THE CAPACITY BUILDING OF THE COMMUNITY REGARDING FLOOD AND DROUGHT DISASTER MANAGEMENT IN THE PROVINCES OF THE LOWER NORTHEASTERN REGION OF THAILAND

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A Dissertation Submitted in Partial
Fulfillment of the Requirements for the Degree of
Doctor of Public Administration
School of Public Administration
National Institute of Development Administration
2017

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September 2017

ABSTRACT

Title of Dissertation	The Capacity Building of the Community Regarding Flood and Drought Disaster Management in the Provinces of the Lower Northeastern Region of Thailand
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Degree	Doctor of Public Administration
Year	2017

This research studies the patterns and methods of community-level disaster management capacity building, analyzes the capacity, problems, and obstacles, and proposes approaches to the development of sustainable flood and drought management capacity building among local communities in Thailand's lower northeastern provinces. Research data were collected from 10 local communities through interviewing community leaders totaling 10 persons, executives from local administrative organizations totaling 10 persons, and executives of provincial offices of disaster prevention and mitigation totaling 5 persons, including group discussions with community committees and observation of community-level disaster management.

The results showed that the selected communities possess disaster management capacity, as can be seen from the development of disaster preparation and the prevention process based on the principle of community-based disaster risk management (CBDRM) with emphasis on the establishment of coordination and cooperation with external agencies during and after natural disaster occurrence. In addition, it was found that the recommended approaches to the development of sustainable disaster management capacity building consisted of structural measures, such as the establishment of reservoirs, building higher homes, and installing village

water systems and non-structural measures such as raising awareness and fostering self-reliance, establishing disaster management plans, and transferring related knowledge among younger people. Significant problems and obstacles include the lack of community-level strategic planning for disaster management and insufficient disaster management-related resources.

According to this study, it is suggested that strategic plans on community-level disaster prevention should be developed and regularly reviewed by each local community. In addition, a network of cooperation should be established with external agencies, whether it be other communities or the public or private sector, including organizing disaster management knowledge and experience sharing activity among local communities. Meanwhile, local administrative organizations should formulate strategic plans that focus on disaster management capacity building at the community level, particularly regarding non-structural measures, and expanding networks of cooperation with other local administrative organizations in a wider scale. Provincial offices of disaster prevention and mitigation should constantly monitor and evaluate the outcome of community based disaster risk management program, including allocating more disaster management-related resources and budgets among local administrative organizations and high-risk communities.

Furthermore, policy on disaster management capacity building should be determined based on the actual problems and needs of the local community and priority should be given to structural and non-structural measures. Meanwhile, disaster management policy should focus on both flood and drought and prioritize every disaster management process, from prevention to mitigation, preparation, response, and recovery.

ACKNOWLEDGEMENTS

First and foremost, the researcher cannot express enough thanks to the advisor, Asst. Prof. Pairoj Pataranarakul, for his assistance and dedicated involvement in every step throughout the years. Also, I would like to express my sincere appreciation to the chairman and thesis committee members, Assoc. Prof. Kampanad Bhaktikul, Assoc. Prof. Surasit Vajirakachorn, and Assoc. Prof. Nuttakrit Powintara for their continued support and many useful comments in completing the dissertation. I would like to pay my deep sense of gratitude to all lecturers from the Faculty of Public Administration for their valuable knowledge and experiences. Moreover, my sincere thanks to all the staff members for their good support during my Ph.D. study and heartful thanks to my Ph.D. colleagues for their memorable friendship throughout the years. I would like to thank Mr. Kittipong Nasaiya for his textual review, which he would like to dedicate in Remembrance of His Majesty the King Bhumibol Adulyadej. Also, my grateful thanks to the staff and administrators from the Department of Disaster Prevention and Mitigation, Local Administrative Organization, and Community Committee in Nakhon Ratchasima Province, Buri Ram Province, Surin Province, Si Sa Ket Province, and Ubon Ratchathani Province, who provided their useful data and interviews in doing the dissertation.

I am also grateful to Office of the Higher Education Commission for granting me the Ph.D. scholarship. Most importantly, I would like to express my special gratitude to my parents Mr. Suwarn Boonreang and Mrs. Nittaya Boonreang for all their support and encouragement. Above all, my deepest thanks go to my wife, Dr. Anothai Harasarn, who is always by my side with her unconditional love. The researcher also would like to thank everyone very much for their helpful participation in completing the dissertation.

Eakarat Boonreang

August 2017

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CHAPTER 1

INTRODUCTION

1.1 Background and Rationale

A disaster is an event that can lead to damage and loss of life and the properties of the victims residing in the area struck by the disaster. A disaster can either occur in nature such as floods, earthquakes, thunderstorms, and volcanic eruptions or by human action such as chemical hazards and deforestation. However, most recorded disasters are natural disasters; namely floods, earthquakes, wildfires, volcanic eruptions, cyclones, and tsunamis (Coppola, 2007). These natural disasters can be categorized into three types: 1) hydro-meteorological disasters such as floods, hails, windstorms, and cyclones; 2) geological disasters such as volcanic eruptions, tsunamis, and earthquakes; and 3) biological disasters such as epidemic diseases and vegetation or animal-related infections (United States Agency International Development or USAID, 2011a). Natural disasters can have a devastating impact on the life and property of its victims; namely, the loss of life, injury, and damage to structures and communication systems (Carter, 1991). It also causes damage to the overall infrastructure, local agriculture, and livestock as well as negative social and economic impacts. Nevertheless, these losses can be avoided and minimized through proper mitigation or vulnerability reduction (Kumara, 2011).

Thailand's geographical setting is considered to be in a high-risk zone. For this reason, the country has encountered diverse natural disasters during the past three decades; namely Typhoon Gay in 1989, a tsunami in 2004, the great flood in 2011, and drought in 2015. According to the Center for Research on the Epidemiology of

Disaster (CRED) (2016), the number of natural disaster occurrences in Thailand recorded from 1980 to 2016 can be summarized, as shown in Table 1.1 below.

Table 1.1 Types of Natural Disasters and Damage Occurring in Thailand from 1980 to 2016

Type	**Total Number of Occurrences**	**Total Death Toll (persons)**	**Total Number of Victims (Injured and Homeless) (persons)**	**Total Damage (US$)**
Flood	76	3,681	50,649,181	45,089,624,000
Windstorm	23	820	3,897,100	746,823,000
Drought	9	-	29,982,602	424,300,000
Earthquake and Tsunami	4	8,347	84,546	1,062,000,000

Note: Adapted from CRED (2016)

According to Table 1.1, it can be observed that flooding is the most frequently-occurring type of natural disaster in Thailand, with a total number of 76 occurrences recorded, followed by windstorms and droughts with 23 and 9 occurrences, respectively. It can also be found that floods cause the most devastating impact in terms of damage compared to other types of natural disaster by causing as high as 45,089,624,000 US$ in damage, followed by earthquakes and tsunamis, windstorms, and drought totaling 1,062,000,000 US$, 746,823,000 US$, and 424,300,000 US$ in damage.

In 2011, Thailand was struck by one of the most destructive floods in history, which led to substantial losses of life and property as follows (Hydro and Agro Informatics Institute, 2011): death toll totaling 657 persons, missing victims totaling 3 persons, affected households totaling 4,039,459 families or around 13,425,869 persons, damaged households totaling 2,329 houses, partially damaged households totaling 96,833 houses, and damaged agricultural sector totaling 11.20 million rai.

Since the geographical condition of Thailand's northeastern region is largely made up of high plains as a result of the upward movement of the western and southern plates, which then formed an eastward slop resembling a pan-like shape, it is therefore considered to be situated in a high-risk zone all year round, as shown in Table 1.2 below.

Table 1.2 Type of Natural Disaster Occurred in Thailand's Northeastern Region

Month	Natural Disaster
January	Cold Weather
February	Wildfire, Drought
March	Tropical Storm, Wildfire, Drought
April	Tropical Storm, Wildfire, Drought
May	Flood, Tropical Storm
June	Flood, Low Rain
July	Cyclone, Flood, Thunderstorm, Low Rain
August	Cyclone, Flood, Thunderstorm
September	Cyclone, Flood, Thunderstorm
October	Flood, Thunderstorm
November	Cold weather
December	Cold weather

Note: Adapted from the Foundation of National Disaster Warning Council

According to Table 1.2, the most frequently-occurring types of natural disaster include floods, droughts, and thunderstorms, with floods being the number one natural disaster within the region with the highest number of occurrences, longest duration, and causing the highest damage to the life, property, and overall infrastructure of the local communities in the northeastern region. Although floods and droughts are clearly distinguishable in terms of characteristics such as floods often occurring immediately and swiftly while droughts gradually expanding over longer periods, both types of natural disasters are water-related. The period during which the most severe case of flooding often occurs in Thailand's northeastern region is between September to October. The average frequency of flood occurrence or the period of repeated flooding is one period per year at a minimum, which is from the end of August to the beginning of October. The average frequency of drought occurrence, on the other hand, is two periods per year at a minimum. The first period is from December to the beginning of April whereas the second period is from the end of May to October. The period during which the most severe case of droughts often occur is from the end of June through July (Department of Water Resource, 2009).

Thailand's northeastern region is joined by three main river systems, the Khong River (northeastern region), covering a total area of 46,991 square kilometers (or roughly 29.36 million rai), the Chi River, covering a total area of 49,131 square kilometers (or roughly 30.70 million rai), and lastly the Mun River, covering a total area of 71,060 square kilometers (or roughly 44.41 million rai) (Hydro and Agro Informatics Institute, 2013a). The river basin of these three river systems is frequently faced with flooding and drought issues, causing damage to nearby provincial areas, particularly those surrounding the Mun River as the river expands over the largest area compared to the other two river systems and covering many provinces in the country's northeastern region, including provinces that are located upstream or in mountainous and high plain areas; namely, Nakhon Ratchasima Province and Buri Ram Province, both of which frequently face drought and flood issues. However, the severity of natural disasters in the two provinces is not as considerable as the provinces in the central plain region; that is, Surin Province and Si Sa Ket Province or even Ubon

Ratchathani Province, which is faced with the most severe degree of flooding due to the overflowing river basin since it is where the two main river systems, the Mun River and the Chi River, join. Hence, Ubon Ratchathani Province is the most severely impacted area compared to other provinces located along the Mun River. The geographical differences and similarities of the aforementioned provincial areas will inevitably affect governmental policy and the disaster management scheme of each local area by taking into account their suitability for the existing problem and the requirements of each local community as well as local and provincial contexts.

With respect to the community settlements along the river basins, it was found that the majority of the population works in the agricultural sector. In addition, the number of buildings and amount of construction have substantially grown as a result of urban expansion. However, inefficient land utilization coupled with the lack of awareness of the impact of floods and drought, deforestation, and climate change have led to severe rain and extended low rain periods, which in turn intensifies the risk of flood disasters.

Based on data from the Department of Disaster Prevention and Mitigation (2011a), the numbers of community or village in Nakhon Ratchasima Province, Buri Ram Province, Surin Province, Si Sa Ket Province, and Ubon Ratchathani Province that are at risk of floods and landslides can be summarized as per Table 1.3 below.

Table 1.3 The Number of Communities in Nakhon Ratchasima Province, Buri Ram Province, Surin Province, Si Sa Ket Province, and Ubon Ratchathani Province at Risk of Floods and Landslides in 2011

Province	Number of Communities at Risk to a Severe Degree			Size of Population and Number of Households		Remark
	3	2	1	Population	Household	
Nakhon Ratchasima	594	102	0	417,007	104,818	Degree of Severity 1 = Low Risk
Buri Ram	6	280	0	151,021	36,712	2 = Medium Risk
Surin	87	113	33	129,634	25,687	3 = High Risk
Si Sa Ket	399	291	0	343,172	64,183	
Ubon Ratchathani	21	426	0	260,559	61,297	
Total	**1,107**	**1,212**	**33**	**1,301,393**	**292,697**	

Note: Adapted from Department of Disaster Prevention and Mitigation (2011a)

The flood conditions by province can be summarized as follows: (Hydro and Agro Informatics Institute, 2013b)

In Nakhon Ratchasima Province, the flooded areas are mainly concentrated along both sides of the Mun River starting at the end of Lam Takhong Dam to the Chalermprakiat District, where it is joined by the Mun River. In addition, the floods occurring in these areas are largely due to overflowing river basins as tributaries are joined with the main river system which then swiftly increases the water level over a short period.

In Buri Ram Province, overflowing of the Mun River basin can be observed but with low severity.

In Surin Province, the flooding is largely concentrated in urban districts, especially when it is raining since it is located along a tributary.

In Si Sa Ket Province, Huai Samran Reservoir has insufficient capacity whereas the urban district is cut through by a tributary. Hence, flood risks are at a moderate level.

In Ubon Ratchathani Province, the flooded areas are largely concentrated along the Mun River basin, which is located in Muang District and Warinchamrab District, where it is mainly influenced by both the Mun River and Chi River systems. These areas are also affected by the natural rapids of the Mun River in Phibun Mangsaharn District, which block the water flow.

Furthermore, five provinces have the largest proportions of land located along the Mun River basins as follows: 1) Nakhon Ratchasima (26.86%), 2) Ubon Ratchathani Province (17.80%), 3) Buri Ram Province (14.19%), 4) Surin Province (12.46%), and 5) Si Sa Ket Province (12.19%), respectively (Hydro and Agro Informatics Institute, 2013Kor.). Apart from having a high risk of floods and landslides, the geographical setting of Thailand's northeastern region, which is mainly constituted by dry and arid conditions, unseasonal rain and extending low rain periods coupled with low-water absorption soil conditions since it is largely made up of sand and worsening deforestation situations, have led to repeated and widening drought issues. Meanwhile, agricultural expansion in irrigation and non-irrigation zones has resulted in increasing fresh water demand, which in turns leads to worsening water shortage. In addition, the region's limited reservoir development capacity can be observed while existing large, medium, and small reservoirs, including check dams, natural ponds, and lakes, are unable to provide sufficient water supply for agricultural and industrial needs and local consumption demand. Natural reservoirs and natural water sources have been found to have become shallow and unable to efficiently reserve water. These factors all affect the quality of the life of the local communities along the river basin. Based on the data prepared by the Department of Disaster Prevention and Mitigation (2007a), the number of communities or villages in Nakhon Ratchasima Province, Buri Ram Province, Surin Province, Si Sa Ket Province and Ubon Ratchathani Province that are at risk of drought can be summarized according to Table 1.4 below.

Table 1.4 The Number of Communities in Nakhon Ratchasima Province, Buri Ram Province, Surin Province, Si Sa Ket Province, and Ubon Ratchathani Province at Risk of Drought in 2007

Province	**Number of Communities at Risk by a Severe Degree**				**Total**
	High	**Medium**	**Low**	**Very Low**	
Nakhon Ratchasima	996	0	0	1,800	**2,796**
Buri Ram	1,045	0	0	1,236	**2,281**
Surin	1,062	0	0	952	**2,014**
Si Sa Ket	728	347	0	1,181	**2,256**
Ubon Ratchathani	17	726	446	848	**2,037**
Total	**3,848**	**1,073**	**446**	**6,017**	

Note: Adapted from Department of Disaster Prevention and Mitigation (2007a)

According to Table 1.4, a large number of “high-risk” communities can be observed in all five provinces but this is still lower than the number of “very low-risk” communities combined. Nevertheless, the high risk level in these provincial areas suggests adverse impacts on the lives and professions of the residents in these high-risk zones. In 2015, drought had spread to many provinces across Thailand’s northeastern region, causing a direct impact on the local economy; namely, losses in terms of agricultural produce, fisheries, livestock, and forestry; a social impact such as poor health and sickness due to water supply shortages, the spread of communicable diseases in humans and animals; an environmental impact such as the lack of biodiversity, poor water quality, and deteriorating underground water; and the occurrence of drought-related disasters such as wildfires, tropical storms, etc. The provinces in the lower northeastern region have been officially announced as

drought high-risk zones. This includes Nakhon Ratchasima Province, totaling 23 districts, and Surin Province, totaling 1 district (Office of Natural Resources and Environmental Policy and Planning, 2015). Nevertheless, other lower northeastern provinces are also at risk of drought.

In addition, it can be found that all five provinces have been allocated with additional budgets as financial aid for assisting flood and drought victims, as shown in Table 1.5 below.

Table 1.5 Expenditures for Supporting Flood and Drought Victims in Nakhon Ratchasima Province, Buri Ram Province, Surin Province, Si Sa Ket Province, and Ubon Ratchathani Province for Budget Year 2012 (exchange rate: 36 baht = 1 US$)

Provinces	**Flood**	**Drought**	**Total (**US$**)**
Ubon Ratchathani	5,253,727	1,296,225	6,549,952
Si Sa Ket	2,607,654	826,572	3,434,226
Surin	1,384,592	1,340,682	2,725,274
Nakhon Ratchasima	1,349,950	1,369,016	2,718,966
Buri Ram	1,046,119	1,183,701	2,229,820
Total	**11,642,042**	**6,016,196**	**17,658,238**

Note: Adapted from Department of Disaster Prevention and Mitigation (2013)

According to Table 1.5, substantial damage from both types of natural disasters has been reported in the five provinces. The provinces showing the highest and lowest expenditures for supporting flood victims include Ubon Ratchathani Province at 5,253,727 US$ and Buri Ram Province at 1,046,119 US$. The provinces showing the highest and lowest expenditures for supporting drought victims include Nakhon Ratchasima Province at 1,369,016 US$ and Si Sa Ket Province at 826,572 US$. The expenditure for supporting both flood and drought victims of the five

provinces combined equals 17,658,238 US$. This reflects not only a considerable amount of financial support but also substantial losses to local communities and governmental budgets. Unless, efficient preventive measures and preparation plans are in place, increasing natural disaster-related damage can be expected.

The aforementioned data indicate that Nakhon Ratchasima Province, Buri Ram Province, Surin Province, Si Sa Ket Province, and Ubon Ratchathani Province are all situated in high-risk zones. The geographical setting, population size, culture and lifestyle, and urbanization expansion are contributing factors causing these five provinces to be at risk of floods and drought. In addition, the lack of disaster prevention or reduction plans, coupled with inadequate disaster management capacity, are the key factors leading to substantial damage and loss of life and the property in the affected areas, particularly in high-risk zones where natural disasters tend to strike first. Hence, community-level preparation plans and adequate disaster management capacity must be developed. In the past, natural disasters were commonly handled through a passive approach. In other words, local communities tended to seek solutions after a natural disaster occurred using local knowledge and existing resources and solely relying on governmental support. As a result, local communities were unable to efficiently prevent damage from natural disasters or promptly respond to the needs of communities located in high-risk zones.

In 2004, the Department of Disaster Prevention and Mitigation began to adopt community based disaster risk management (CBDRM) through a community-level disaster prevention and mitigation capacity building program, which aims to build knowledge and understanding among local communities regarding natural disaster risks and impacts, raising awareness of the importance of community engagement in preliminary organizational disaster management, promoting the development of community-level preparation plans, and lastly implementing regular emergency drill exercises among local communities (Department of Disaster Prevention and Mitigation, n.d.). The key focus of this program is to enhance the disaster management capacity among local communities. Nevertheless numerous communities in Nakhon Ratchasima Province, Buri Ram Province, Surin Province, Si Sa Ket Province and

Ubon Ratchathani Province continue to be severely affected by natural disasters, that is, floods and drought, despite the implementation of disaster management capacity building based on the CBDRM principle. This reflects inefficient disaster management and ineffective disaster management capacity development, which then prevents natural disaster issues and community requirements from being handled and addressed in a sustainable manner.

Hence, it is highly interesting and crucial to conduct a study on flood and drought disaster management capacity building among the local communities in Nakhon Ratchasima Province, Buri Ram Province, Surin Province, Si Sa Ket Province, and Ubon Ratchathani Province. The selected population of study includes high-risk communities that have received training on disaster prevention and mitigation capacity building based on the principle of community based disaster risk management. This has allowed the researcher to study the patterns and methods of flood and drought management capacity building, including analyzing the capacity, problems, and obstacles concerning flood and drought management and proposing suggestions for the development of sustainable flood and drought management capacity building among local communities in the lower northeastern region. The study results will provide policy guidance on flood and drought management capacity building among Thailand's lower northeastern provinces.

1.2 Research Questions

1) What are the approaches taken by local communities in Thailand's lower northeastern provinces in managing floods and droughts and what are some of the management problems and obstacles faced by the local communities in the area?

2) What are the approaches taken by local communities in Thailand's lower northeastern provinces in enhancing flood and drought management capacity and how has such capacity building affected the community's disaster management and sustainability?

3) What are some of the suggested approaches for the development of sustainable flood and drought management capacity building among the local communities in Thailand's lower northeastern provinces?

1.3 Objectives of Study

1) To study the patterns and methods for enhancing flood and drought management capacity among local communities in Thailand's lower northeastern provinces

2) To analyze the capacity, problems, and obstacles related to flood and drought management among the local communities in Thailand's lower northeastern provinces

3) To propose approaches to the development of sustainable flood and drought management capacity building among the local communities in Thailand's lower northeastern provinces

1.4 Scope of Study

1) Content Aspect – This study concentrates on flood and drought management capacity building among Thailand's lower northeastern provinces.

2) Geographical Aspect – This study mainly focuses on the local communities in Thailand's lower northeastern provinces, which include Nakhon Ratchasima Province, Buri Ram Province, Surin Province, Si Sa Ket Province, and Ubon Ratchathani Province.

3) Demographic Aspect – The selected population of study consisted of the heads of villages, community committees, the executives of local administrative organizations, disaster prevention and mitigation officers from each local community, and the heads of the provincial office of disaster prevention and mitigation in Nakhon Ratchasima Province, Buri Ram Province, Surin Province, Si Sa Ket Province, and Ubon Ratchathani Province.

