization approach, and explore potential channels to drive the public policy such as roadmap development, Community Assembly meeting, and Hatyai People Assembly meeting.

The results from this present research clearly showed the key factors of sustainable development model for effective disaster management policy of Khlong U-Taphao Basin in Thailand. The details could be summarized in Figure 1.

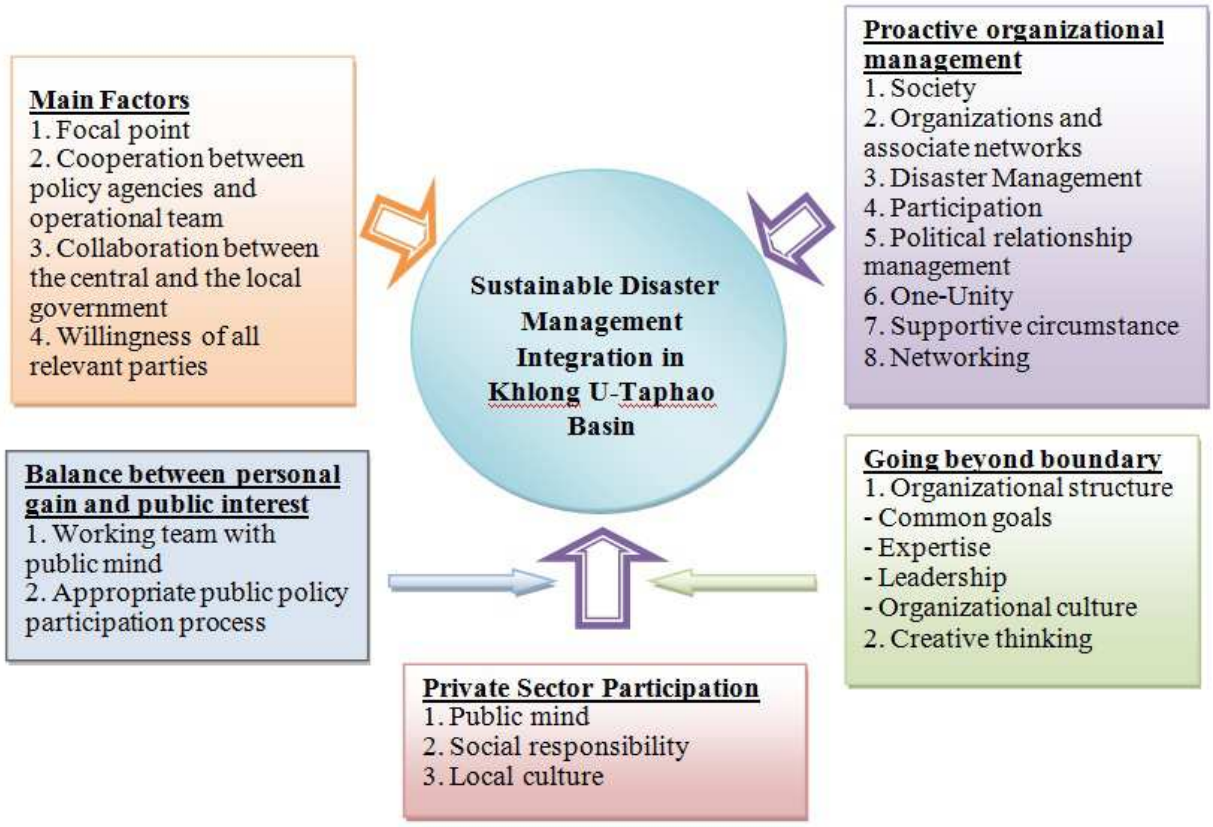

Figure 1: The relationship model of factors affecting effective and sustainable disaster management policy implementation in Khlong U-Taphao Basin

6. CONCLUSION AND RECOMMENDATION

Khlong U-Taphao Basin area is full of physical and biological diversity and can cause economic and social impact on the southern part of Thailand. To solve the major flood problems in Khlong U-Taphao Basin, integrated disaster management methods, comprehensive engagement of all sectors are required. The governmental, local, and educational organizations as well as affected people and public policy stakeholders should collaborate on environmental and natural resource management and find effective solutions suitable for the local context of each community byusing knowledge sharing and community engagement approach. In addition, social action should be taken to empower the citizens and communities in Khlong U-Taphao Basin, contributing to self-reliance among related communities and sustainable public policy management in Khlong U-Taphao Basin area.

In this research, the current climate change causing natural phenomena and the Asian Cities Climate Change Resilience Network are taken into account in order to promote the ability and readiness of the cities in Asia in coping with the impact of climate change. The coordinating network should be formed to enhance 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. Hatyai City was selected to be a pilot city in theHatyai ACCCRN project, which aimed to find the appropriate public participatory policy development

modelfor disaster management in Hatyai City, Songkla Province.The recommendations for this project regarding public policy promotion are as follows.

1. Community Level: The communities in risky and vulnerable areas should develop climate change response plan, disaster preparedness, mutual capacity enhancement, and social cooperating networks to cope with the disaster and support the existing measures.

2. Landscape Ecology Level: The disaster management model of Khlong U-Taphao Basin can be further applied in other basin areas throughout Thailand in order to enhance effective flood management and prevention suitable for environmental context, way of life, social capital, and other supportive factors.

3. Policy Level: The cooperating networks should be formed at national level in order to handle climate change problems, develop mutual agreements and practices, and drive practical continuity.

Public policy promotion should take account of the local network mechanism in each area such as community and network organization. Local knowledge should be used to develop public participatory policy together with related factors. Private networks should be built to conduct CSR activities, CSR-after-process, CSR-in-process, and CSR-as-process and collaborate in formal and informal operations. The key stakeholders, including universities, hospitals, merchants, and street vendors, should have equal chance to cooperate with each other, contributing to sustainable disaster management in the future.

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