4) Duration – This research focuses on studying the management of the floods and droughts that occurred between 2011 – 2016.

1.5 Expected Benefits

1.5.1 Academic Benefits

This study will reduce the gap in the studies on natural disaster management capacity building since there are a limited number of studies on flood and drought management capacity building among the local communities in Thailand's lower northeastern provincial areas.

1.5.2 Benefits of the Study

1.5.2.1 To recognize the patterns and methods of flood and drought management capacity building adopted by local communities in Thailand's lower northeastern provincial areas

1.5.2.2 To recognize the capacity, problems, and obstacles related to the flood and drought management faced by the local communities in Thailand's lower northeastern provincial areas

1.5.2.3 To recognize the approaches to the development of sustainable flood and drought management capacity building among the local communities in Thailand's lower northeastern provincial areas

1.5.3 Management Benefits

1.5.3.1 Community Level – Each community will be able to recognize its disaster management capacity and develop appropriate approaches for sustainable flood and drought management capacity building.

1.5.3.2 Local Administrative Organization Level – The local administrative organization in each community will be able to determine appropriate flood and drought management capacity building programs or activities for each local context.

1.5.3.3 Policy-Maker Level – The Provincial Office of Disaster Prevention and Mitigation will gain appropriate policy on flood and drought management capacity building to be adopted among the local communities in Thailand's lower northeastern provincial areas.

1.6 Terms and Definitions

The following terms and definitions have been determined for use in this research as follows:

Crisis management means the procedures for the prevention, preparation, rectification, and improvement of conditions that may cause damage to the surrounding community.

Capacity means the ability to prevent and mitigate the impacts resulting from natural disasters, including preparation, and the provision of relief, assistance, and recovery from natural disasters.

Capacity building means the patterns and methods used for supporting or enhancing the ability to prevent and mitigate the impacts resulting from natural disasters, including preparation, and the provision of relief, assistance, and recovery from natural disasters.

Risk means the possibility of being exposed to danger and damage caused by natural disasters.

Natural disaster in this research focuses only on floods and droughts.

Lower northeastern provinces mean Nakhon Ratchasima Province, Buri Ram Province, Surin Province, Si Sa Ket Province, and Ubon Ratchathani Province.

Community means to the local communities in lower northeastern provinces.

Local means the local administrative organization that look after communities.

Provincial means the Provincial Office of Disaster Prevention and Mitigation in the lower northeastern provinces.

System or institution means policies, laws, and plans related to community-level disaster management capacity building.

Community based disaster risk management means the community's ability to manage natural disasters—from planning to implementation—and the evaluation of outcomes using existing resources instead of relying on the assistance of external organizations.

Knowledge and skills mean the provision of knowledge and skills training related to natural disaster management among the local community.

Resources mean the budget, equipment, and personnel related to disaster management capacity building.

Engagement means community engagement in the process of planning, preparation, and prevention prior to the occurrence of natural disasters, providing relief and aiding victims during a natural disaster, including the recovery and reconstruction process following the occurrence of a natural disaster.

Cooperation means community cooperation in enhancing disaster management capacity together with other communities, the public, and private agencies.

Role of the community leader and community committee means the role in enhancing disaster management capacity among the local community.

Disaster risk reduction refers to prevention and preparation processes in order to prevent or minimize the impacts resulting from natural disasters.

Active disaster management means the disaster management process before, during, and after a natural disaster occurrence by focusing on natural disaster prevention and mitigation, including preparation, response, recovery, and development rather than assistance during the natural disaster.

Sustainability means a community's adaptability in terms of economic, social, and environmental aspects before, during, and after a natural disaster occurrence.

Sustainable disaster management means an approach to community-level disaster management capacity building in order to enable self-reliance and sustainable disaster management among the local community.

CHAPTER 2

LITERATURE REVIEW

This chapter presents the literature review relevant to community capacity building in flood and drought management in the lower northeastern provinces of Thailand. The details are as follows.

2.1 Crisis Management

2.1.1 Definition of Crisis

Since the 1980s numerous crises have raised fear and panic among the global population. This includes Chernobyl's nuclear power plant leakage, the outbreak of hand-foot-and-mouth disease and avian flu disease, the subway explosion in London, the 9/11 terrorist attack, and Hurrican Katrina. Similarly, Thailand was also struck with several crisis events; namely, the Tom Yam Kung Crisis in 1997, the tsunami disaster in 2004, and the Great Flood in 2011. These deveastating events brought significant losses to life, property and income at personnel, organizational, and national levels.

The term crisis can be replaced by many other terms, such as disaster, business interference, devastation, or emergency, depending on the situation (Herbane, 2010). The term crisis is rooted in the word "krisis," which means judgment, choice or decision (Paraskevas, 2006). However, no universally-accepted definition has currently been given for this term since its meaning depends on the context of use, the speaker, and level of chaos in each situation (Eliasson & Kreuter, 2000). In addition, the cultural and legal perspectives of each country must also be taken into account in

order to develop an appropriate operation plan for the concerned crisis (Khodarahmi, 2009). Pearson and Clair (1998) provided a definition of the term crisis as an event with low possibility but that causes a significant impact and organizational threats and often presents vague logic, impacts and problem-solving method. Devlin (2007) provided a definition of the term crisis as a period of organizational volatility, as there is a clear possibility of an undesirable outcome. Both definitions are aligned with the one provided by Coombs (2007), who defined the term crisis as the realization of an unexpected event that threatens the significant expectation of the stakeholder and may have a serious affect on organizational performance and a negative outcome. Furthermore, crisis can refer to an event that affects the long-term credibility of an organization or a product or affects the normal function of that organization or product either by a natural or man-made cause (Department of Tourism Thailand, 2013).

The researcher concluded that crisis is an undersirable event that may threaten the normal living and function of an organization and often bring losses to the life and property on personnel, organizational, and national levels.

2.1.2 Types of Crises

Hillyard (2000) categorized public crisis into the following types:

1) Natural crises such as hurricanes, tonados, tidal waves, storms, snowstorms, and meteoroids

2) Technological crises such as water contamination, power shortages, computer viruses, and nuclear power plant leakages

3) Political crises such as genocide, revolutions, and riots

4) Human conflict-related crises such as wars, crimes, terrorism, and weapons trading

Shaluf, Ahmadun, and Said (2003) categorized the crisis as follows:

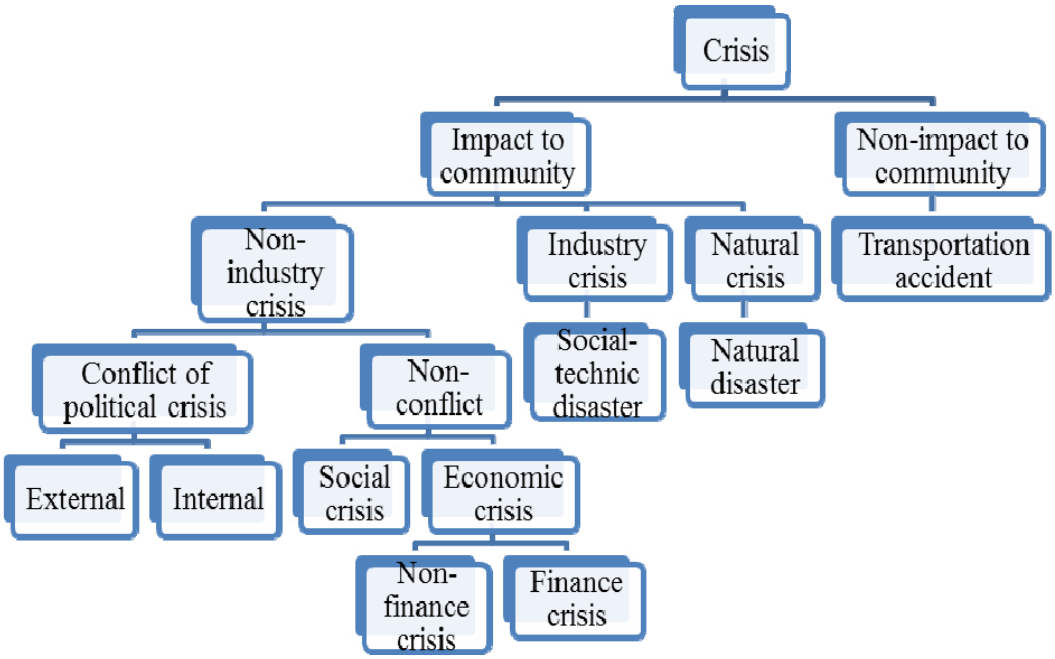

Figure 2.1 Types of Crises

Note: Adapted from Shaluf, Ahmadun, and Said (2003)

According to Figure 2.1, external political crises include wars and terrorism, whereas internal political crises include conflicts related to race and religion. Socical crises, on the other hand, include bribery, sexual harassment, sexual discrimination, etc. Crises with no affects on the local community include road accidents, which have no impact on community structure or function. A natural disaster, on the contrary, is a type of natural crisis that affects the local community by causing damage to the life and property of the people within that community.

In sum, crises can be categorized into different types depending on the judgement of each scholar. However, no universal categorization of crisis has so far been determined. Hence, this study divided the notion of crisis into two main types: 1) national crises and 2) man-made crises. The first type involves crises that occur

naturally and that are often unavoidable but their impact can be prevented and mitigated, such as volcanic explosions, tsunamis, storms, and floods. The second type of crisis includes polical conflicts, race and religious conflicts, wars, and terrosim. However, this study largely focuses on two main natural crise, floods and drought.

2.1.3 Crisis Management

Crisis management means a series of procedures designed to combat and detect a crisis in order to develop proper prevention and to minimize negative impacts. Most importantly, it aims to protect an organization, stakeholders, and the industrial sector from harm. Crisis management involves the four following procedures (Deaprtment of Toursim Thailand, 2013; Coombs, 2007):

1) Prevention or Reduction – This procedure involves the attempt to avoid or prevent a crisis from happening through predicting a potential crisis, including preparing steps for minimizing potential impacts based on a SWOT analysis.

2) Preparation or Readiness – This is the most well-known procedure in crisis management as it involves determining a crisis management plan (CMP), including finding the cause of crisis volatility, the selection and training of a crisis management team and host, preparing crisis profiles, and improving the crisis communication system. In addition, relevant persons must be physically and mentally prepared for handling the impacts from crises.

3) Response – This step involves applying the elements in the preparation procedure during the actual crisis and usually takes place during the chaos of the event. The efficiency of the organizational response often depends on the determined reduction and preparation plan. In this third procedure, controlling the damage to life and property is the top priority whereas effective communication is also highly crucial in order to establish correct understandings among the victims.

4) Revision or Recovery –This procedure involves evaluating organizational response efficiency during simulation and real-life events in order to determine strengths and weaknesses during crisis management. This step mainly relies

on teamwork and efficient coordination among relevant parties in order to ensure quick and efficient recovery.

A crisis is a situation that no organization desires as it often adeversly impacts the normal operation of that organization and causes damage to the overall nation. Hence, crisis management should be incorporated as part of strategic management by establishing correlations among strategies, scenarios, and crisis management since a scenario involves foreseeing the possible future of the organization to enable immediate handling of environmental changes and at the same time enhances crisis management strategies and the capacity of an organization. Nevertheless, crisis management and strategic management should be based on creativity and originality in order to ensure the survival of an organization (Pollard & Hotho, 2006). For this reason, seeking the root cause of the crisis is therefore highly crucial in order to be able to identify potential crises and to be prepared for crisis management. Some of the most influential or frequently-adopted crisis management concepts for use as a guideline of practice or for developing crisis management patterns include the following.

Fink (1986) applied the concept of medical symptoms to crisis management procedures or cycles as follows:

1) The prodromal crisis stage is when warning signs prior to a crisis occur or when the starting point of a crisis can be observed.

2) The acute crisis stage is when damage begins to take place. The severity of damage depends on the readiness of an organization and the effectiveness of the organizational response to that crisis.

3) The chronic crisis stage is when an organization attempts to recover from a crisis and to learn from its response failure or success.

4) The crisis resolution stage is when an organization has returned to its normal situation and functioning. At this stage, an organization may gain deeper crisis management knowledge if knowledge management has been implemented.

The above procedures resemble the crisis management procedures defined by Mitroff (1994), who divided crisis management into five stages as follows:

1) Signal detection is the stage during which warning signals have been identified for crisis prevention.

2) Probing and prevention is the stage during which an organization searches for potential crisis risk factors and takes action for reduction of harm.

3) Damage containment is the stage during at which a crisis occurs and the affected organization attempts to prevent harm and damage from it.

4) Recovery is the stage during which an organization has returned to the normal situation and operation as much as possible.

5) Learning is the stage during at which an organization revises and analyzes its crisis management attempt via learning processes or knowledge sharing regarding crisis management.

Furthermore, Crandall, Parnell, and Spillan (2014) have discussed the crisis management framework, which takes into account the internal and external conditions of an organization. The framework involves the following procedures:

1) Landscape survey involves considering the internal and external crisis of an organization in order to indicate its organizational strengths and weaknesses. Industrial weakness is considered as a preliminary crisis that an organization must specifically encounter.

2) Strategic planning involves considering the internal conditions of an organization with vaim to prevent a potential crisis and to carry out mitigatin planning in case the implemented preventive measure fail to prevent the crisis. This stage often begins by appointing a crisis management team to be mainly responsible for evaluating the potential crisis, including preparing a general crisis management guideline or plan. Meanwhile, considering the external conditions should laregely be focused on the events tha have occurred within the industry in order to enable the prevention and handling of crisis situations.

3) Crisis management is a procedure that mainly involves the attempt to resolve the crisis and to rectify the situation as soon as possible and is still relevant to

primary and secondary stakeholders. Primary stakeholders include the owner of an organization, employers, clients, the local community, and raw material suppliers. Secondary stakeholders include any groups having personal gain within an organization. Furthermore, relevant stakeholders can also be categorized in terms of internal and external stakeholders. Internal stakeholders include the owners and employees of an organization, whereas external stakeholders include clients, raw material suppliers, the local community, diverse governmental groups, and specific benefit groups.

4) Organization learning mainly emphasizes what an organization has learned from its crisis management. It is a stage during which an organization has resumed to the normal situation and functioning. Organization learning also involves considering the internal conditions by focusing on whether the organization was able to prevent the crisis from reoccuring and whether it was able to reduce the impact in the case of crisis reoccurrence. Meanwhile, the consideration of external conditions mainly focuses on evaluating and revising governmental rules and regulations after the crisis occurrence. For instance, significant changes were applied to the U.S. aviation industry following the 9/11 terrorist attack. Most governmental rules and regulations are often implemented or revised following a crisis event in order to ensure higher safety of the stakeholders within that industry.

In conslusion, crisis management in the present study refers to the attempt to rectify the problems and threats afftecting people, organizations, and the overall nation in a systematic and orderly fashion, beginning with prevention, preparation, and response to recovery with the aim to prevent a crisis or to reduce the impact of a crisis as much as possible.

2.2 Disaster Management

2.2.1 Definition of Disaster

The term disaster originated from the French word “desastre,” which is comprised of two separate terms: “des,” which means evil, and “aster,” which means star. When combining the two terms, it forms the meaning, star of evil (Khan, Vasilescu, & Khan, 2008). The United Nations International Strategy for Disaster Reduction (UNISDR, 2009) defined disaster as a serious disruption of the functioning of a community or a society on any scale due to hazardous events interacting with conditions of exposure, vulnerability, and capacity, leading to human, material, and environmental losses and impacts and where the effect may exceed the capacity of a community or society to cope using its own resources. Hossain (2013) provided a similar definition by stating that disaster is the result of a hazard occurring among volatile populations. A natural hazard can become a disaster when it causes a serious disruption of the functioning of a community or a society on any scale, leading to human, material, economic, and environmental losses and impacts beyond the capacity of a community or society to cope using its own resources. Twigg (2004) also provided a similar definition by stating that a disaster is a hazard and a serious disruption with effects exceeding the capacity of a society to handle it, including natural changes beyond the normal level that lead to significant impacts on human as well as social and economic development (Zhang, Okada, & Tatano, 2006).

In addition, disaster has also been defined as a highly complex event that occurs abruptly and causes destruction, including property and environmental losses and local hazards (National Security Council of Malaysia, 1997). The idea of a disaster has also been foud to be correlated with poverty by reducing income and consumption level, which leads to poverty on a wider scale. At the same time, proverty can lead to a significant disaster impact as a result of insufficient resources and mechanisms for coping with the disaster (Vatsa, 2014). Hence, in order to recover from disaster losses, a community must shift its approach from disaster impact mitigation (by which a community is viewed as a victim and passive player) to

disaster preparation (which is a holistic and long-term approach to enable vulnerability reduction, which is part of the development planning process) (Rahman, 2012).

Disaster risk can also be explained through a combination of hazard, exposure, vulnerability, and capacity or inadequate measures for reduction or coping of negative outcome (UNISDR, 2009), which can be expressed by the following equation (Collins, 2009, as cited in Sitko, 2012; Zhang et. al., 2006) below:

$$\text{Disaster risk} = \frac{\text{Hazard x Exposure x Vulnerability}}{\text{Capacity}}$$

The above equation can be explained as follows (Zhang et al., 2006):

Hazard refers to a serious natural event that has adverse impacts on human life, material or activities and that is the cause of a disaster with a certain level of possibility and severity. The higher is the possibility and severity level, the more devastating will be the damage and risks of a natural disaster.

Exposure refers to the size of the population, property, structure, and activity affected by the hazard. The higher the size of the population and property exposed to a hazard, the higher is the level of losses and risks of the natural disaster.

Vulnerability refers to the resistibility of material and the population against hazard. The higher is the vulnerability of the material or the population, the higher will be the level of losses and risks of a natural disaster. The causes of vulnerability can be physical factors, such as settlements in high-risk zones, the construction of sub-standard buildings and structures, or social factors such as viewing the disaster as a uncontrollable event since it is solely caused by the actions of God or nature (McEntire, 2012).

Capacity refers to the ability to handle natural disaster risks by forming data and information, power, institution, partnership, plan, resources, and measures for the prevention and reduction of natural disaster risks.

The increasing exposure and delays in vulnerability reduction are two contributing factors leading to increasing numbers of natural disasters and higher

levels of losses. Therefore, in order to reduce natural disaster risks, it is highly crucial to reduce the vulnerability and limit the exposure to hazards as much as possible by migration the population and property and by promoting emergency responses and capacity recovery (Zhang et al., 2006).

Hence, a disaster will occur when a hazard, exposure, and vulnerability are combined. In addition, a disaster can also mean a negative event that takes place abruptly or causes severe misfortune, leading to severe harm to humans, plants, and animals (Khan, et al., 2008). A disaster often impacts population vulnerability and causes hazards, a high death toll, and destruction. Disaster impact may also include the loss of life, injury, serious disease, and other negative impacts on the physical and mental health of humans and the well-being of the overall society, including property damage, service distruption, social and economic destruction, and environmental deterioration (UNISDR, 2009). Despite its diverse definitions, no universally-accepted definition of the term disaster has been determined so far as its meaning largely depends on the context of use (term) (Shaluf et al., 2003). However, a general definition of the term is the impact resulting from a disaster that leads to the loss of life and well-being, economic losses, physical injury, property damage, life and necessary service disruptions, damage to infrastructures and regimes, and social and psychological impacts following the disaster occurrence (Carter, 1991). In addition, the meaning of the term also depends on the policies, laws, organizations, and disaster management in each country.

During the past two decades the number of disaster occurrences have significantly increased due to more frequent natural disasters largely caused by severe hydrological and meteorological weather conditions (Center for Research on the Epidemiology of Disaster or CRED, 2010). It has been widely accepted that the increasing number of disaster occurrences actual results from human actions and development patterns (Coppola, 2007) and is closely related to economic conditions, society, traditions, culture, and the weather conditions within a community (Pandy & Okazaki, 2005). In addition, Zhang et al. (2006) revealed that half of the natural disaster occurrences recorded in Asia during the past three decades have made this

region the world's most dangerous. Apart from a rapidly-increasing number of disaster occurrences, the different characteristics and patterns of natural disasters recorded can also be observed as follows: 1) they have become a regular phenonmenon instead of a single event; 2) there are more frequent occurrences of disasters instead of occasional occurrences; 3) they are caused by various factors instead of a single factor; 4) most local disasters tend to rapidly spread leading to crises on a large scale; and 5) a crisis caused by anatural disaster in one country can spread to another country at any point of time or even spread on a global scale.

In Thailand, no definition of the term disaster has been determined since the country uses the term "public disaster" to represent a disaster as per Thailand's Disaster Prevention and Mitigation Act B.E. 2550 (2007), which refers to fires, windstorms, floods, droughts, epidemic diseases in humans, epidemic diseases in animals, epidemic disease in marine wildlife, the spreading of weeds, including other hazards that may affect general public whether caused by nature, humans, accidents or any other causes that can damage the life and physical health of the people or damage the property of the people or the government, including aeronautical hazards and sabotage (Department of Disaster Prevention and Mitigation, 2007b)

To sum up, a disaster or a public disaster is an event that may be harmful to humans and cause damage to the life and property of humans. Hence, relevant persons both in the public and private sectors, including the local community and key stakeholders, should seek efficient ways to enhance disaster management capacity in order to allow for the development of sustainable disaster prevention.

2.2.2 Disaster Management Procedures

The objectives of disaster management include: 1) preventing loss of life, 2) relieving human pain and suffering, 3) disseminating risk information among the general public and officials, and 4) reducing damage to infrastructure, property, and loss of economic resources (Ulum & Chaijaroenwatana, 2011). Although disasters impact life and property usually occur during the disaster, the management procedures before and after disaster occurrence are also crucial to ensure efficient prevention,

preparation, and revision of the past disaster management to see whether the action taken was able to prevent and minimize losses from the disaster. Hence, disaster management is not merely a process of managing disaster during its occurrence. Instead, it involves managing a disaster before, during, and after its occurrence. Khan et al. (2008) summarized the activities related to disaster management procedures as follows.

1) Before the disaster occurrence – This mainly involves reducing damage and loss of human life and property due to the occurrence of the hazard, such as initiating campaigns, raising awareness, strengthening vulnerable structures, preparing disaster management plans at the household and community levels, and setting up advance warning systems to ensure quick evacuation (White & Rorick, n.d.).

2) During the disaster occurrence – This mainly involves providing for the needs of the victims and minimizing suffering. The activities carried out at this stage are commonly known as emergency response.

3) After the disaster occurrence – This mainly involves responding to a disaster event with the aim to carry out initial recovery and reconstruct the affected community immediately after a disaster has occurred. This procedure is commonly known as response and recovery.

Coppola (2007) summarized complete disaster management procedures as follows.

1) Mitigation - This procedure involves reducing or eliminating the possibility or impact of hazards. A key aspect of this procedure is risk assessment, which can help to identify the potential risks faced by each individual, the community, and the country (Beach, 2010). Mitigation can be performed before, during, and after a disaster occurrence. Hence, mitigation can overlap any procedures of the disaster management process (Fernando, 2001, as cited in Hossain, 2013) and is closely related to vulnerable communities, and the government sector and non-governmental sectors (Metri, 2006).

Disaster impact mitigation also involves reducing and eliminating the hazardous impacts of a disaster by implementing structural measures such as the construction of bridges, dams, check dams, and other protective structures and non-structural measures, such as community risk assessment, community risk reduction planning, raising public awareness, and providing advice related to disaster and development. Mitigation and prevention are directly-correlated procedures in order to pave the way for the development of a sustainable disaster management capacity enhancement plan (Vitoria, 2001). In addition, mitigation is a procedure that requires high commitment and effort in promoting integration and coordination among relevant parties in order to bring existing emergency management capacity into practice (Metri, 2006).

2) Preparedness – This procedure involves supplying tools and knowledge to the population exposed to the disaster risk and reducing the losses and property damage of the people. Knowledge, awareness, resources, and efficient operation frameworks are the key elements of the community's preparation for a natural disaster (Khan, 2008). It also involves developing a disaster plan, providing training among officials and high-risk communities, and maintaining human resources, equipment, materials and finance, including establishing an education system and public information, and forecasting and making advanced preparation for upcoming threats (Kreps et al., 2006; Kadel, 2011). Hence, the effective responses to a disaster must be promoted and achieved through efficient or proper preparation (Hossain, 2013). In addition, the more the community is familiar with disaster management and advance warning procedures, the lower will be the severity of the disaster impact (Abarquez & Murshed, 2004). It is also recommended that preparation procedure be carried out through participation by starting from awareness raising if possible, including providing education and conducting risk analysis (Jahangiri, Izadkhah, &Tabibi, 2011).

Preparation is part of the mitigation procedure and is involved in many other related disaster management activities—from providing victim relief and

reconstruction to recovery (Suda, 2000). Any community having implemented its preparation plan is likely to have quicker recovery (Waugh, Jr., 2013).

3) Response – This procedure involves reducing or eliminating the current disaster impact, including preventing harm to life and property. It mainly focuses on dealing with emergency situations and urgencies during disaster. However, disaster management in most countries, particularly developing countries, is largely prioritized in terms of emergency response, which is more of a passive disaster management approach instead of focusing on disaster impact prevention and mitigation, which is an active disaster management approach.

4) Recovery – This procedure concerns returning the victims back to their normal situation after having been affected by a disaster. This includes physical recovery, such as repairing and reconstructing damaged houses and buildings and mental recovery, such as giving medical consultation to the victims. In addition, response also involves educating the victims regarding natural disasters, and revising and improving disaster prevention plans at the community level in order to ensure efficient handling of future disasters.

The disaster management procedures proposed by Coppola correspond to the disaster management process proposed by Carter (1991), who defined the basic disaster management cycle pattern as follows:

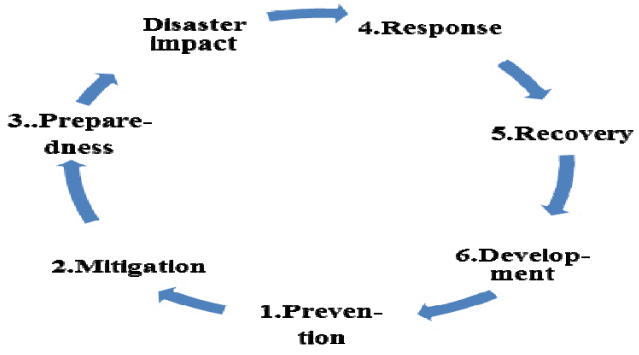

Figure 2.2 The Disaster Management Cycle

Note: Adapted from Carter (1991)

Figure 2.2 displays the disaster management process beginning with 1) prevention, which is a process before the disaster occurs and mainly focuses on avoiding or preventing disaster impacts, for example by constructing flood protection dams and designing standardized structures; this is followed by 2) mitigation, which mainly involves reducing disaster impacts such as by improving warning systems and raising public awareness of disaster risks; 3) preparation, which emphasizes coping with disaster impacts, for example by developing emergency plans and making preparations for and evacuation; 4) response, which involves taking immediate action during a disaster such as saving lives, and providing assistance and donations; 5) recovery, which takes place after a disaster and mainly involves reconstructing and renovating damaged structures and mental recovery; 6) development usually takes place once long-term recovery is achieved and often includes plans revisioning for efficient disaster management, raising public awareness of disaster risks, and integration between disaster management at the community, local, provincial, and national level.

Furthermore, disaster management also concerns the significant difference in systems such as government and political systems, history, society, economy, finance, and the environment (Cavallo & Ireland, 2014). The UNDP (1992) defined disaster management as a series of policy decision-making and management and operational-level activities related to disaster management procedures at every level. Hence, the definition of disaster management is a science of searching based on systematic observation and analysis with the aim to improve measures related to prevention, mitigation, preparation, emergency response, and recovery processes (Carter, 1991).

According to the USAID (2011a), disaster risk management is a process which consists of structural measures and non-structural measures with the aim to prevent, mitigate, and prepare for the adverse impact of potential hazards, which corresponds with the definition proposed by Zhang et al. (2006), who stated that disaster risk management can help to strengthen disaster impact prevention and reduction and preparation prior to the disaster occurrence with the aim to minimize the number of disaster occurrences as a way to achieve effective control in coping with unavoidable

disasters and at the same time establish complete readiness in handling disasters and reducing losses.

Non-structural measures such as rules and regulations, reservoir management, town and land development planning, providing education and insurance, including hydrology warnings and forecasts, are contributing factors that will help to support the structural measures that in turn will allow for the reduction in the loss of human life and economic loss (Minea & Zaharia, 2011).

As disasters today have become more diverse and severe and often abruptly and quickly occur, a more active disaster management approach is therefore needed. This includes identifying risks, developing risk-reduction strategies, and setting up policies and programs in driving these strategies toward achieving the expected targets (Pilon, 2002). One of the strategies in promoting active and sustainable disaster management is strengthening the capacity of the government, public, and private sectors, including non-profit organizations that can in turn help to minimize disaster impacts. Interestingly, it can be observed that prevention, mitigation, and preparation processes allow for more efficient results than focusing on providing assistance and responding to disaster impacts (Adedeji, Odufuwa, & Adebayo, 2012).

Furthermore, total disaster risk management has also been adopted in coping with disasters today due to the more frequent occurrence and heightening severity of disasters, which leads to higher population vulnerability and lower effectiveness of the local capacity and mechanisms in handling disasters. Hence, total disaster risk management is needed, as it also focuses on comprehensive disaster reduction and prioritizes the following aspects (Guzman, n.d.):

1) Overall disaster risks by covering every stage of the disaster management process, taking into account the root cause of the disaster such as disaster risks

2) Effective prevention, mitigation, preparation, and response via local capacity enhancement, particularly disaster management capacity

3) Supporting diverse levels and directions, including diverse forms of cooperation and coordination among the stakeholders in reducing and responding to disasters

In the past, disaster management mainly placed importance on handling crises by focusing on rehabilitation and reconstruction after the disaster occurrence and overlooking the prevention, mitigation, and preparation processes prior to the disaster. Meanwhile, the integrated disaster management capacity of local communities has been inadequate. Hence, integrated natural disaster risk management was introduced and has become more widely adopted since it helps to raise public awareness and supports various types of natural disaster risk assessment, including enabling the management of potential risks based on the lowest cost. In addition, it is the most comprehensive and integrated disaster management approach and covers every type of natural disaster and every procedure presented in the disaster management cycle. It is a systematic disaster management approach by incorporating risk assessment, disaster prevention, and impact reduction and preparation, including covering a wide range of aspects and gaps in disaster management in a holistic and comprehensive manner, focusing on the basic causes of a disaster as well as disaster risk conditions and community vulnerability. This approach also aims for the integration, completion, and promotion of existing disaster reduction strategies and responses, which allow for the effective integration of actions taken by stakeholders at every level, including the diverse directions, coordination, and cooperation among diverse lecturers and key strategies for improvement of disaster reduction and response (Zhang et al., 2006).

To sum up, the basic definition of integrated natural disaster risk management consists of several elements as follows (Zhang et al., 2006):

1) It involves the management of every type of disaster. In other words, natural disaster management has changed from single disaster management to integrated disaster management, covering every type of natural disaster. In addition, it involves determining the same pattern of strategy, policy, management plan, preparation, and resource support system. Natural disaster risk management can help

to enhance disaster response efficiency and cost effectiveness via the allocation of limited resources.

2) It is a comprehensive management process that covers every disaster management procedure beginning with general risk management before the disaster occurrence, emergency risk management during the disaster occurrence, and risk management during the response, recovery, and reconstruction stage after the disaster occurrence.

3) It focuses on total and integrative disaster risk management. In other words, it involves a series of actions (programs, projects, and measurements) and tools with aim to reduce disaster risks and disaster expansion, including the integration of existing knowledge and techniques for disaster reduction and response and risk management by focusing on coordination and cooperation at diverse levels and regarding diverse directions and fields of knowledge in order to achieve disaster reduction and response targets.

4) It mainly prioritizes operational performance where the government must identify the objectives of disaster management performance in a comprehensive manner.

Flood and drought management, on the other hand, must also rely on active disaster management by focusing on managing them before, during, and after their occurrence. This includes having adequate preparation to enable a positive impact on the effectiveness of expected targets during floods and droughts, allowing recovery from the damage caused by floods and droughts (Katsuhama, 2010), all of which must be comprehensively carried out (Lebel et al., n.d.) by promoting the engagement of every relevant party, particularly vulnerable communities where the disaster management capacity must be enhanced. In addition, flood and drought risk management also requires the cooperation of governing institutions, non-profit organizations, and the private sector, and must be supported by effective management strategies and operational planning, including educating and training vulnerable groups and relevant institutions in official or non-official manners (Ulum & Chaijaroenwatana, 2011). The flood and drought management approaches adopted

today largely focus on non-structural measures such as the improvement of land utilization plans, resettlement, flood and drought forecasting, and warning systems (Bradford et al., 2012). Apart from active disaster management, integrated water resource management should also be adopted. This involves processes for supporting the development and management of water, land, and related resources in a cooperative manner with aim to create optimal economic and social welfare benefits in an equal and non-compromising way in order to ensure the sustainability of essential ecosystems (Global Water Partnership, 1996, as cited in Hassing et al., 2009). It is also a process of planning and implementation in a cooperative manner based on scientific grounds by which relevant stakeholders are gathered together to decide on the methodology for achieving long-term social needs. Regarding water and coastal resources, continuous ecosystem service and necessary economic benefits are currently maintained (USAID, n.d., as cited in Xie, M., 2006).

Furthermore, integrated water resource management prioritizes comprehensive disaster management since water is directly related to floods and droughts. Additionally, it is carried out based on sustainable development in three aspects, 1) social equality, 2) economic efficiency, and 3) environmental sustainability (Grobicki, MacLeod, & Pischke, 2015), which correspond to the general elements of sustainability, which include three aspects as follows (Harris, 2000):

1) Economic sustainability, which is the ability to produce goods and services in a continuous manner with the aim to maintain the management level of the government and external debt and to avoid an imbalance between agricultural and industrial sectors

2) Environmental sustainability involves maintaining stable resources and preventing excessive resources exploitation, including maintaining biodiversity and atmospheric stability.

3) Social sustainability involves creating equality in terms of income distribution, providing sufficient social services, including health, education, gender equality, accountability, and political participation.

Sustainable development can therefore be defined as a process of comprehensive development, namely, economic, social, and environmental development, together with emphasis on the development of quality rather than growth. Efficient development involves building growth through providing job opportunities among the general public in an equal and fair manner without excessive exploitation of natural resources in order to maintain a balance or to promote mutual interactions among diverse dimensions and at the same time responding to the needs of the modern generation without reducing the development capacity for addressing the needs of the next generations (Department of Disaster Prevention and Mitigation, 2014). The goal of sustainable development can be achieved through physical investment and human capital, poverty reduction, institutional capacity building, technological capacity promotion, the use of local resources, and creating an environment that can drive innovative thinking and actions among the people, promoting community engagement and fostering a sense of ownership using a bottom-to-top approach (Suda, 2000).

Nevertheless, the key to disaster management sustainability is prevention and mitigation before the disaster occurrence, which can be achieved through providing adequate education, training, and raising awareness (Shaw, 2009), including establishing preventive and cooperative development approaches by focusing on capacity building in order to lessen poverty, raising cultural awareness, and awareness of diverse life and work conditions, the connections between a disaster, the environment, and development (Suda, 2000), and shifting the focus from relieving victims to preparation, prevention, and mitigation in order to enable cost effectiveness and sustainability (Metri, 2006). In addition, the development of a sustainable mechanism for the sharing and dissemination of disaster-related information is also crucial as it can help to build personnel and organizational empowerment in the long run in order to achieve community-level disaster risk reduction (UNISDR, n.d.).

Hence, sustainability can be achieved through the following methods (Gupta, n.d.):

1) Focusing on educating the local community rather than physical infrastructure development

2) Improving possible options

3) Supporting the capacity of each individual by offering decision-making power

4) Strengthening local institutions

5) Cooperating with the government

In conclusion, an effective natural disaster management process requires an active, integrated, and comprehensive disaster management approach with sustainability and one that prioritizes every procedure in the disaster management cycle, whether before, during, or after the disaster occurrence with aim to minimize the loss of human life and property resulting from a disaster.

2.3 Climate Change Adaptation (CCA) and Disaster Risk Reduction (DRR)

Both CCA and DRR concepts are aimed at reducing panic impacts caused by predicted risks and uncertainties and dealing with vulnerability. The two concepts are both associated with climate and water hazard management. CCA focuses on handling changes, while DRR places importance on reducing the impacts of disasters. The main difference between CCA and DRR is that DRR takes account of geographical risks and disasters such as volcanic eruptions and earthquakes, whereas CCA emphasizes long-term adaptation to climate change, including empowering the capacity of people and organizations for long-term change processes (Mitchell, Van Aalst, & Villanueva, 2010).

2.3.1 Climate Change Adaptation (CCA)

Climate change is a natural challenge that humans have to face in the 21st century. Climate change can cause high risks to great number of people because there has been a steady increase of population growth at global and community levels (McBean & Rodgers, 2010), which affects both natural and human systems. In addition, climate change can lead to various forms of disasters, including droughts and floods and can cause damage at local and global levels. It can also create unknown results in the short-, medium-, and long-term future (O'Brien, O'Keefe, Rose, & Wisner, 2006).

Climate change has been variously defined. The Hyogo Framework for Action 2005–2015: Building the Resilience of Nations and Communities to Disasters (HFA) specified that climate change is one of threats to the world's future and that disaster risk management is one of the important means of dealing with the climate change threat (United Nations International Strategy for Disaster Reduction: UNISDR, 2005). Moloney and Funfgeld (2015) defined climate change as a policy issue relevant to a wide range of sectors and technologies, which requires a significant level of cooperation and coordination for success. The International Panel on Climate Change or IPCC (n.d., as cited in United States Agency International Development or USAID, 2011a) defined climate change as "a change in the state of the climate that can be identified (e.g. using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer." Moreover, the United Nations Framework Convention on Climate Change or UNFCCC (n.d., as cited in USAID, 2011a) defined climate change as "a change of climate, which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods."

Climate change results from increased greenhouse gas emissions, which leads to an increase in temperature and a change in rain patterns and affects human well-being (Schipper & Pelling, 2006). Climate change also has an impact on water shortages, the limitation of agricultural products, threats to food safety, and the supply

of hydropower. In addition, climate change can lead to floods, mudslides, and droughts, causing significant risks and losses to human life and property (Cruz et al., 2007, as cited in Pullin, Tapia, & Perez, 2010).

Climate change affects disaster risks through an increase of climate hazards and community vulnerability to natural disasters, which consequently results in ecological collapse, lack of water and food, and changes in lifestyle. Without appropriate management plans, environmental collapse and rapid urban growth may have a negative impact on community capacity in dealing with climate hazards and disasters (USAID, 2011a). In addition, climate change has both short- and-long term effects on disaster risks. In the short term, climate variability can influence and cause social panic. In the long term, climate variability can lead to changes in the production base of society, especially in terms of economic-based natural resources (Parry & Carter, 1985).

Therefore, climate change adaptation is the human response to climate change that aims to reduce vulnerability to climate change and to preserve human well-being (USAID, 2011a). It refers to long-term adjustment in capacity building systems in response to climatic stimuli and climate change processes in the long run. Climate change adaptation is also considered as a strategy necessary for managing the risks of climate change. Disaster management policies responding to climate change issues may depend on a number of factors, such as the readiness to accept the reality of climate change, related institutions, capacities, and the intention to integrate climate change issues into risk assessment and strategic development processes (O'Brien et al., 2006).

2.3.2 Disaster Risk Reduction (DRR)

Disaster risk is an outcome of a combination of harmful events and social vulnerability. A systematic connectivity between disaster risk reduction and climate change adaptation is required for sustainable development. Human safety has been increased when there are negotiations on climate change associated with disaster-prone communities (Birkmann & Teichman, 2010). Disaster risk may increase,

however, if there is inappropriate planning such as allowing dense settlements on a floodplain, allowing substandard construction in earthquake-prone areas, and allowing the destruction of natural resources (UNISDR, 2010).

Disaster risk reduction has been seriously discussed according to the Hyogo Framework for Action 2005-2015. This collaboration framework was first proposed during the World Conference on Disaster Reduction (WCDR) in 2005 and subsequently endorsed by the United Nations General Assembly (Okazumi & Nakasu, 2015). During the third WCDR held on March 18th, 2015 at Sendai city, Japan, UNISDR announced the Framework for Disaster Risk Reduction (2015-2030), focusing on 7 global targets (Okazumi & Nakasu, 2015) as follows:

1) Reduce global disaster mortality
2) Reduce the number of affected people
3) Reduce economic loss
4) Reduce disaster damage to critical infrastructure, basic services, and health and educational facilities
5) Increase the number of countries with national and local disaster risk reduction strategies by 2020
6) Enhance international cooperation
7) Increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments

Disaster risk reduction is aimed at reducing the impact of disasters on future society (Davies et al., 2015). It intends to build capacity, increase community resilience to risks, and promote safety and well-being (USAID, 2011a). Its ultimate goal is to prevent and minimize losses in physical, social, economic, environmental, and other related aspects, which contribute to the reduction of vulnerability and an increase in the capacity of people and communities (Luna, 2014). The key elements of disaster risk reduction capacity development include analyzing and understanding local contexts, engaging stakeholders in capacity building, understanding ongoing risks and the potential to reduce risks, and regularly examining and assessingv impacts of capacity building projects (Hagelsteen & Becker, 2014). Knowledge management

also plays a very important role in disaster risk reduction because it helps to ensure that disaster risk information is accessible, accurate, and reliable. The main disaster knowledge factors that have an effect on disaster management achievement consist of technology, economy, society, law, and the environment. These are considered direct factors affecting the disaster management cycle, while institution and politics are the indirect factors of the cycle (Pathirage, Seneviratne, Amaratunga, & Haigh, 2012).

In addition, UNISDR (2007) defined disaster risk reduction as the practice of reducing disaster risks and impacts through systematic efforts to analyze and manage the causal factors of disasters, including reduced exposure to hazards, lessened vulnerability to social and economic harm, and improved preparedness to adverse events. Disaster risk reduction is also a systematic development and application of policies, strategies, and implementation in order to minimize disaster vulnerability, hazards, and impacts in the context of sustainable development (UNISDR, 2004; Gero, Meheux, & Dominey-Howes, 2011). The achievement of disaster risk management mainly depends on the effective integration of disaster risk reduction into development plans and processes, community engagement and ownership building, and decision making regarding project implementation (UNISDR, 2004).

There are many problems and obstacles involved with disaster risk reduction. Currently, the most discussed problems are: 1) lack of political will and 2) the limitation of the decentralization of authority and (financial and technical) resources to local governments (Lavell & Maskrey, 2014).

Disaster risk management (DRM) and disaster risk reduction often refer to "the systematic process of using administrative directives, organizations, and operational skills and capacities to implement strategies, policies, and improved coping capacities in order to lessen the adverse impacts of environmental and technological hazards" (United Nations Development Program or UNDP, 2004). Disaster risk management is mostly associated with disaster risk reduction (prevention, preparedness, and impact reduction) and humanitarian management and development (response to emergencies, disaster mitigation, and reconstruction) (Schipper & Pelling, 2006). Therefore, disaster risk management is clearly related to

disaster risk reduction. Disaster risk reduction places greater emphasis on strategic activities while disaster risk management focuses on tactical implementation and disaster risk reduction practices (USAID, 2011a).

Pullin et al. (2010) found that the factors contributing to the effective integration of climate change adaptation and disaster risk reduction are awareness raising, policy possibility, technological and capacity enhancement, leadership, and effective cooperation. This integration enables the efficient use of resources and the achievement of disaster vulnerability reduction. In addition, innovative research and development concerning climate change adaptation and disaster risk reduction should be promoted and supported in both formal and informal education systems. Meaningful learning focusing on what actually happens should not be limited in classrooms. Thomalla, Downing, Siegfried, Han, and Rockstrom (2006) attempted to compare the contexts of climate change adaptation and disaster risk reduction and emphasized that communities implementing disaster risk management tended to place greater importance on ongoing risks, whereas climate change experts were likely to pay more attention to future risks.

Moreover, the integration of climate change adaptation and disaster risk reduction can result in the following benefits: 1) reduction of climatic losses through a disaster risk reduction approach; 2) the increase of (financial, human, and natural) resource efficiency; and 3) the effectiveness and sustainability of climate change adaptation and disaster risk reduction (Gero et al., 2011).

The practical barriers to the effective integration of climate change adaptation and disaster risk reduction consist of the following: size, knowledge, and norm (Birkmann & Teichman, 2010). Capacity in the context of climate change and disaster management refers to the institutional, technological, economic, and social capacities associated with climate change and disaster risk management implementation, disaster vulnerability reduction, community development, and educational effectiveness (Prabhakar, Srinivasan, & Shaw, 2009). While climate change has an impact on disaster risks, the evaluation of disaster risk reduction pays attention to vulnerability reduction in the context of development efforts (Schipper & Pelling, 2006).

The researcher has concluded that climate change is a risk that leads to disasters such as floods, droughts, and windstorms. Adaptation is necessary for the planning for responding to climate change and disaster reduction impacts. Disaster risk reduction is an effort to systematically increase capacity and to minimize disaster risks. Both climate change adaptation and disaster risk reduction are aimed at reducing risk impacts and uncertainties. Therefore, the integration of climate change adaptation and disaster risk reduction should be promoted in order to strengthen both current and future disaster management capacities.

2.4 Disaster Management Capacity Building

Capacity means the ability of individuals, organizations, and systems to perform their tasks effectively, efficiently and sustainably (United Nations Educational, Scientific and Cultural Organization or UNESCO, 2006). Capacity also refers to physical, institutional, social, and economic means as well as personal skills and overall attributes such as leadership and management skills. Moreover, capacity is defined "as a combination of all the strengths, skills, assets, attributes, and resources available within a community, society, or organization that can be used to achieve agreed goals" (USAID, 2011b). The definition of capacity is also associated with the responses of individuals or groups to external pressures and living restoration (Kelly & Adger, 2000). In addition, capacity is considered the ability to properly work and effectively, efficiently, and sustainably obtain achievements at individual, community, organizational and government levels (Antwi & Analoui, 2008).

A common definition of capacity (Scott, Few, Leavy, Tarazona, & Wooster, 2014) can be summarized as follows:

1) It focuses on the ability and performance in achieving goals and objectives.

2) It deals with operations at individual, organizational, institutional and societal levels.

3) It is a concept with a broad scope, relating to technical, resource, contextual and relationship abilities.

Capacity building is defined as a process or activity aiming to improve capacity (LaFond et al., 2002, as cited in Amaratunga, n.d.). It also refers to a process by which people, groups, organizations, institutions and societies develop their capacities to solve problems and deal with their development needs in a broad context and in a sustainable manner (UNDP, 1997, as cited in UNESCO, 2006). Capacity building is associated with developing an environment according to appropriate policy and legal frameworks, institutional development, a community engagement approach, and human resource development and management system strengthening (Alaerts, Blair, & Hartvelt, 1991). The United Nations Environment Programme (UNEP) defined capacity building as the development of the abilities, relationships, and values that enable individuals, groups, and organizations to improve their performances and achieve their goals (United Nations Environment Programme, 2006).

Generally, capacity building has been viewed as an effort to help the government, communities, and individuals to develop the expertise and skills needed for achieving their goals. Capacity building programs are designed to strengthen abilities in assessing policy choices and making effective decisions. Capacity building includes learning and training, regulatory and institutional reform, and financial, technological and scientific support. Interaction, relevance, and participation among stakeholders, including improved skills and abilities, also help to enhance capacity building (Ulum & Chaijaroenwatana, 2011). In addition, capacity building is aimed at creating continuous and sustainable benefits at every level of social development and achieving a better standard of living (Lavell, 1999).

Capacity building is generally related to the following (UNESCO, 2006):

1) Human resource development that is associated with the process of creating understanding and skills for individuals to access knowledge, information, and training enabling them to function effectively

2) Organizational development that involves management structure, processes, and practices within an organization as well as relationship management between an organization and various public, private, and community sectors

3) Institutional and legal framework development that is related to creating legal and regulatory changes in order to enhance the capacities of organizations, institutions, and representatives at all levels and in all sectors

The above concept of capacity building is consistent with LaFond et al. (2002, as cited in Amaratunga, n.d.), who summarized that capacity building can be viewed in two perspectives:

1) A narrow perspective focusing on providing knowledge and developing the skills of each individual through training programs

2) A broad perspective placing importane on the integration of systems such as policy formation, management, and finance

Boyd and Juhola (2009, as cited in Amaratunga, n.d.) stated that capacity building provides opportunities to understand the strengths, weaknesses, threats, and chances towards a flexible future through identifying broader issues relevant to the sustainability development of specific programs or processes as well as unusual cultural, social, and ecological attributes. Capacity building also refers to the consolidation of strengths, attributes, and resources within a community, society, or organization that can be used to achieve agreed goals. Therefore, capacity building is "a process by which people, organizations, and society systematically stimulate and improve their capacities over time to achieve social and economic goals, including through the improvement of knowledge, skills, systems, and institutions" (McBean & Rodgers, 2010).

The term "capacity building" is interchangeable with several words such as institution building, institutional and organizational development, and institutional capacity building (Jones & Blunt, 1999). The concept of capacity building has been prominently discussed since the mid-1990s and has evolved from the concept of institutional building and organizational development. Capacity building is a very important trend associated with the disaster management concept, policies, and

practices. Institutional capacity building requires coordination in terms of policy, resource mobility, and human resource development (Tadele & Manyena, 2009; Krishnaveni & Sujatha, 2013). Therefore, the main aspect of capacity building is promoting the ability of individuals, institutions, and systems to cope with unexpected changes and challenges. In addition, the characteristics of capacity building consist of the following (World Health Organization: WHO, 2001):

1) A continual process of improvement within an individual, organization, or institution

2) An internal process that may be enhanced or accelerated by outside assistance

3) An emphasis on the need to build on, utilize, and strengthen existing capacities

4) The intrinsic value of capacities in fostering satisfaction and self-esteem

5) The use of time and long-term relationships with all related stakeholders

Capacity building has been mostly discussed at individual, organizational, and institutional levels (UNDP, 2008; Adedeji et al., 2012; Krishnaveni & Sujatha, 2013). Capacity building at the individual level is the most important element because it is related to knowledge, skills, values, attitudes, physical conditions, awareness and motivation. As individual capacity tends to depend on existing knowledge and skills, capacity building at the individual level requires the development of conditions that allow individual participants to enhance their own abilities. Capacity building at this level can be implemented through formal education, training, hands-on learning, lesson learning, coaching, advising, and network building (Capacity for Disaster Reduction Initiative: CADRi, 2012). The participation of individuals or organizations during pre-disaster, disaster, and post-disaster periods can greatly reduce disaster risks, especially in communities with a risk map in place. This is because the risk map is a useful tool for educating communities on disaster risks and appropriate disaster prevention, reducing disaster impacts, and building community capacity to cope with

disasters in the future (Saltbones, n.d.). Considering capacity building at individual and group levels, training is considered an appropriate and recognized strategy for developing disaster risk reduction capacities and strengthening community abilities to deal with floods (White & Rorick, n.d.). Therefore, building human capacities through training, educating, and increasing access to production resources can develop a variety of skills, living strategies, and sources of income for the people in disaster-prone areas (Suda, 2000).

Capacity building at an organizational level refers to the processes or methods influencing organizational performance. It is associated with human resources (capacity of organizational employees), physical resources (work equipment and facilities), knowledge resources (organizational strategy, strategic planning, management, business knowledge, production technology, project management and process management), organizational connections (networking and partnership), motivation and governance (Walters, 2007), rewarding systems, organizational culture, and the leadership of managers. Capacity building at an organizational level focuses on organizational performance and overall management (Adedeji et al., 2012). It determines how to utilize and strengthen individual capacity by taking account of organizational ability in terms of resource utilization, project management, financial management, product liability, and employment and employee training for specific tasks.

Capacity building at an institutional or system level refers to the environment and conditions necessary for describing individual and organizational capacity. It places importance on creating environmental possibilities such as policy, economy, and rules and responsible frameworks relevant to individual and organizational operations (Adedeji et al., 2012; CADRi, 2012). It includes systems and frameworks essential to defining and implementing policies and strategies that are beyond individual and organizational levels. It also covers political, technological, financial, economic, cultural, social, and administrative issues. Capacity building at an institutional or system level intends to promote and strengthen the abilities of

governmental, non-governmental, and community groups in providing services to people and communities (Krishnaveni & Sujatha, 2013).

Started from the 1990s to the present, the concept of capacity building or capacity development has been connected with enhancing the potentials of individuals, organizations, and systems, aiming to achieve sustainability development through a comprehensive internal approach (Kühl, 2009). In developing countries, capacity building is particularly specified as a key success factor of sustainability (Hartwig et al., 2008). Capacity building requires the clear commitment and sustainability of financial and human resources (UNESCO, 2006). It can close the gap between actual performance and desired performance (Walters, 2007). Moreover, it helps to improve the humanitarian aid approach to handle the vulnerability and risks faced by local communities and to ensure that there are people with leadership, skills, relationship, authority and trustworthiness that can effectively design, deliver, and coordinate rescue operations in communities (Sitko, 2012).

CADRi defined the capacity development process as follows (CADRi, 2012):

1) Engage stakeholders in capacity development. It is the first and essential step to build relationships and to gain support from all main stakeholders in the process. This step requires different levels of understanding and the significant analysis of stakeholders.

2) Assess capacity assets and needs. Assessment helps to identify existing capacity, responsibility, and local limitations, which leads to the need to change regarding capacity improvement.

3) Formulate a capacity development response. A capacity development response can be built at group, community, organizational, regional, and national levels. It helps to identify evidence and indicators. The capacity development response requires cost calculation in order to prepare an actual budget for implementation.

4) Implementation of a capacity development response. Implementation is a needed part of projects or programs. It can be a combination of short-term

approaches to enhance performances or skills and long-term approaches to address organizational or institutional challenges.

5) Evaluate capacity development. The evaluation of capacity development helps to ensure that input resources are transformed into improved capacity and support hands-on learning. Therefore, it needs to be flexibly implemented and monitored in order to ensure that the outputs can lead to capacity development outcomes and objective achievement. The conceptual framework for evaluation should be clearly defined.

Regarding the differences between capacity building and capacity development (CADRi, 2012), capacity development is considered to be more comprehensive and relevant to internal changes, while capacity building is more likely to be involved with mechanical processes and technical cooperation to create capacities that did not previously exist. The details of the differences are as follows:

Capacity Building:

1) Has a narrow scope. Capacity is a means towards an outcome.

2) Focuses on initial stages of creating capacities

3) Interests in outsiders, who can help to build capacities and benefits created by outsiders

4) Connects with technical coordination for skill development, training, and technological transition

5) Seen as a short-term intervention

Capacity Development:

1) Has a wide scope. Capacity is likely to be both a means and an outcome.

2) Focuses on creation and enhancement such as capacity management, retention and sustainability

3) Explores the benefits of existing national capacities as a starting point

4) Considered as a national approach, allowing those with external roles to be supported and involved in national processes

5) Combines both formal and informal methods with less tangible techniques

6) Has a long-term process

Thus, capacity building or capacity development is a process that causes changes. It is not an urgent solution because it takes time for changes to occur. It is associated with people, organizations, and overall society. This process is driven by internal needs and a sense of ownership so as to strengthen existing capacities and to ensure sustainability (Freeman, 2010). Capacity building requires a development approach beyond just individual training, which is considered a short-term and unsustainable practice. In order to achieve sustainable capacity building and to raise the awareness of capacity building at various levels, organizational and structural issues should be taken into account together with capacity building at organizational and institutional levels (Scott et al., 2014). This also helps to ensure that capacity building is implemented in an integral and sustainable way. In addition, increased cooperation at all levels can minimize disaster response time and is considered a basis for building disaster response capacity at the international level (Coppola, 2007). A network or social capital is also an important element of the interdependence between knowledge, motivation, economic and governance capacities (Działek, Biernacki, & Bokwa, 2013). Capacity building is a key factor that drives communities to understand their risky situations. It helps to create disaster risk awareness through learning from past mistakes and seeking ways to reduce vulnerability so that the communities can handle, prevent, and reduce losses and damage to life, property, and the environment (Pribadi, Argo, Mariani, & Parlan, 2011).

Capacity building has been involved in disaster management, policies, and practices during the past decade due to the increase of climate change impacts (UNISDR, 2005 cited in Amaratunga, n.d.). Capacity building has been recognized as an important component of the improvement of climate change response at local, provincial and national levels (Archer & Dodman, 2015), especially in terms of local capacity building relevant to human skills, information, technology, patterns, and methods to cope with the disasters in developing countries in the future. Capacity

building for disaster risk reduction and domestic resilience is important because governments tend to have limitations in terms of disaster prevention, preparedness, and response and rehabilitation during pre- and post-disaster periods (McBean & Rodgers, 2010).

In addition, UNISDR (n.d., as cited in International Labour Organization, 2005) defined capacity building in the scope of disaster risk management as an effort aimed at improving human skills and social structures within communities or the need of organizations to reduce risks. In a broader understanding, capacity building includes institutional, financial, political, and technological development. Moreover, it refers to a process that enables individuals, teams, organizations, networks, and communities to develop their abilities to achieve measurable and sustainable outcomes (USAID, 2011a).

Capacity building is vital to disaster management because it is associated with the development of disaster management systems at local, provincial, regional, national, and international levels. Controlling natural hazards is difficult. Therefore, disaster response capacity building is one of the most effective ways to manage and reduce disaster risks (Japan International Cooperation Agency or JICA, 2008). Social capacity refers to an overview of resources available at individual, organizational, and community levels, which can be used to prevent, respond to, deal with, recover from, and apply to external stresses (such as dangerous incidents). Thus, social capacity building is a process that aims to acknowledge a lack of abilities and resources (Kuhlicke et al., 2011).

Disaster response capacity enhancement of the central government alone is not sufficient to handle or reduce the impacts of a disaster on a community, which is the first sector that needs to respond to a disaster. Disaster response capacity enhancement has been globally recognized as a more effective way to improve disaster management and to deal with disasters in a timely and efficient manner, which should be implemented by communities and local governments (JICA, 2008). This is associated with an ability to appropriately move resources within local and national regions and to ensure better coordination with the main stakeholders at a national level. Moreover,

capacity building is expected to cover all processes of disaster management, including pre-disaster planning, prevention, impact mitigation, preparedness, rehabilitation and reconstruction. Capacity enhancement for disaster management and disaster damage reduction requires adequate capacities during the disaster prevention (impact mitigation and preparedness), response, rehabilitation, and reconstruction periods (JICA, 2008). Capacity building for flood disaster management particularly requires various forms of implementation such as simulation, training, and educating. However, there are still problems regarding capacity development such as a lack of human resources and a budget for disaster management implementation at all stages (Ulum & Chaijaroenwatana, 2011).

A system approach to capacity building is considered an effort to achieve systematic development. It consists of 5 main steps as follows (Krishnaveni & Sujatha, 2013):

1) Identifying existing capacity. This step enables policy makers to focus on main resources and to aim at desired capacities.

2) Assessing needed capacity. This step systematically analyzes what is the main capacity and how much more capacity is needed to meet desirable development outcomes.

3) Consulting with stakeholders and forming multi-stakeholder working groups. Stakeholders need to participate in the development, implementation, and interpretation of impact assessment, which has an effect on communities. The multi-stakeholder working groups are responsible for introducing the implementation of capacity building strategies.

4) Developing capacity building-driven strategies. The strategies should be driven by demand and on the basis of benefits. Moreover, they should be overall strategies integrated with coordination such as cooperation and participation (Wamukoya & Mutula, 2005) and proactive education (Kevany, 2007).

5) Assessing the impact of capacity building. Effective evaluation starts with the agreements on what the impact of capacity building is, how the impact occurs, and who will evaluate the impact.

The researcher concluded that capacity building in the context of disaster management refers to the ways to increase the knowledge and skills of individuals and organizations in dealing with disasters. It also includes institutional and systemic conditions that can promote the knowledge and skills necessary to cope with disasters and to reduce disaster damage.

2.5 Public Participation in Disaster Management

Participation refers to actions demonstrating forms of involvement performed by people or interest groups (United Nations or UN, 1970, as cited in Hossain, 2013). Public participation is one of the sustainable development strategies and is an effective resource mobilization strategy (Suda, 2000). It is also a form of cooperation between governmental and community representatives. Public participation is recognized as an effective tool for analyzing and solving social problems in a sustainable way (Osti, 2004).

The principle of public participation focuses on allowing people to take part in all relevant stages, including brainstorming, decision-making, implementing, receiving benefits, and taking responsibility and assessing outcomes. Orathai Kokphol (2009) defined public participation as a process whereby people or stakeholders have a chance to share their information and opinions in order to find appropriate choices and mutually-accepted decisions for a project. All involved parties should participate in this process, from the beginning until the follow-up and evaluation stage, so as to gain understanding and to learn to adjust the project for the benefit of all parties. Public participation helps to enable more careful decision making, reduce costs and time consumption, minimize political conflicts, legitimize governmental decisions, facilitate plan and policy implementation, and make people understand decision-making processes and eager to take part in public affairs (Wanchai Wattanasap, 2001). Effective community participation is a process of learning and empowerment by which communities identify their problems, needs, and responsibilities for planning, managing, controlling, and evaluating overall necessary actions (Rajeev, 2014).

The World Health Organization (WHO) (2002, as cited in Kadel, 2011) defined public participation as a process by which people are empowered to become truly involved in the issues they are interested in and to make decisions on elements affecting their lives and associated with policy making and implementation, service planning, development and delivery, and change implementation. This is consistent with the definition given by Disaster Preparedness ECHO (2009, as cited in Kadel, 2011), which states that public participation is a process by which people change or transform their differences to an equal extent in order to facilitate the participatory decision-making process.

Orathai Kokphol (2009) suggested that the process of public participation planning should be comprised of the following stages.

1) A preparation stage that is associated with assigning responsible teams or persons, examining situations within an agency responsible for decision making, and evaluating public or community situations. This stage helps to identify projects responsible persons, related laws and regulations, and the budgets and characteristics of involved communities.

2) A planning stage that uses information from the preparation stage in order to identify and analyze stakeholders, predict controversies and arguments that may arise from participation, determine the objectives and goals of participation, specify the conditions that may affect public participation, select participation techniques and activities suitable for communities, and to prepare a participation plan.

3) An implementation stage that focuses on implementing and applying the participation plan from the planning stage to developing an action plan for each participation activity. Action plans should be flexible, measurable, and adjustable so that they can be improved to match public and community situations.

Public participation generally includes community engagement. A community is a group of people living in the same area, sharing the same activities, and jointly taking care of community resources. Therefore, community engagement refers to the involvement of people in a project in order to solve their problems or develop their socio-economic conditions. Community engagement motivates people to work

together and makes people feel a sense of community and to be aware of their benefits (Hossain, 2013).

Community engagement has been discussed as one of the sustainable development strategies for two reasons: 1) in the field of environmental management and protection, community initiatives often incorporate local ecological knowledge and traditional environmental management practice into modern technological and project development knowledge; and 2) the effectiveness of community-based participation mostly depends on the awareness of agricultural and ecological problems (Suda, 2000).

A participatory approach has evolved over periods of time. It placed importance on awareness in the 1960s, local cooperation in the 1970s, and acceptance of local knowledge in the 1980s. Participation was included in the sustainable development agenda in the 1990s (When, Rusca, Evers, & Lanfranchi, 2015). Although it has been presented as a remedy for the lack of legitimacy of traditional policy formation and as a way to create more informal and effective policies, a number of studies have indicated that many participation approaches could not be successfully implemented (Edelenbos & Khjn, 2006; Behagel & Turnhout, 2011).

Currently, a top-down approach alone is not sufficient for disaster management because this approach pays less attention to dynamics, perceptions, and community needs and also ignores capacity and resource management on the part of the community (Murshed, 2003, as cited in Hossain, 2013). One of the reasons for the failure of participation building is a lack of understanding of community situations (Luna, 2014). Low awareness of disaster risks is also a barrier to participation (When et al., 2015).

Disaster preparedness can be effective when there is the participation of vulnerable communities. Vulnerable communities are considered the basic component that needs to participate in a disaster relief process that aims to develop community capacity in dealing with disasters. This process requires all resources to create more sustainable community engagement (Newport & Jawahar, 2003) and to build the awareness that the implementation of disaster impact reduction is very effective at a

community level. As people in communities are the primary victims responding to disasters, disaster-prone communities should be empowered with appropriate training, necessary information, and community engagement building in the aspects of disaster management cycle (Jahangiri et al., 2011).

Many development projects cannot be effectively implemented due to a lack of community engagement. Disaster impact reduction is a part of economic and social development programs that begin implementing in vulnerable areas during the pre- and post-disaster periods. It should be noted that disaster impact reduction efforts are linked with each period of disaster to create a sustainable development process. In addition, a situational plan should be prepared at the community level through a community engagement approach. The situational plan of each community is a list of activities that a community agrees to conduct in order to prevent losses of life and property (Newport & Jawahar, 2003).

Some of the barriers to community engagement in disaster management (Hossain, 2013) are as follows:

1) A traditional mindset, believing that disaster relief is the responsibility of governmental and/or volunteer agencies. Therefore, it takes time to replace that old belief with the concept of community-based disaster risk reduction.

2) Unwillingness of local officials to create awareness of disaster on the part of local people

3) Lack of financial resources at local and national levels

4) Culture of having to stay in one's own house. For example, Bangladeshi women usually stay in their own house and do not want to be in a public shelter so they have no participation in disaster management.

Moreover, in developing and underdeveloped countries, communities tend to have limitations in terms of in disaster management resources. Most disaster sufferers are poor people with limited resources and lack infrastructure and access to social services (Rajeev, 2014).

Disaster management is not a single event. People should be the center of disaster management. A good structure and collaborative and integrated efforts are

needed to deal with disasters and emergencies. Communities can begin conducting their own activities in an effective way once they are trained and are aware of disaster management (Rajeev, 2014).

In Thailand, people can participate in disaster management and public disaster prevention through voluntarily applying to be a civil defense volunteer. When a disaster strikes, civil defense volunteers are the main governmental task force that deals with the disaster and rescue and evacuation of people, and provides assistance to victims. In addition, people are encouraged to participate as a disaster warning volunteers, called a Mister Warning. A Mister Warning is responsible for disaster monitoring, warning, and facilitating the evacuation of people from risk-prone areas to safe areas. Both forms of participation are considered disaster management capacity building at the individual level, which enables community members to gain more knowledge and skills in disaster prevention, rescue, and rehabilitation. Moreover, governmental agencies are committed to enhancing the disaster management capacity of people using various methods, such as lecturing on disaster knowledge and practicing evacuation procedures.

The researcher concluded that public participation in disaster management refers to the involvement of the people, who live in risk prone areas, in the disaster management processes, including opinion proposing, planning, decision making, implementing, and assessing and reviewing. Public participation enables the people in communities to have higher capacity regarding disaster management and to rely on themselves without having to wait for assistance from other organizations.

2.6 Community-Based Disaster Risk Management (CBDRM)

Considering the implementation of public participation and community engagement approaches in disaster management, it was found that there were many practical problems to be solved. For example, participation was still a government-based activity. People did not initiate participation by themselves and lacked collaborative strength to carry out disaster management because they thought that it

was a waste of their work time. Thus, there emerged a new concept focusing on disaster management of people and communities, called community-based disaster risk management (CBDRM). It is a process by which communities are the center of disaster management and an approach to build people's capacity in coping with disaster risks and minimizing disaster impacts on life and property. It helps to build public networks in the form of volunteers that provide help to governmental staff in the process of disaster preparedness (Department of Disaster Prevention and Mitigation, 2015).

CBDRM's general purposes are composed of the following: 1) to reduce vulnerability and to increase the capacity of vulnerable groupsand communities in coping with, preventing, and mitigating loss of life, property, and the environment; 2) to minimize human pain and suffering; and 3) to accelerate disaster rehabilitation (Victoria, 2001). An application of the community-based concept is a process that places importance on communities and empowers people to prepare for and deal with climate change impacts (Parashar, Sharma, & Shaw, 2015).

The community-based approach is expected to strengthen communities' abilities in terms of disaster preparedness, impact reduction, and the assessment of community situations based on community experiences in the initial stages (Jahangiri et al., 2011). This approach has been applied to managing disaster risks and dealing with vulnerability issues focusing on people's involvement and empowerment (Luna, 2007) so as to ensure that the people in communities can handle, survive, and respond to emergency situations before assistance from governmental and non-governmental organizations (Iglesias, 2011).

The CBDRM approach also pays attention to community activities in all processes of disaster risk management because the community sector plays an important role in both pre-and post-disaster periods. CBDRM is also a process by which communities participate in disaster risk identification, analysis, treatment, monitoring, and evaluation in order to reducecommunity vulnerability and enhance community capacity (Community Center for International Studies and Cooperation, n.d.). It is associated with community empowerment for disaster risk management,

which allows communities to take part in risk assessment, impact mitigation planning, capacity building, implementation, and monitoring system development, which contribute to higher community capacity in terms of emergency response. Therefore, based on the CBDRM approach, people not only take part in planning and decision-making processes but also play an important role in implementation (Pandy & Okazaki, 2005).

CBDRM's important components (Victoria, n.d.a) consist of the following:

1) Public participation: community members play a key role in driving and sharing the direct benefits of disaster risk reduction and relevant development.

2) Giving first priority to the most vulnerable groups, families, and people: the most vulnerable ones are poor people in the urban areas and farmers, native people, and elders in the rural areas.

3) Specific risk reduction measure: the measure will be determined after analyzing the disaster risks (hazard, vulnerability, capacity, and perception) of each community.

4) Taking account of existing management mechanisms and capacities: community-based disaster management can promote and strengthen existing capacities.

5) Vulnerability reduction: this component focuses on strengthening community capacity and building community resilience to disasters.

6) Integrating disaster risk reduction into development.

7) Supporting and facilitating the role of external parties.

Through long-term change and short-term improvement, the CBDRM concept has been expected to enhance the betterment of lives of people (Luna, 2007), which includes:

1) Vulnerability reduction

2) Changes in structures and relationships causing unfairness and non-development

3) Public safety and reduction of loss of life, property, resources, and of the environment caused from hazards

4) Empowerment of individuals and community institutions

Luna (2007) also has suggested that CBDRM's strategy places importance on public participation and people-centric operations, including participation analysis, risk map preparation, vulnerability and capacity assessment, integration of disaster management plans into comprehensive development at all levels, community organizations development, establishing local structures such as people's organizations and disaster operation team, mobilization of community volunteers, building people's capacity through knowledge, skill and attitude enhancement, access to human resource development, and internal cooperation and coordination between communities, people's organizations, non-governmental organizations, governmental agencies, and the private sector. Therefore, building community capacity through community-based disaster preparedness such as community training on disaster rescue, first aid, and psychological support for self-reliance is considered the most appropriate approach to disaster management (UNDP, 2002).

It can be summarized that the benefits of the CBDRM concept (Parkash, 2011) are as follows.

1) Create a sense of cooperation and ownership essential for social development

2) Attend to the willingness of people to participate in development and disaster management and focus on the characteristics of local climate and socio-economic conditions

3) Enable local people and communities to provide support to governmental agencies in terms of disaster management

4) Enable an exchange of knowledge, information, skills, and techniques between communities and internal experts

5) Enable people to express their opinions and suggestions in selecting development programs that are suitable for their community and society

6) Enable communities to examine the quality of work, which helps to build a sense of ownership

7) Lead to community capacity building in the area of disaster safety development

Community-based disaster management tools are comprised of the following (Parashar et al., 2015):

1) A seasonal calendar that reflects local knowledge and provides information about important activities, problems, and changes of resources throughout the year. It is a useful tool for determining the community-based activities associated with livestock production, cultivation and agriculture, and seasonal and weather conditions.

2) A timeline that is used to highlight the trends and key issues in the history of a community or village helpful for local people to consider their positive and negative impacts on their way of life

3) A transect walk, which is a tool used to present the scope of the problems, conditions, and opportunities of each target area, including the slope of drainage areas, plants, water, soil, and other resources in the form of maps

4) A community map or model that is an image or symbolic graphic illustrating social, physical, and resource and geographical conditions. It is used to identify microzones, differences in land use, and areas with specific problems. It is also applied to designing the direction of a transect walk.

5) A ranking and rating method that is used to prioritize community problems and problem-solving options. It is a way of rationalizing why a community chooses one option over another.

6) A semi-structured interview that is used to obtain information about communities and societies from informants. It also includes group interviews, direct observation, and acquiring secondary data.

It is important to emphasize that community-based disaster risk management cannot be implemented by communities alone. A wide range of cross-sectoral efforts is required to improve the understanding of effective linkages and mechanisms for disaster risk reduction. Communities should start byrecognizing the importance of disaster reduction. Communication skills are needed to transform the awareness into

actions. Community-based disaster risk reduction depends on the political environment supporting engagement processes (UNISDR, n.d.).

Moreover, the CBDRM methodologies seem to have worked in communities and should be continually used as a core concept in all future disaster risk reduction activities. Some key recommendations to consider are (Nguyen, Shaw, & SVRK, 2010):

1) Ensuring community participation and government linkages, including communications with authorities and disaster management focal points

2) Focusing on sustainable projects and strengthening capacity

3) Integrating disaster risk reduction into national and local planning rather than conducting stand-alone disaster risk reduction activities

4) Providing access to more resources and funding in order to ensure effective implementation of disaster risk reduction

5) Addressing food security issues for rural households when carrying out disaster risk reduction activities at the community level, since food security is a primary concern for most rural households

In Thailand, the CBDRM concept has been adopted to establish the Community Capacity Building in Disaster Prevention and Mitigation project since fiscal year 2004. This project aims to provide communities or villages in risk-prone areas with knowledge, understanding, and awareness of the importance of participation in public disaster management. Community plans, disaster preparedness, disaster emergency operations, and the evacuation of people to safe areas have been prepared and rehearsed in order to build community readiness and the people's capacity in dealing with disasters without waiting for help from other organizations.

This project suggests that each community needs to comply with the following recommendations in order to become strong and to have the capacity to prevent disasters (Department of Disaster Prevention and Mitigation, 2008):

1) People in each community should have public awareness and participate in disaster risk-reduction issues.

2) Each community should have disaster information system and disaster prevention and mitigation plans.

3) Each community should establish community organizations and assign volunteers to be a disaster prevention subcommittee.

4) Each community should rehearse emergency responses and evacuation procedures.

5) Each community should ask for financial support for disaster prevention and mitigationequipment from local administrative organizations.

6) Each community should have a local rescue team that is ready to work as soon as a disaster strikes.

7) Each community should build a disaster response network with external organizations.

8) Each community should continually conduct disaster prevention and mitigation activities and develop the capacity of community members.

The researcher concluded that the CBDRM is an approach that encourages communities to initiate disaster management plans by themselves, promote community participation in disaster management activities, raise community awareness of disaster management, and enhance community capacity in disaster management during pre-disaster, disaster, and post-disaster periods. This will help to prevent disasters and to reduce the impacts of disasters that may occur and minimize the loss of life and property within the communities.

2.7 Natural Disaster Management in Thailand

In Thailand, a natural disaster management system has been implemented at local, provincial, and national levels. In order to developa disaster response system at national level, Thailand has taken account of three main issues: 1) the legal framework, 2) key actors and issues, and 3) a national disaster management structure. The disaster management system in Thailand has been improved in terms of structure and mechanisms. Relevant laws and regulations were restructured when the Disaster

Prevention and Mitigation Act 2007 and the National Disaster Prevention and Mitigation Plan 2010-2014 were adopted. Currently, the National Disaster Prevention and Mitigation Act 2015 has been enacted.

The Disaster Prevention and Mitigation Act 2007 is considered the main law dealing with disasters caused by wildfires, windstorms, floods, epidemics in humans and animals, and air attacks and terrorism (Khunwishit & McEntire, n.d.). This Act is enforced by the Department of Disaster Prevention and Mitigation, Ministry of the Interior, which is the national agency responsible for disaster management, including disaster prevention, disaster impact reduction, and disaster rehabilitation in Thailand. Its disaster management activities have been carried out through 18 Disaster Prevention and Mitigation Centers and 76 Provincial Disaster Prevention and Mitigation Offices. The Disaster Prevention and Mitigation Academy is an agency that provides knowledge and training to the Disaster Prevention and Mitigation Academy's staff through the Executive Program on Disaster Prevention and Mitigation, which can effectively strengthen disaster management skills and capacities at the individual level and enhance abilities to systematically combine disaster prevention and mitigation activities with the operations of other related organizations. The Emergency Response Team (ERT) was also established to handle large-scale disasters and has been empowered to respond to emergencies and to assist victims in large crisis situations. Moreover, the Disaster Prevention and Mitigation Academyprovides training to personnel from government agencies, private organizations, local administrative organizations,and local communities in order to raise awareness and preparedness for disaster management.

There is also the National Disaster Prevention and Mitigation Committee (NDPMC), which was set up to deal with disaster management at the policy level. The NDPMC is chaired by the prime minister and consists of members from relevant ministries and organizations. The prime minister has the power to command and control governmental agencies and local administrative organizations in order to cope with disaster situations (ASEAN Inter Parliamentary Assembly, 2013). The NDPMC is also responsible for defining a national disaster prevention and mitigation plan,

approving the national plan before submitting it to the cabinet, advising, guiding, and ensuring the integration of disaster prevention and mitigation system development in all relevant sectors.

According to the Disaster Prevention and Mitigation Act 2007, a provincial governor is authorized to direct the disaster management activities in each province. The disaster management committee will be appointed to determine a provincial disaster prevention and mitigation plan, covering all key issues such as guidelines, procedures, and budgets for continual disaster prevention and mitigation. The committee is also responsible for preparing operational staff and equipment, defining guidelines for disaster rehabilitation and relief, establishing a disaster management operation center, determining an action plan for local administrative organizations, and developing a coordination plan with non-profit organizations.

The National Disaster Prevention and Mitigation Plan 2010-2014 pays attention to the participation of all stakeholders and to proactive disaster management. It focuses on three mainaspects, which are: 1) disaster management principles; 2) disaster response practices; and 3) threat prevention and natural disaster management and national safety practices. The National Disaster Prevention and Mitigation Act 2015, which is currently enacted, places importance on disaster risk management using the concept of risk as a key element in implementing proactive disaster management and achieving sustainability development. This Act also focuses on disaster risk reduction, which includes prevention, mitigation, and preparedness; emergency management, which comprises response and relief; disaster recovery, which covers rehabilitation and reconstruction; and Build Back Better and Safer, as shown in Figure 2.3.

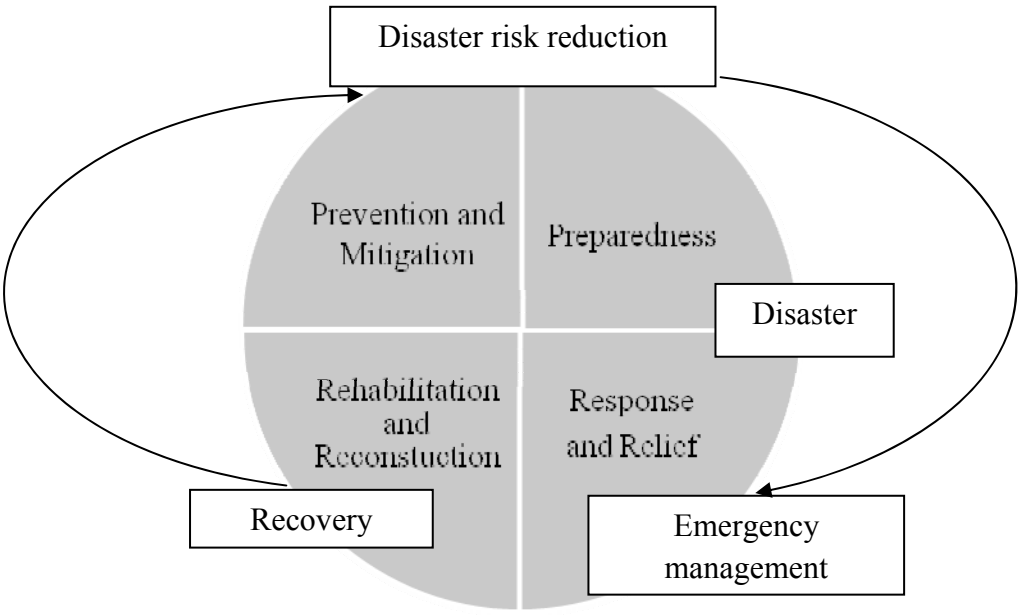

Figure 2.3 The Cycle of Disaster Risk Management

Note: Adapted from the Department of Disaster Prevention and Mitigation (2015)

Figure 2.3 indicates that disaster risk management begins with disaster risk reduction, which is a concept and approach to reducing the adverse impacts of disasters. The causal factors and effects of disasters are managed and analyzed in order to determine policies, measures, and activities that can mitigate risks, reduce factors causing vulnerability, and increase disaster management capacity. It aims to minimizeongoing risks in communities and societies and to prevent risks that may occur in the future. Disaster risk reduction consists of prevention, mitigation, and preparedness. When a disaster strikes, emergency management must be implemented in terms of disaster response and disaster relief. This process requires the knowledge and skills of those involved in disaster management, including representatives from governmental, local, and community organizations to solve problems during the disaster period in an efficient and effective way. When the disaster is over or about to be over, disaster recovery should be implemented to help the victims return to a normal physical and mental state and to achieve better living and social conditions.

This process includes rehabilitation and reconstruction, which focus on assisting the victims to rely on themselves without waiting for external support alone and allowing the victims to be involve in the decision-making process in order to build acceptance and engagement in other related processes.

In addition to the concept of disaster risk management, the Department of Disaster Prevention and Mitigation also encourages those involved in disaster management to develop their capacity in related areas, such as community-based disaster risk management, which places importance on enhancing community capacity in disaster management and enabling risk-prone communities to carry out disaster management activities without relying on assistance from external organizations. All of the staff members of the Provincial Disaster Prevention and Mitigation Offices are also assigned to attend the Executive Program on Disaster Prevention and Mitigation in order to obtain useful knowledge and skills to be able to implement disaster management in an effective way.

Although disaster management in Thailand has been continually improved and developed in terms of laws, management, and work processes, there are still many problems to cope with as follows (Office of the National Economic and Social Development Board, 2011):

1) Lack of unified coordination between related agencies
2) Inadequate resources for disaster management such as budget, personnel, and equipment
3) Delays in damage restoration
4) Disaster-prone location of households
5) Lack of awareness of disaster risks

In addition, the Department of Disaster Prevention and Mitigation (2011b) has summarized the limitations of disaster management and mitigation in Thailand as follows:

1) Assistance to victims focuses on distress relief rather than proactive management.
2) People have little knowledge or skill in disaster warning.

3) Most research on disaster management does not include disaster cycles.

4) Management information system (MIS) at both operational and strategic levels have not been analyzed or synthesized.

5) The cooperation and participation specified in policy were found to cause problems when put into practice.

6) Disaster management staff and equipment are insufficient and inefficient.

Apart from the problems and limitations mentioned above,disaster management in Thailand also lacks robust stakeholder engagement (World Bank, 2011), a natural disaster management plan, the involvement of local and non-profit organizations at the international level, education and knowledge about tsunamis, and an information management system (Moe & Pathranarakul, 2006; L. Lebel, P. Lebel, & Daniel, 2010).

Therefore, disaster management in Thailand still needs to be developed and promoted. As there has been an increase of disasters over the last few years, the issues that need to be developed include the lack of specific operational standards, an overall approach to disaster management at all levels, budget and basic equipment, support for research and development related to disasters, integrated cooperation between relevant agencies, and disaster cycle management focusing on disaster response and recovery. In the future, the disaster management system should be improved to work consistently with other related systems and become the key to building capacity in disaster preparedness and response. A better disaster management model should be initiated and developed. The improvement of disaster management should be carried out at community, local, provincial, and national levels. Natural disaster management capacity should be promoted by raising awareness and strengtheningthe abilities of local communities. Capacity building also includes institutional, policy, legal, structural, resource, and technological development. Thus, this research places great importance on capacity building in natural disaster management.

The Local Administrative Organization has close relationships with the local people in the communities and is considered the first organization that needs to provide assistance to disaster victims. Disaster management activities that should be carried out by the Local Administrative Organization during the pre-disaster, disaster and post-disaster periods are as follows (Kamolvej, 2012):

During the pre-disaster period, the Local Administrative Organization should provide disaster knowledge and training to local people, analyze risk-prone areas, develop simulation scenarios and evacuation maps, rehearse evacuation procedures, set up an effective warning system, and create a culture of safety.

During the disaster period, the Local Administrative Organization should clearly comprehend all plans and policies related to disaster management, effectively use the command system, determine the main operational unit and supportive agencies, evaluate situations and provide assistance in a timely manner, have enough resources for evacuation, manage a smooth traffic system, coordinate with the mass media to provide useful insights into disaster management, and increase communication channels and manage evacuation areas.

During the post-disaster period, the Local Administrative Organization shouldconduct disaster damage assessment, implement disaster recovery focusing on physical and mental states, effectively manage donations, educate disaster-affected communities on how to deal with disasters, and determine an action plan for the next disaster.

According to the Disaster Prevention and Mitigation Act 2007, local administrators are normally appointed as local disaster management directors. The local disaster management director must take immediate action to prevent and reduce the effects of disasters. He or she is authorized to give orders togovernment officers, local officials, governmental representatives, volunteers and people in the local community, and use public and private facilities, equipment, tools and vehicles in the community in order to prevent and mitigate disaster impacts and thoroughly and immediately provide assistance to victims in the community. The local administrative staff involved in disaster management must be educated and trained on disaster

management, such as participating in the One Tambon One Search and Rescue Team (OTOS) program, which helps enhance individual capacity in terms of resuscitation, emergency response, and basic search and rescue skills.

In summary, the local government organization plays a key role in preventing and mitigating disasters in local communities because it is a governmental organization that has close relationships with the local people and also is the first organization that needs to respond to emergency situations when disasters occur. The local government organization is responsible for directing, supervising, and implementing disaster prevention and mitigation activities, providing support to disaster-affected areas, and coordinating with the government agencies or related organizations in each area.

Considering previous research on disaster management, the researcher found many interesting studies related to community disaster management as follows. The first interesting research is "Lifestyle and role of communities in flood crisis areas: Case study of basin areas in Northeastern Region" (Department of Water Resources, 2009). The results suggested that the communities in flood- and drought-affected areas had a high level of resilience. Flood and drought management strategies should be determined by focusing on disaster prevention at the local area level so as to respond to the needs of the target communities, accurate and complete disaster information management, and the establishment of community self-help funds for flood and drought management complying with the creative sufficiency economy approach. The second interesting study is "Drought impact, readiness and community and Local Administration Organization (LAO) participation in preventing and solving drought problems in the lower Northern Region: Case study of Kamphaeng Phet, Phichit, Phitsanulok, Phetchabun and Uthaithani Provinces" (Department of Disaster Prevention and Mitigation, 2012). The results of this research indicated that the communities had a moderate level of ability to deal with drought problems. The local administrative organizations were also reported to have a moderate level of participation in drought prevention and mitigation. It was recommended that there should be measures to systematically prevent and solve drought problems in a

systematic way. In the short term, modern tools, equipment, and technologies should be appropriately provided. In the medium term, an effective drought relief plan should be determined to help those affected by drought during the pre-disaster, disaster, and post-disaster periods. In the long term, an irrigation system should be developed. The community leaders and the Local Administrative Organizations should have better awareness of disaster management and also participate and cooperate in planning and implementing drought risk management projects.

The third interesting research focusing on communities with good disaster and water resource management plans is "Community map for climate change risk reduction from climate change" (Sustainable Development Foundation, 2013). The results suggested that the Tamod community, Tamod District, Phatthalung Province, had prepared a community plan for disaster response providing information about safe areas, disaster-prone areas, evacuation routes, and priority assistance provided to children, elders, and disabled people, which helped to build awareness and understanding of appropriate use of land such as land use for agricultural purposes. The community plan enabled the community to integrate disaster prevention with natural resource and environmental management, community expansion planning, and public utility management, and also promoted community rights regarding and residential land management. The fourth interesting research is "From the Mekong basin crisis to sustainable water management by the Wiang Khuk Community Organizations Council, Muang District, Nong Khai Province" (Benjasab, 2011). The results revealed that Wiang Khuk Sub-district had repeatedly experienced flood and drought problems for more than 40 years since the establishment of the HuayKhuk floodgate near the Mekong River. In order to solve the community water issues, the Wiang Khuk Community Organizations Council and Wiang Khuk Sub-district Municipality had discussed the problem in order to find solutions based on a participatory approach and then organized community meetings with local people and stakeholders in order to create a canal dredging plan that could contribute to efficient water retention and drainage. Moreover, the Wiang Khuk Community Organizations Council and Wiang Khuk Sub-district Municipality also determined short- and long-

term water management plans in order to ensure the sustainability of a local water management system.

From the above previous studies, the researcher found that communities were the first areas affected and damaged by disasters. If the communities just waited for help from the government or external organizations alone, it might result in more damage because in terms of policy implementation the government cannot immediately help every disaster-affected community when a disaster occurs. In addition, it might cause a long-term burden for the public sector in the aspect of a disaster management budget, as the communities are unwilling to rely on or help themselves first.

Most research studies on flood, drought, and natural disaster management in the northeast of Thailand tend to pay attention to the disaster management approaches of the government and other related organizations and how those organizations implement disaster management, relief, and recovery in communities rather than community-based disaster management. As a result, most research findings place more importance on the values and benefits of the improvement of the disaster management of the government sector in spite of the fact that the communities should be empowered and developed to have more ability to deal with disaster situations without waiting for help from governmental organizations alone. Community members should be allowed to take part in community disaster management in order to make them aware of the importance of disaster prevention and mitigation. This is a better way to minimize disaster damage instead of waiting for disasters to occur and then solvingthe problems. It will also lead to long-term development and contribute to sustainable development.

The lower northeastern provinces in the Mekong basin consist of NakhonRatchasima, Buriram, Surin, Sisaket, and UbonRatchathani. They are prone to floods and droughts almost every yearbecause most of their geographical areas are lowlands, their population has settled close to water sources, their urban areas have continually expanded, and the demand for water has increased. These provinces continue to face flood and drought problems, which cause enormous damage to life,

property, houses, livelihood, and livestock. Although the central government and local administrative organizations have put their efforts into helping and solving the problems for the communities, most support is provided by using a disaster relief approach rather than building community-based disaster management capacity. In addition, the researcher found that there are still few research studies on capacity building and natural disaster management in the northeastern provinces of Thailand, especially the 5 provinces that are the target areas of the present research.

Based on the above reasons, the researcher was interested in studying community capacity building in dealing with natural disasters, especially in terms of the floods and droughts that frequently occur in the lower northeastern provinces and cause greater damage to the communities than other types of disaster. Thus, this research focuses on capacity building and community-based disaster management, which encourages the people in the communities to initiate basic disaster prevention and mitigation activities on their own so that they have public consciousness and the willingness to help each other before receiving assistance from government agencies. As this research employed a community-based approach, it is significantly different from other previous studies in terms of target area (Local communities in NakhonRatchasima, Buriram, Surin, Sisaket, and UbonRatchathani), the topic of study (disaster management capacity building and community-based disaster management), and the type of disasters (floods and droughts). It is hoped that the results will be valuable for and beneficial to disaster-affected communities in building their flood and drought management capacity and will make this present research significantly different from other studies.

2.8 Related Research

The related research on disaster management capacity building can be summarized as follows.

Grobicki, MacLeod and Pischke (2015) wrote an article entitled “Integrated policies and practices for flood and drought risk management” and suggested that an

integrated approach to water disaster management had become an integral part of political decision-making and that the impact of climate change had resulted in water-related disasters, including floods and droughts. Therefore, it was essential to make the society more resilient to disasters by focusing more on an integration of policies and practices and taking account of stakeholders and partnerships, such as improving the infrastructure management in the basin, policy implementation and social perspectives on changes regarding flood and droughts. Further, the integration of flood and drought management should take into account all stages of the disaster management cycle. This was considered a shift of focus from short-term responses to long-term preparedness, prediction, and prevention.

Archer and Dodman (2015) wrote an article entitled "Making capacity building critical: Power and justice in building urban climate resilience in Indonesia and Thailand" and found that capacity building processes were valuable for developing technical knowledge and understanding climate change and response. They helped to promote a sense of ownership in building community resilience. In addition, capacity building also provided an opportunity framework for awareness raising.

Okazumi and Nakasu (2015) wrote an article entitled "Lessons learned from two unprecedented disasters in 2011- Great East Japan Earthquake and Tsunami in Japan and Chao Phraya River flood in Thailand" and found that Japan still had problems in urban development planning associated with high-risk areas. In Thailand, there were problems concerning special foreign investment laws. It was also revealed that investment areas were at high risk of flooding. The lessons learned in terms of disaster management were that risk awareness should be built before disasters occurred, structural and non-structural problem-solving should be emphasized, and a holistic approach to disaster risk reduction should be taken into account.

Davies et al. (2015) conducted a study entitled "Toward disaster resilience: A scenario-based approach to co-producing and integrating hazard and risk knowledge" and suggested that the basic complications of disaster risk reduction were composed of 1) limitation and ineffective integration of science into disaster-risk reduction policy planning and implementation; 2) lack of effective community

involvement in the development of community resilience regarding large-scale disasters; and 3) placing greater emphasis on disaster assessment and risk probability. Therefore, a scenario planning technique should be applied to reduce disaster risks. A disaster management team consisting of community members, local government officials, civil society organizations, and scientists should be established to carry out community development activitiesand to determine a long-term plan for community resilience development.

Hori and Shaw (2014) did a study entitled "Elements for sustainable community-based disaster risk management inlocal disaster risk management in a changing climate: Perspective from Central America," where it was indicated that an important factor of effective local disaster risk management was community participation and that the main components of sustainable CBDRM implementation through community ownership were composed of the following:

1) Providing CBDRM equipment, which is a key to creating a sense of community ownership and building sustainability, such as radio communication equipment and storm detectors for farmers.

2) Providing processes for raising awareness of climatic risks that motivates volunteers to regularly monitor disaster phenomena and related risks.

3) Building trust and respect between project management organizations and beneficiary communities, which are the basis of community participation.

4) Choosing durable and easy-to-use equipment that has a direct effect on the community's ability to carry out future tasks. Taking good care of equipment also contributes to work effectiveness.

Jensantikul and Suttawet (2014) wrote an article entitled "Factors affecting the efficiency and effectiveness of policy formation and management according to public policies and the appropriate management model in response to disaster: Case study on floods in Thailand during 1942-2012" and suggested that Thailand should do the following: 1) share information among stakeholders in order to reduce the gap between policy formation and policy implementation; 2) have television programs that

disseminate disaster information, educate the public, and raise public awareness of disaster risks; 3) identify good disaster management practice withthe cooperation of stakeholders from both the government, the private sector, and civil society; 4) encourage the exchange of information among all organizations responsible for water management, including data prediction, GIS data shown in mathematical models, aerial photographs, and natural resource information in order to verify the reliability of the data and to facilitate water management analysis, forecasting, and planning; and 5) promote knowledge and ability development and experience sharing among policymakers, policy followers, stakeholders, and other communities in order to understand the problems, weaknesses, and strengths of water management practices.

Wongpreedee and Sudhipongpracha (2014) conducted a study entitled "Disaster management that works: Flood management strategy and implementation in NakornPakkred Municipality," where it was revealed that the Pak Kret Municipality had an effective practice in dealing with the flood disaster in 2011 and was able to successfully control the flood-affected zones. Although the Pak Kret Municipality had limitations in terms of budget and decentralized authority from the central government, it was able to effectively handle the flood crisis. The key water management strategies that were implemented included using all of the canals in the area to change the water direction, warning people with an emergency alert system, and preparation sandbags and placing them along the Chao Phraya River banks. In addition, the Mayor of Pak Kret Municipality also exhibited water management knowledge, leadership, and decision-making skills, and a sense of responsibility, which strongly affected the effectiveness of flood management.

Fakhruddin and Chivakidakarn (2014) conducted a study entitled "A case study for early warning and disaster management in Thailand" and found that socio-economic changes hada significant impact on disaster risk management. They also suggested that early warning was effective because it was considered a synergy of policies, laws, institutional frameworks, and the capacity of the national and local authorities responsible forthe disaster management system.

In addition, it was found that early warning and disaster management with more comprehensive assessment tools could contribute to clear and progressive political statements related to the disaster management responsibility of Thailand. The more comprehensive assessment tools were helpful for evaluating policy and regulatory frameworks, defining a national approach to disaster management, and promoting targeted national policiesand regulatory interventions, which could strengthen all of the national emergency management systems and organizations of Thailand.

Raungratanaamporn, Pakdeeburee, Kamiko, and Denpaiboon (2014) did a study called "Government-communities collaboration in disaster management activity: Investigation in the current flood disaster management policy in Thailand" and found that collaboration in disaster management activities was said to be an important professional issue in conducting those activities. As there were limitations regarding unilateral and unmanageable orders, a series of disaster management concepts such as management, command, control, professional collaboration, and incident command systems (ICS) had become a much-discussed issue. The government had the responsibility to be the first responder in disaster management that supported close relationships between local administrative organizations and communities, and this had an influence on disaster response effectiveness. However, there were always difficulties in cooperation such as differences in perceptions, willingness, intentions, and political expectations, which contributed to a decrease in the disaster management collaboration.

Carr (2014) did a study entitled "Pre-disaster integration of community emergency response teams within local emergency management system," in which it was indicated that the performance of the disaster management team varied according to its integration. This variation could be explained according to a number of related factors. Moreover, when the disaster managementteam had a skillful leader, who had organizational loyalty and recognized the importance of the local emergency management system, the integration would be more effective.

Tiwari (2013) conducted a study entitled “From capability trap to capacity development: Understanding local capacity for managing disasters” and found that the disaster management system in Gujarat, India fell into a capacity trap. The system was used for practical and institutional purposes rather than for overall social capacity building.The top-down institutional structure could respond to disasters in a timely manner but it might disrupt the disaster management procedures. In development planning, the governmental representatives had little motivation to maintain a focus on disaster prevention, and the people lost their benefits in terms of preparedness because they felt powerless and excluded from the entire process.

Sinha (2012) did a study entitled “A holistic framework for capacity building to achieve sustainable water management system in Arid and Semi-Arid lands of Africa,” where it was suggested that capacity building cycle consisted of the following 5 steps: 1) preparation that involved accepting objectives, and setting up work processes at individual, organizational, and systemic levels; 2) analysis associated with identifying the gaps incapacity and determining what capacity needed to be built, acquired, and utilized; 3) planning that transformed desired capacity into a strategy for capacity building; 4) implementation that required good planning in order to deliver services to recipients; and 5) evaluation that aimed to measure the impact of capacity building.

In steps 1-4, the matrix was used to explain the capacity building processes at three levels (individual, organizational, and systemic) and three dimensions (social, economic, and environmental). As for step 5, it focused on assessing the impacts of overall capacity building processes that applied a dynamic regional water supply system and investigated the economic and environmental impacts of a sustainable water management system.

Ulum and Chaijaroenwatana (2011) did a study called “Governance and capacity building of handling the flood issue in Bojonegoro Municipality, Indonesia” and suggested that the factors contributing to flood disaster management were as follows: 1) political commitmentof the government both in terms of policy and activity, including local politics; 2) effective institutions that required an integrated

approach such as an action plan engaging all stakeholders, the government, the private sector, and civil society; 3) a disaster management information system that emphasized the importance of information in disaster management planning, early warning, emergency response, and rehabilitation and reconstruction; and 4) local community participation that affected the effectiveness of flood risk reduction. Communities should be involved in the whole process of identifying hazards, assessing vulnerability and capacity, and developing and implementing flood risk reduction activities. The fifth factor was resource allocation and mobilization related to planning and determining how to use resources, such as personnel, materials and equipment needed for conducting activities.

Dinmuang (2011) conducted a study entitled "Integrated flood prevention and mitigation of Bang Mak Sub-district Administration Organization, Kuntung District, Trang Province" and found that the Bang Mak Sub-district Administrative Organization applied a receptive approach in order to prevent and solve flood problems. In the Bang Mak Sub-district, there was a shortage of personnel with expertise in disaster prevention and mitigation, a limited operating budget, and a lack of integrated implementation. Thus, the Bang Mak Sub-district Administrative Organization should determine an integrated approach to improve its disaster prevention and mitigation. In the short term, it should focus on personnel preparation, mobilization of manpower from all relevant sectors, and educating local people on disaster prevention and mitigation. In the medium term, it should sign a memorandum of agreement with the neighboring local government organizations so as to solve flood problems together, organize community forums and meetings in order to find sustainable solutions to local flood problems, and collect disaster statistics essential for determining a strategic plan to prevent and solve flood problems. In the long term, it should implement a strategic plan in an effective way.

Katsuhama (2010) did a study entitled "Capacity building for flood management in developing countries under climate change," where it was found that in Jakarta, Indonesia and the Tokai region in Japan institutional arrangements were necessary for effective flood management. The effectiveness depended on

implementation capacity.While infrastructure might mitigate flood damage, its limitations had to be recognized and should not induce complacency.Awareness of flood threats and management by the local community is a key issue and data accessibility is fundamental to the flood management process.

In addition, case studies in Manila, the Philippines, and the Nyando basin, Kenya resulted in the following principles of capacity building for flood management in developing countries with climate change problems: 1) the capacity to implement both structural and non-structural measures needed to be developed; 2) all institutional, organizational, and individual capacities arecrucial; 3) leadership and decision-making capacities are more necessary under increased flood risks; and 4) the capacity to secure the "3Es" (effectiveness, efficiency and equity) is a key to increasing the feasibility offlood management means.Then, capacity building procedures wereformulated, which consisted of the processes of capacity assessment, the integration of resources, including the formulation and prioritization of alternatives and the implementation of priority measures, and human resource development in order to optimize the use of resources.

Erramilli (2009) conducted a study entitled "Disaster management in India: Analysis of factors impacting capacity building" and indicated that the roles of economic resources, democratically-decentralized institutions, political party systems, and focusing events had varying impacts on state capabilities. Economic resourceswere an inevitable element of disaster management, but were not necessarily required for policy reform. The Panchayati Raj Institutions, which weredemocratically decentralized agencies, were reported to have great capacity; however, their role was mostly limited to the response phase because the states restricted their involvement.

Khan (2008) did a study entitled "Disaster preparedness for sustainable development in Bangladesh" and found that plans and projects had beencarried out to deal with disasters. In a cyclone response program, volunteers were trained to facilitate emergency responses and properly use the multi-purpose shelters. The planning and designing of structural interventions for natural disaster prevention and mitigationshould be done with more caution in order to avoid adverse impacts on

the environment. A participatory approach was essential in this process. Education and awareness-building programs should be more accessible to the people.

Gopalakrishnan and Okada (2007) did a study entitled “Designing new institutions for implementing integrated disaster risk management: Key elements and future directions” and suggested that the goal of integrated disaster risk management wasto promoteoverall improvement of the safety quality in a region, city, or community that was prone to disasters. The findings indicated eight key elements for the design of dynamic new disaster management institutions. Six specific approaches were also proposed toincorporate the key elements in building new institutions that might have a significant ability to enhance the effectiveness of integrated disaster risk management.

Manuta, Khrutmuang, Huaisai, and Lebel (2006) conducted a study entitled “Institutionalized incapacities and practice in flood disaster management in Thailand” and found that there were indications of the government’s improved institutional performance in disaster relief and emergency management, the formation of a flood disaster emergency committee at the beginning of the monsoon season in flood prone areas, and efforts to engage communities in flood prevention and mitigation. However, some institutional incapacities had continually hindered the provision of assistance and services that could reduce the risks of flood disasters. Poor coordination between administrative organizations and implementation agencies led to fragmented flood mitigation and prevention, and flood disaster victims were left alone in remote areas because of incomplete policy implementation, poor follow-up, and structural biases. Many problems were worsened bythe lack of the monitoring and evaluation of governmental organizations’ performance. Social mobilization regarding flood management was necessary in order to enable these organizations to perform their roles in reducing the vulnerabilities and risks of flood disasters.

Newport and Jawahar (2003) did a study called “Community participation and public awareness in disaster mitigation” and found that in India the participation of the community in the identification of resources, capabilities, and coping mechanisms and vulnerability assessment would be more effective when there was sensible and

practical system planning and would be more suitable for the needs of the community, task forces, and response mechanisms when there was community preparedness. Community involvement was included in the assessment of rural areas in terms of contingency planning and preparedness, which could reduce the loss of individual and community property and strengthen the disaster response of the community. Moreover, community participation and disaster response mechanisms could lead to continual development and result in economic benefits for the community.

Based on the above review of the literature, the following can be concluded.

Disaster management capacity building is aimed at enabling communities, local administrative organization, and provinces to have resilience in coping with disasters. Capacity building can lead to opportunities for building disaster awareness **(**Archer & Dodman, 2015). The capacity building process is a five-stage cycle (Sinha, 2012), composed of the following: 1) preparation that deals with accepting objectives, and setting up work processes at individual, organizational, and systemic levels; 2) analysis that focuses on identifying the gaps incapacity and determining what capacity is needed to be built, acquired, and utilized; 3) planning that transforms desired capacity into a strategy for capacity building; 4) implementation that requires good planning for delivering services to recipients; and 5) evaluation that measures the impact of capacity building. In addition, the factors that have an effect on disaster management capacity building include the roles of economic resources, democratically-decentralized institutions, and political party systems (Erramilli, 2009).

Every country in the world has experienced the problem of climate change, and adaptation is a solution that leads to disaster risk management and reduction. Currently, the concepts of disaster risk management and disaster risk reduction have gained much attention because they place importance on pre-disaster prevention in order to minimize the impacts of disasters as much as possible. This seems to be in line with capacity building, which also focuses on enabling communities, local administrative organization and provinces to have capacity in dealing with disasters in an effective way. In addition, the DRM and DRR concepts are more proactive and comprehensive than other disaster management approaches that only pay attention to

disaster emergency responses. The goal of integrated disaster risk management is to promoteoverall improvement of the safety quality in a region, city, and community concerning disaster risk (Gopalakrishnan & Okada, 2007). The main factor influencing disaster risk management is socio-economic changes. For example, poor people have no access to good housing services so they need to move and live in disaster-prone areas such as river banks. Other factors include effective early warning systems (Fakhruddin & Chivakidakarn, 2014) and community participation (Hori & Shaw, 2014).

The principles of capacity building for flood disaster management under climate change consist of the following: 1) capacity to implement both structural and non-structural measures needs to be developed; 2) all institutional, organizational, and individual capacity is important; 3) leadership and decision-making capacityis more necessary under increased flood risks; and 4) capacity to secure the "3Es" (effectiveness, efficiency, and equity) is the key to increasing the feasibility of flood management means (Katsuhama, 2010). Moreover, disaster management capacity building requires integration (Grobicki, MacLeod, & Pischke, 2015) in terms of types of disaster (flood and drought) and the management dimension (policy and implementation). The integration must take account of all processes in the disaster management cycle. The focus point should be shifted from short-term response (during the disaster period) to long-term prevention and preparedness (during the pre-disaster period). In addition, disaster management integration should be planned and implemented both in the short, medium and long term (Dinmuang, 2011). In the short term, personnel preparation, the mobilization of manpower from all related sectors, and educating local people on disaster prevention and mitigation should be carried out. In the medium term, the integral activities that should be done include signing a memorandum of agreement with the neighboring local government organizations for integrated disaster problem-solving and organizing community forums and meetings in order to find sustainable solutions to local flood problems and collecting disaster statistics essential for determining a strategic plan to prevent and solve flood problems. In the long term, the strategic plan should be effectively implemented.

An emergency response team and a community leader with exceptional leadership and decision-making skills, a sense of responsibility, organizational loyalty, and social recognition can contribute to better integration in communities (Carr, 2014) and strongly affect the effectiveness of disaster management (Wongpreedee & Sudhipongpracha, 2014). Community participation and disaster response mechanisms can lead to continual development and result in economic benefit for the community (Newport & Jawahar, 2003).

There are problems and barriers that can obstruct the success of disaster management capacity building, such as differences in perceptions, willingness, intentions, and political expectations, which can contribute to a decrease in disaster management collaboration (Raungratanaamporn, Pakdeeburee, Kamiko, & Denpaiboon, 2014). Although the top-downinstitutional structure can respond to disasters in a timely manner, it may disrupt community participation in disaster management (Tiwari, 2013). In addition, institutional incapacities and poor coordination between administrative organizations and implementation agencies may lead to fragmented flood mitigation and prevention. Incomplete policy implementation, poor follow-up, structural biases, and the lack of monitoring and evaluation of governmental organizations' performance is also an important issue (Manuta et al., 2006).

The above problems and obstacles can be solved via the following elements: 1) the political commitment of the government both in terms of policy and activity, including local politics; 2) effective institutions that require an integrated approach such as an action plan engaging all stakeholders, the government, the private sector, and civil society; 3) a disaster management information system that emphasizes the importance of information in disaster management planning, early warning, emergency response, and rehabilitation and reconstruction stages; 4) local community participation that affects the effectiveness of flood risk reduction. Communities should be involved in the whole process of identifying hazards, assessing vulnerability and capacity, and developing and implementing flood risk reduction activities; 5) resource allocation and mobilization that are relevant to planning and determining how to use

resources such as the personnel, materials, and equipment needed for conducting activities (Ulum & Chaijaroenwatana, 2011); and 6) capacity and knowledge development and experience sharing among policymakers, policy followers, and stakeholders and other communities that would help to identify the problems, weaknesses, and strengths of water management practices (Jensantikul & Suttawet, 2014).

In addition, the planning and design of structural interventions for natural disaster prevention and mitigation should be done with more caution in order to avoid adverse impacts on the environment. A participatory approach is essential in this process. Education and awareness-building programs should be more accessible to the people (Khan, 2008).

Applying a scenario planning technique to reduce disaster risks is another way to help communities and local become more aware of disaster management. A disaster management team consisting of community members, local government officials, and civil society organizations and scientists should be established to carry out community development activities and to determine a long-term plan for community resilience development (Davies et al., 2015). Awareness should be built during the pre-disaster period, and solving structural and non-structural problems should be emphasized. A holistic approach to disaster risk reduction should also be taken into account (Okazumi & Nakasu, 2015).

According to all of the relevant concepts and research, the researcher can summarize that capacity building in natural disaster management should be implemented at individual, organizational, and systemic or institutional levels in order to achieve sustainability and to enable communities to deal with disasters on their own during the pre-disaster, disaster, and post-disaster periods. Water disasters, including flood and drought, should be taken into account. Although flood and drought have opposite natures, they similarly cause great damage to life, property, and the well-being of people. The researcher found that there are few research studies on capacity building regarding flood and drought management of the communities in the lower

northeastern part of Thailand. Therefore, the present research was conducted in order to fill this research gap.

2.9 Conceptual Framework

The research framework, which was developed based on the literature review, can be seen below.

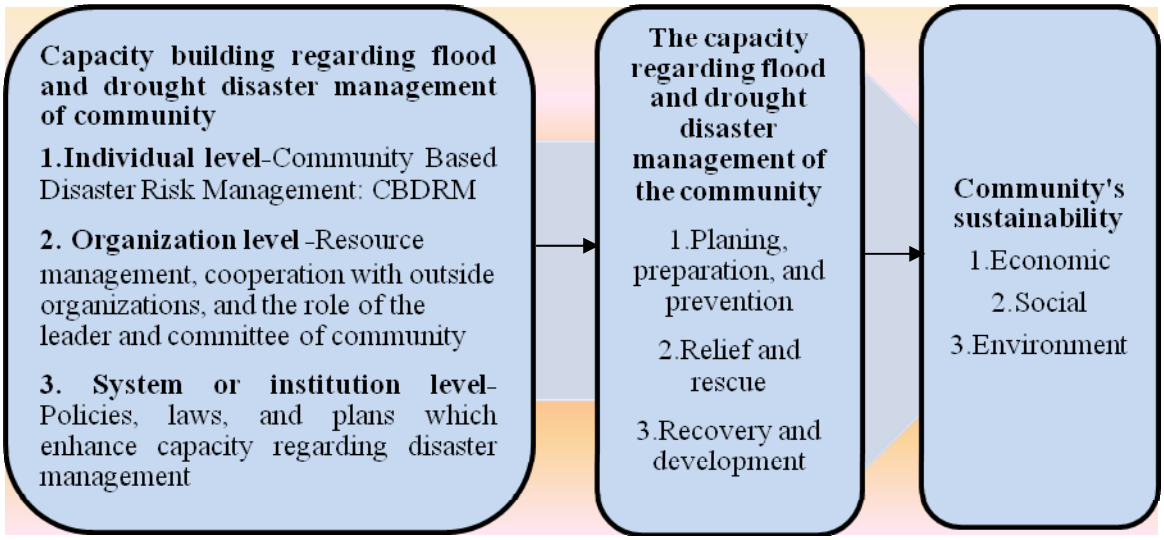

Figure 2.4 Conceptual Framework

Figure 2.4 illustrates the conceptual framework for community capacity building regarding flood and drought management in the lower northeastern provinces. The patterns and methods of community capacity building in disaster management can be divided into 3 levels: 1) the individual level, which is associated with community-based disaster risk management (CBDRM), and educating and training local people on disaster response and preparedness; 2) the organizational level, which is related to disaster resource management, building collaboration, and networks with external organizations, including public and private agencies and other communities, in order to enhance disaster management capacity and the role of the community leader and

community committees in disaster management; and 3) the systemic or institutional level, which focuses on the policies, laws, and plans that support community capacity building in terms of disaster management.

The patterns and methods of capacity building at all three levels were analyzed as to whether they had an impact on the community's capacity during the pre-disaster, disaster, and post-disaster periods. In the pre-disaster period, the capacity regarding response planning, disaster preparedness, and disaster prevention was taken into account. In the disaster period, the capacity to provide relief and assistance to disaster victims in communities was examined. During the post-disaster period, the capacity to engage in disaster recovery and community development was given importance. Then all of these capacities will be analyzed as to whether they can sustainably benefit communities in terms of economic (occupation and income), social (safety in life and helping each other), and environmental (nature conservation and cleanliness of the community) dimensions.

CHAPTER 3

METHODOLOGY

This qualitative research focuses on studying the patterns and methods of disaster management capacity building and approaches to the development of sustainable disaster management capacity building through in-depth data collection. Hence, the qualitative research methodology was applied in this research. The details are as follows:

3.1 Duration of Study

This study was conducted during the period October 2015 to June 2017 as per the details shown in Table 3.1 below:

Table 3.1 Duration of Study

October 2015 – November 2015	**December 2015 – June 2016**	**July 2016 – September 2016**	**October 2016 – June 2017**
Design data collection tools and preparation for data collection	Data collection	Data analysis and conclusion	- Thesis final oral defense - Final revised thesis - Publish research article

3.2 Selected Areas and Units for Analysis

This study focuses on collecting data from two high-risk communities per province, making up a total of ten communities. Initially, these local communities were selected from a database from the Department of Disaster Prevention and Mitigation and each selected community had to be situated in high-risk zone. Then, an interview was conducted among the executives at the disaster prevention and mitigation provincial offices in Nakhon Ratchasima, Buri Ram, Surin, Si Sa Ket, and Ubon Ratchathani Provinces, including the executives of the local administrative organization in each selected community in order to collect additional information to evaluate which community was at high risk and had implemented disaster management capacity building based on the principle of community-based disaster risk management (CBDRM). In addition, the disaster management capacity or strength of each community was also taken into account for the selection of the following communities as a sample group for this study. The reasons for selection are provided as follows.

Table 3.2 The Selected Communities, Tributaries, and Reason for Selection

Province	Community	Tributary	Reason for Selection
Nakhon Ratchasima	1. Saad community, Dong Yai Sub-district, Phimai District	Upper Mun River	Both communities are largely made up of alluvial plains and several tributaries, making the areas at high risk of floods rather than drought.
	2. Prasuk community, Prasuk Sub-district, Chum Phuang District	Upper Mun River	The Saad community has high capacity by having established a community-level disaster prevention center and disaster prevention committee.

Table 3.2 (Continued)

Province	Community	Tributary	Reason for Selection
			The Prasuk community has high capacity by having strong self-reliance during natural disasters in spite of its small size.
Buri Ram	3. Khok Klang community, Khok Klang Sub-district, Lum Plai Mat District	Lum Plai Mat	The Khok Klang community is largely made up of alluvial plains and is therefore at high risk of flood. The Khok Krachai Nuea community is at higher risk of droughts than flooding. The Khok Klang community has high capacity by having a strong community council that recognizes the importance of disaster management. The Khok Krachai Nuea community has high capacity by having high adaptability during natural disaster occurrence and strong self-reliance.
	4. Khok Krachai Nuea community, Sai Taku Sub-district, Ban Kruad District	Lum Pa Tia	
Surin	5. Pa Wei community, Koh Kaew Sub-district, Samrong Thab District	Huai Tab Tan	The Pa Wei community is largely made up of alluvial plains and is therefore at high risk of flooding. The Yang Kao Community is at higher risk of droughts than floods. The Pa Wei community has high capacity since the majority of people within the community are familiar with and have extensive experience with disaster

Table 3.2 (Continued)

Province	Community	Tributary	Reason for Selection
	6. Yang Kao community, Ba Sub-district, Tha Toom District	2nd Section Mun River	management, which has enabled the community to overcome many disasters in the past in spite of its small size and limited resources. The Yang Kao community has high capacity as the community has formed a special team for providing disaster management support and assistance.
Si Sa Ket	7. Saen Khun community, Khok Chan Sub-district, Uthumphon Phisai District	Huai Samran	Both communities are largely made up of alluvial plains and are situated in basin-liked geographical areas making both areas at high risk of flooding rather than drought. The Saen Khun community has high capacity because the community leader recognizes the importance of disaster management and the people within the community have exhibited high adaptability during natural disasters. The Kra Tam community has high capacity since the community leader possesses strong leadership and is able to efficiently regulate and control disaster management within the community.
	8. Kra Tam community, Kha Yung Sub-district, Uthumphon Phisai District	Huai Samran	

Table 3.2 (Continued)

Province	Community	Tributary	Reason for Selection
Ubon Ratchathani	9. Tha Bong Mang community, Warinchamrab Sub-district, Warinchamrab District	Lum Dome Yai	Both communities are largely made up of alluvial plains and are connected to the Mun River basin, making both areas at high risk of floods rather than droughts. The Tha Bong Mang community has high capacity as the community has extensive experience with flood management and has joined forces with other communities in setting up natural disaster prevention and support networks for providing aid during natural disaster occurrence. The Khu Sawang community has high capacity since the community is able to provide for itself and prepare the essential resources for disaster management such as motor boats and knockdown houses, making it a strong self-reliant community that need not only depend on governmental support.
	10. Khu Sawang community, Nong Kin Plane Sub-district, Warinchamrab District	Lum Dome Yai	

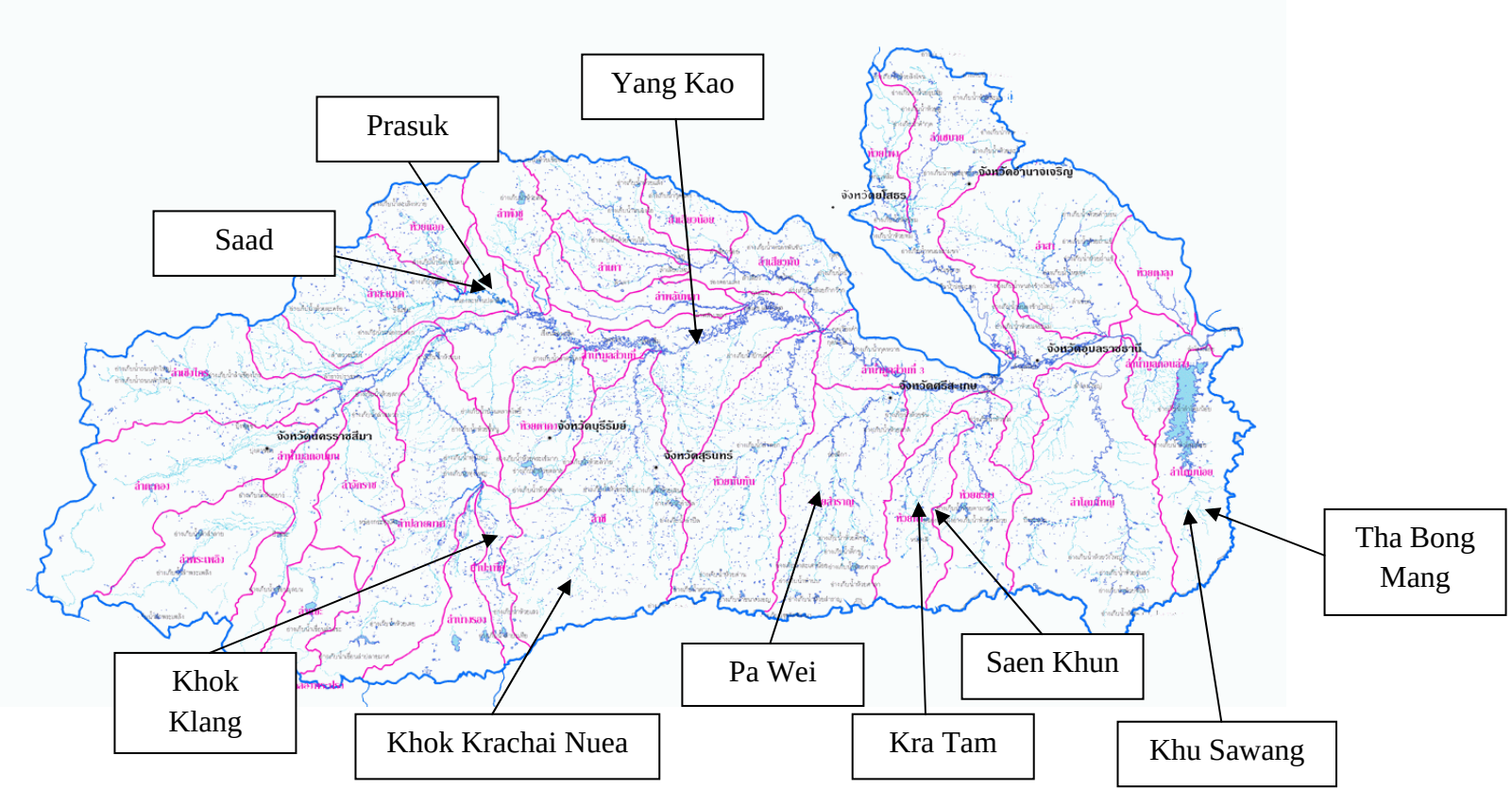

Figure 3.1 Studied Communities and Sub-Basins of the Mun River Basin

Note: Adapted from the Teachers' Council Network 572, the Buri Ram Primary Educational Service Area Office 4 (2010)

For each community, the community leader and community committee, including relevant persons concerned with community-level disaster management, were determined as key for the data analysis. Once the initial data had been collected from each community, additional data were then collected from the executives of the local administrative organization, totaling ten local administrative organizations as follows:

1) Dong Yai Sub-District Administrative Organization administrates Saad Community, Dong Yai Sub-District, Phimai District, Nakhon Ratchasima Province

2) Prasuk Sub-District Administrative Organization administrates Prasuk Community, Prasuk Sub-District, Chum Phuang District, Nakhon Ratchasima Province

3) Khok Klang Sub-District Administrative Organization administrates Khok Klang Community, Khok Klang Sub-District, Lam Plai Mat District, Buri Ram Province

4) Sai Taku Sub-District Administrative Organization administrates Khok Krachai Nuea Community, Sai Taku Sub-District, Ban Kruad District, Buri Ram Province

5) Koh Kaew Sub-District Administrative Organization administrates Pa Wei Community, Koh Kaew Sub-District, Samrong Thab District, Surin Province

6) Ba Sub-District Administrative Organization administrates Yang Kao Community, Ba Sub-District, Tha Toom district, Surin Province

7) Khok Chan Sub-District Municipality administrates Saen Khun Community, Khok Chan Sub-District, Uthumphon Phisai District, Si Sa Ket Province

8) Kha Yung Sub-District Administrative Organization administrates Kra Tam Community, Kha Yung Sub-District, Uthumphon Phisai District, Si Sa Ket Province

9) Nong Kin Plane Sub-District Administrative Organization administrates Khu Sawang Community, Nong Kin Plane Sub-District, Warinchamrab District, Ubon Ratchathani Province

10) Warinchamrab Town Municipality administrates Tha Bong Mang Community, Warinchamrab Sub-district, Warinchamrab District, Ubon Ratchathani Province

Furthermore, additional data were collected from the executives of the Provincial Offices of Disaster Prevention and Mitigation in Nakhon Ratchasima Province, Buri Ram Province, Surin Province, Si Sa Ket Province and Ubon Ratchathani Province, totaling five offices. Because of, these executives play a vital role in capacity building and supporting the disaster management in the local communities. At the same time, it enables cross-checking between the data collected from the local communities and the governmental agencies in order to ensure higher accuracy before proceeding to the data analysis in Chapter 5.

3.3 Study Factors

The study factors were determined based on the capacity building concept, which is divided into three levels as follows.

1) Personnel level is the most crucial fundamental factor since it concerns knowledge, skills, values, attitude, physical conditions, awareness, and incentives. This research focuses on studying disaster management based on the principle of community based disaster risk management initiated by the Department of Disaster Prevention and Mitigation through a knowledge building and training program conducted among the high-risk communities to ensure the clear understanding and readiness of local communities in handling natural disasters. The objective of this program is to promote disaster management capacity building on the individual level.

2) Organizational level mainly emphasizes overall organizational performance and management competencies; namely, resource management (such as human resources, physical resources, and knowledge-related resources), institutional connections (such as networks and partnerships), award system, organizational culture, and manager leadership. In this study, the management of resources related to community-level disaster management capacity building is emphasized, including the

formation of cooperation or networks with the external public and private agencies and other communities, and the roles of the community leader and community council in disaster management capacity building.

3) Institution or system Level refers to the environmental and necessary conditions needed for describing the personnel level and organizational level capacity, such as policies, the economy, rules and regulations, and the scope of work. This research focuses on studying the policies, laws, and plans related to community-level disaster management capacity building.

Capacity building at all three levels was then analyzed to see whether it was able to promote disaster management capacity building among the local communities before, during, and after natural disaster occurrences. Capacities regarding planning, preparation, and disaster prevention were considered in relation to before a natural disaster occurrence. Capacities regarding disaster relief and assisting victims were considered in relation to during natural disaster occurrence. Capacities regarding recovery and community development were considered in relation to after a natural disaster occurrence. Further analysis was conducted of the above-mentioned capacities to see whether they could create sustainability among the local communities in terms of 1.the economic aspect, such as occupation and income; 2.the social aspect, such as living safety and mutual assistance within the community; 3.the environmental aspect, such as environmental conservation and cleanliness within the community.

3.4 Data Collection

The data collected in this study included the following.

1) The primary data consisted of data related to personnel-level and organizational-level disaster management capacity building collected from the community leaders and community committees by means of interviews, group discussion, and observation. Additional data were also collected from the executives of the provincial office of disaster prevention and mitigation and local administrative

organizations by means of interviews. The interview questions and group discussion topics based on the research objectives are as follows.

Table 3.3 Interview Questions and Group Discussion Topics for Selected Communities

Objectives	Questions
1. To study the patterns and methods for enhancing flood and drought management capacity among the local communities in Thailand's lower northeastern provinces	1.1 How does your community handle natural disasters before, during, and after their occurrence? 1.2 Has your community received or practiced any of the following disaster management capacity building methods? - Training under the CBDRM program - Resource management - Roles of the community leader and community committee - Building cooperation with external agencies - Policies, laws, and plans
2. To analyze the capacity, problems, and obstacles related to flood and drought management among the local communities in Thailand's lower northeastern provinces	2.1 How has the disaster management capacity building as per No. 1.2 affected your community's disaster management capacity? 2.2 What are some of the disaster management-related problems or obstacles faced by your community?
3. To propose approaches to the development of sustainable flood and drought management capacity building among the local communities in Thailand's lower northeastern provinces	3.1 How has community-level disaster management capacity building as per No. 2.1 affected your community's sustainability in terms of economic, social, and environmental aspects? 3.2 What are some of the recommended approaches for the development of sustainable disaster management capacity building at the community level?

The interview questions for the executives of the provincial offices of disaster prevention and mitigation and local administrative organizations are as follows.

(1) How were the flood and drought situations occurred during 2011 – 2016?

(2) What are the flood and drought management processes before, during, and after a natural disaster occurrence?

(3) How has disaster management capacity building based on the principle of community based disaster risk management (CBDRM) affected your community?

(4) What are some of the recommended approaches for the development of sustainable disaster management capacity building at the community level?

2) The secondary data consisted of data related to disaster management capacity building on the system level collected from academic journals, books, policies, plans, and websites related to capacity building for natural disaster management, including related photos of natural disasters occurring within the community.

3.5 Data Analysis

The following techniques and statistics were applied in data analysis as follows.

1) Qualitative data were grouped and categorized for content analysis, data comparison, and data synthesis in order to determine the patterns and methods related to disaster management capacity building, including the capacity, problems, and obstacles related to disaster management and approaches to the development of sustainable flood and drought management capacity building at the community level among the local communities in Thailand’s lower northeastern provinces.

2) Quantitative Data were analyzed using descriptive statistics in order to describe the general information concerning the selected communities, such as size of population and disaster management-related resources.

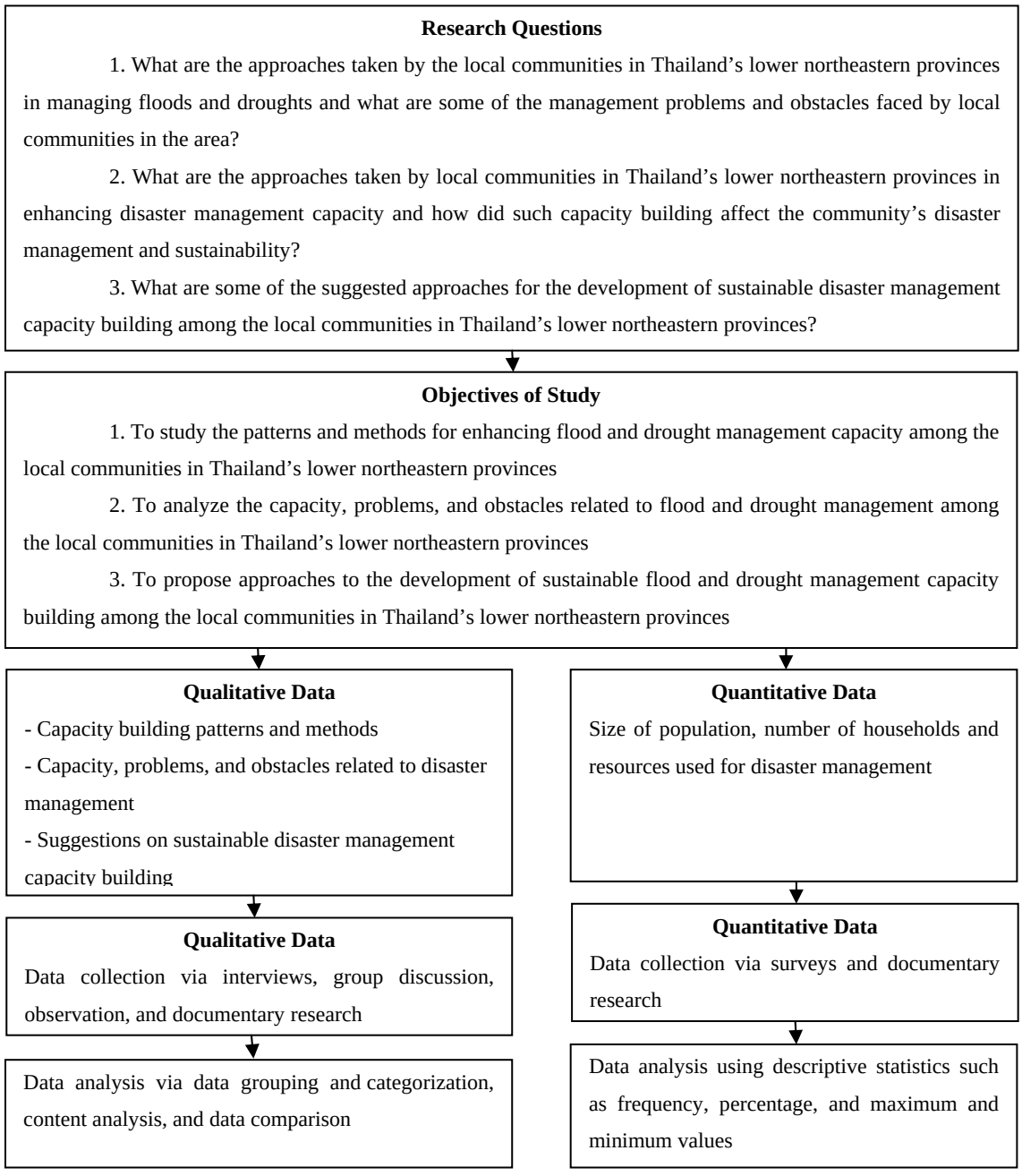

Figure 3.2 Summary of Research Methodology

CHAPTER 4

RESEARCH RESULTS

This chapter describes the results of the study on community capacity building regarding flood and drought management, which was conducted in 10 communities in 5 lower northeastern provinces in Thailand as follows.

1) Saad Community, Dong Yai Sub-District, Phimai District, Nakhon Ratchasima Province

2) Prasuk Community, Prasuk Sub-District, Chum Phuang District, Nakhon Ratchasima Province

3) Khok Klang Community, Khok Klang Sub-District, Lam Plai Mat District, Buriram Province

4) Khok Krachai Nuea Community, Sai Taku Sub-District, Ban Kruad District, Buriram Province

5) Pa Wei Community, Koh Kaew Sub-District, Samrong Thab District, Surin Province

6) Yang Kao Community, Ba Sub-District, Tha Toom district, Surin Province

7) Saen Khun Community, Khok Chan Sub-District, Uthumphon Phisai District, Si Sa Ket Province

8) Kra Tam Community, Kha Yung Sub-District, Uthumphon Phisai District, Si Sa Ket Province

9) Khu Sawang Community, Nong Kin Phle Sub-District, Warinchamrab District, Ubon Ratchathani Province

10) Tha Bong Mang Community, Warinchamrab Sub-District, Warinchamrab District, Ubon Ratchathani Province

The general characteristics of each community, flood and drought disaster management, disaster management problems and obstacles, patterns and methods of disaster management capacity building, disaster management capacity and community sustainability, and the sustainable approach to disaster management, are also presented in this chapter.

Moreover, this chapter also provides the information obtained from the interviews with the executives of local administrative organizations and the chiefs of provincial offices of disaster prevention and mitigation, who were the stakeholders assisting and supporting disaster management capacity building. The information gained from these governmental organizations can be used to review the reliability of the information obtained from the communities.

4.1 Disaster Management Implemented by the Communities

4.1.1 The Saad Community, Dong Yai Sub-District, Phimai District, Nakhon Ratchasima Province

General Characteristics

The Saad community (Moo 10) separated from the Kluay community (Moo 7) in Dong Yai Sub-district, Phimai District, Nakhon Ratchasima Province in 1988. The community's name "Saad" is derived from the fact that in the past there were many Saad trees in this area. The first community leader was Mr. Chuen Jongphimai. The current community leader is Mr. Suchart Nanklang. The community had a population of 244 households, which accounted for a total of 1,000 people, 495 of them were males and 505 were females.

The community area mostly consists of low plains crossed by the Khem stream and eight natural canals. Therefore, the main occupation of the villagers is rice farming. The Saad community suffered the most severe flood in 2010, which caused great damage to houses and agricultural crops. The roads within the community were damaged until the villagers had to travel by boat. The Saad community seldom suffers from drought problems because there are many natural water sources in the area.

However, those water sources were not able to fully capture or effectively store water, and therefore, during the dry season the community tended to experience shortages of water for agriculture. The flood and drought disaster management implemented by the Saad community can be summarized as follows.

1) Flood Management

During the pre-disaster period, preparedness activities are regularly carried out because the Saad community is situated in a flood-prone area. The Nakhon Ratchasima Provincial Office of Disaster Prevention and Mitigation holds training on disaster preparedness for the villagers every year. The community's wire broadcasting system is used to alert the villagers to move their belongings and cattle to higher places or safe spots such as Ban Kluay School and Ban Kluay Temple. Evacuation and moving are normally assisted by the civil defense volunteers. The villagers also need to listen to the information from the government agencies in order to comply with announcements and evacuate in time.

During the disaster period, boats are used as vehicles to transport people. The villagers need to ask for survival bags and other support from the government agencies because they cannot work during floods. A local security team is set up to guard the community and to monitor the safety of the children swimming in flood areas.

During the post-disaster period, the villagers clean and fix their houses and then move their belongings back. After the big flood event in 2010, the villagers raised their houses in order to deal with future disasters. However, as the community has not experienced any big flood disaster since, it still cannot be confirmed that raising the houses is able to prevent flood damage.

2) Drought Management

The Saad community has rarely experienced drought disasters and has never been declared as a drought area. Each household stored water to use in the dry season. One of the community committee members provided his suggestion as follows: "The canals should be dredged. The community has many water sources.

If we dredge them, the canals can store and supply enough water for consumption and agriculture in the dry season."

Disaster Management Problems and Obstacles

The villagers could not work during floods so they had to depend on survival bags from the government agencies or donators.

Patterns and Methods of Disaster Management Capacity Building

The Saad community's capacity in disaster management was enhanced through the knowledge sharing and training provided by the Nakhon Ratchasima Provincial Office of Disaster Prevention and Mitigation and the Dong Yai Sub-District Administrative Organization. The community was encouraged to create a local disaster prevention and mitigation plan and to establish a community disaster prevention and mitigation committee in order to take care of disaster management tasks such as disaster monitoring and warning, disaster evacuation, search and rescue, and disaster relief. One of the community committee members provided suggestions as follows: "Establishing the community committee makes each villager recognize their role and contributes to more systematic disaster management."

The Saad community had plenty of resources essential to disaster management capacity building: a broadcasting tower, radio transceivers, life jackets, traffic cones, and 32 civil defense volunteers. These resources enabled the community to have higher capacity regarding disaster prevention and response and disaster damage reduction. In addition, the community also used local wisdom to prepare for floods in advance such as predicting flood occurrences by observing nest-moving behaviors of insects or ants.

Considering building disaster management networks and collaboration with other communities, the community leader gave information as follows: "All communities in Dong Yai Sub-District jointly participated in the training, which leads to knowledge sharing among the communities." Most of the villagers attending the training were civil defense volunteers and community representatives.

The community leader and the community committee has the role to coordinate with external organizations in order to ask for support and equipment sponsorship during the disaster periods such as asking for boats to evacuate people and household belongings.

Moreover, the Saad community is more outstanding than other communities because it has a community disaster prevention and mitigation plan. The Saad community and Dong Yai Sub-District Administrative Organization have collaborated in determining an annual disaster prevention and mitigation plan with the aims to enhance disaster preparedness, reduce disaster damage, and increase community capacity in disaster management.

Disaster Management Capacity and Community Sustainability

The above patterns and methods of capacity building enabled the Saad community to become stronger and to be ready to cope with disasters. One of the practical results was the establishment of the Ban Saad Civil Defense Volunteer Center, which was responsible for monitoring and protecting the villagers from disasters. In addition, the capacity building also affected the sustainability of the Saad community in economic, social, and environmental aspects. As for the economic aspect, the villagers could do other agricultural work during the disaster and post-disaster periods or the dry season such as growing plants requiring less water instead of rice farming. However, one of the community committee members stated the following: “Although they change to growing other plants, it generates less income than rice farming does.” Considering the social aspects, the villagers became more unified. They helped each other during the disaster period, especially when they needed to move their belongings. Regarding the environmental aspect, the community rarely had environmental problems because garbage and weeds were collcted and removed during the floods. One of the community committee members gave further information as follows: “At present, the community has more disaster preparedness. If a big flood like that in 2010 occurs again, we can cope with it.”

Capacity Building Approaches to Sustainable Disaster Management

In order to make the Saad community achieve sustainable disaster management, one of the community committee members provided suggestions as follows: “Disaster management capacity building should be implemented. Initially, the villagers need to take care of each other and solve the problems on their own. The responsibility of each committee member should be clearly and systematically defined.” Moreover, the construction of Kaem Ling was another sustainable way to capture water in the rainy season and store water to use in the dry season.

4.1.2 The Prasuk Community, Prasuk Sub-District, Chum Phuang District, Nakhon Ratchasima Province

General Characteristics

The Prasuk community (Moo 1) separated from Phimai District and was included in Chum Phuang District, Nakhon Ratchasima Province in 1956. Its previous name was “Phra Sook,” which means hiding. Later, the community’s name was changed to “Prasuk,” which has a more beautiful and auspicious meaning. There was no record of the first community leader. The current leader is Mr. Prajuab Songnok. The community has a population of 212 households, which accounted for 707 people, 323 of whom are males and 384 are females.

The community is situated in a basin area. The Khem stream is an important water source for the community. A flood is likely to occur when there is heavy rain. In 2010, the Prasuk community experienced the worst flood, which caused total damage to the community’s property and rice crops. Roadways were severely damaged until the villagers could only travel by boat. The Prasuk community rarely had a severe drought problem. The community mainly experienced shortages of water in agriculture. The flood and drought disaster management implemented by the Prasuk community can be described as follows.

1) Flood Management

During the pre-disaster period, the villagers are informed and alerted to pack and move their belongings to higher places when there is a large amount of water

flowing from Phimai District. The community committee is responsible for evacuation and floodwater monitoring. Some families have to evacuate to their relative's house on higher ground. The villagers are quite familiar with flooding because it occurs every year.

During the disaster period, boats are used to transport people. The villagers help each other in buying necessary things. The community asks for medical assistance from external organizations such as the public health center and the medical station. Moreover, a security team is set up to guard the community.

During the post-disaster period, the villagers clean their house. The Prasuk Sub-District Administrative Organization helps to assess and repair damaged houses. The Chum Phuang District Agricultural Extension Office evaluates the agricultural damage and then provides damage compensation to the villagers. The villagers then plant off-season rice or sell fish, and fruits and vegetables in order to earn extra income during the post-disaster period.

2) Drought Management

The Prasuk community has never been severely affected by drought. In 2016, the community was not in drought-declared areas. The villagers deal with drought problems by storing water in containers during the rainy season and digging a well in their land to capture water. Some of them bring drinking water due to the concern that the rainwater might be unclean.

Disaster Management Problems and Obstacles

The natural water sources in the community cannot effectively capture water. One of the community committee members provided more information as follows: "The problem is that the government does not allow us to plant off-season rice. Where will we get rice to eat? When there are no flood problems, we can get rice from in-season rice growing. However, we need to plant off-season rice when flood occurs."

Patterns and Methods of Disaster Management Capacity Building

The Prasuk community's capacity in disaster management was developed through knowledge sharing and training provided by the Nakhon

Ratchasima Provincial Office of Disaster Prevention and Mitigation and the Prasuk Sub-District Administrative Organization. The villagers gained relevant knowledge and learned how to prevent and deal with disasters. However, the knowledge obtained from the training course has seldom been used because the training topics often do not match the actual disaster situations happening the community. For example, the villagers had been trained on flood response but a drought problem suddenly occurred.

As for disaster management resources, the community had limited resources but the villagers used local wisdom to prepare for and cope with disasters in advance such as predicting floods by observing a number of jig flowers or fish spawns. Once there is a large number of the jig flowers or fish spawns, the probability of floods is high. In terms of human resources, the community has 10 civil defense volunteers to assist and support the community disaster management.

Considering building networks and cooperation with external organizations, the Prasuk community and other communities participated in the meetings held by Nakhon Ratchasima Provincial Office of Disaster Prevention and the Mitigation and Prasuk Sub-District Administrative Organization. Then the community representatives attending the meetings transferred the knowledge to other villagers through the community committee meetings.

In the Prasuk community, the community leader and the community committee had the responsibility to coordinate with other organizations in order to request help and support when disasters occurred, for example, requesting for a boat from the Nakhon Ratchasima Provincial Office of Disaster Prevention and the Mitigation and Prasuk Sub-District Administrative Organization.

The Prasuk community only has a general community plan but still does not have any specific disaster prevention or mitigation plan. The villagers are familiar with floods and droughts, which happen every year, so they know what to do when disasters occur.

Disaster Management Capacity and Community Sustainability

The Prasuk community has obtained more capacity in disaster preparedness and resilience due to the above capacity building patterns and methods.

The community leader provided further suggestions as follows: “The villagers know by themselves what should be done. They had lived with water for a long time. Once there was a heavy rainfall, they will prepare for flooding by placing sandbags or installing a water pump.”

The disaster management capacity building contributed to the sustainability of the Prasuk community in social, environmental, and economic aspects. In terms of social aspect, the villagers relied on each other during the disaster period. Especially, they helped each other move their belongings to higher ground when floods occurred. Regarding the environmental aspect, the villagers managed to regularly collect and burn garbage so the garbage did not cause any environmental problem. As for the economic aspect, economic sustainability was not clearly evident. The community leader just let the villagers sell agricultural products such as eggs and vegetables during the disaster period in order to earn additional money because the villagers could not do other agricultural work.

Capacity Building Approaches to Sustainable Disaster Management

One of the community committee members suggested an approach to sustainable disaster management as follows: “Sustainability can result from the community’s familiarity with floods and droughts. The villagers tend to encourage each other in disaster management, which leads to reciprocal helping and more effective disaster monitoring. The villagers can live harmoniously with nature.” Moreover, in order to solve flood and drought problems, a systematic irrigation system should be developed to capture and store water. The community leader provided his suggestion as follows: “The important thing is how to store water for use in the dry season.” The community’s canal dredging has not been effective so far, and therefore the community leader suggested establishing a proper dredging project that could make the canals store water better.

4.1.3 The Khok Klang Community, Khok Klang Sub-District, Lam Plai Mat District, Buriram Province

General Characteristics

The Khok Klang community (Moo 1) was originally situated in the Ban Kao community (Moo 11) in the Khok Klang Sub-District. In 1910, an outbreak of cholera occurred and killed many villagers in the Ban Kao community. Surviving villagers moved to a new community and named it “Khok Klang” in 1912. The first community leader was Mr. Tui Sudsainet. The current community leader is Ms. Chanisara On-Nual. The community has a population of 214 households, which accounted for a total of 942 people, 457 of whom are males and 485 are females.

The community mainly consists of flat lands watered by the Mat stream. The main occupation of the villagers is rice farming. The Khok Klang community suffered the most severe flood in 2010, which caused enormous agricultural damage. The villagers’ houses were not seriously destroyed except the houses located along the river banks. Boats were needed during the disaster period. The community did not have a flatboat so the villagers had to borrow one from the Khok Klang Sub-District Administrative Organization. The community rarely suffered from drought. The most severe drought occurred in 2016. The flood and drought disaster management implemented by the Khok Klang community can be summarized as follows.

1) Flood Management

During the pre-disaster period, the villagers prepare for floods by moving their belongings to higher places. Once receiving flood warnings from Khok Klang Sub-District Administrative Organization, the community leader alerts the villagers through the community’s wire broadcasting system. The villagers spread the disaster information by word-of-mouth. The villagers have never evacuated so far because the previous flood situations were not severe.

During the disaster period, the community’s civil defense volunteers facilitates the transportation of people and makes flood warning signs to prevent car accidents.

During the post-disaster period, the villagers clean their house and ask for damage assessment from the Khok Klang Sub-District Administrative Organization. The Ministry of Agriculture and Cooperatives provides assistance to the villagers in form of agricultural seeds.

2) Drought Management

The Khok Klang community has experienced shortages of water, although it already has a community water supply system. The villagers have to stored rainwater during the rainy season. When there is not enough water for consumption, the Khok Klang Sub-District Administrative Organization supplies water to each household. One of the community committee members provided suggestions as follows: “An effective way to solve drought problem is building Kaem Ling to capture water in the rainy season. However, Lam Plai Mat District is located in flood-prone area. We should build an above-ground reservoir on higher area and let water flow down through a faucet.”

Disaster Management Problems and Obstacles

The Khok Klang community has inadequate and limited resources such as boats. Therefore, it has to ask for help and support from other organizations such as the Buriram Provincial Office of Disaster Prevention and Mitigation and the Khok Klang Sub-District Administrative Organization.

Patterns and Methods of Disaster Management Capacity Building

The community’s capacity in disaster management is promoted through knowledge sharing and training on disaster management, agricultural technique, and occupational development provided by the Buriram Provincial Office of Disaster Prevention and the Mitigation and Khok Klang Sub-District Administrative Organization. The villagers are encouraged to be aware of disasters, find ways to help each other during v initial stage of a disaster, and learn about disaster response and evacuation procedures.

The Khok Klang community has limited disaster management resources. The villagers use local wisdom to predict the probability of floods and to prepare for disasters in advance. For example, once a large number of fish are trapped, a flood is

likely to occur. The community has 9 civil defense volunteers to facilitate disaster management activities without waiting for support from the governmental sector alone.

Considering building networks and cooperation with external organizations, the representatives from the Khok Klang community has joined the training with other communities in order to exchange knowledge and opinions. After the training, the representatives transfer the obtained knowledge to other villagers.

The community leader and the community committee play an important role in all aspects of community capacity building. Their main disaster management responsibility is coordinating with other organizations so as to ask for help during the disaster period, for example, asking for survival bags from the Khok Klang Sub-District Administrative Organization when flooding occurs.

The Khok Klang community does not have any specific disaster prevention or mitigation plan. Most of the community's disaster management activities result from the discussions among the villagers and the community's familiarity with floods and droughts. The villagers know what should be done in order to cope with disasters.

Disaster Management Capacity and Community Sustainability

Disaster management capacity building has enabled the Khok Klang community to have higher disaster preparedness and this has positively affected the sustainability of the community in economic, social, and environmental dimensions. In the economic dimension, the villagers have begun to grow other kinds of plants such as morning glory in order to earn money when they are unable to grow rice during the post-disaster period. This adaptation can be beneficial for the villagers in terms of generating additional income in the future. In the social dimension, the villagers helpe and rely on each other, especially in terms of disaster monitoring. In the environmental dimension, the villagers are able to manage and create value from garbage. The Khok Klang Sub-District Administrative Organization has established the Garbage Bank project, allowing elderly people to sell their garbage

when they come to receive their allowance. The money is deposited into their account in the form of an elderly welfare.

Capacity Building Approaches to Sustainable Disaster Management

One of the community committee members provided suggestions for the community's sustainable disaster management as follows: "There is no specific method or pattern because the world and climate is naturally fluctuating. Education and training provision is essential but there should be enough resources for the villagers to apply the obtained knowledge. For example, when the villagers were trained about a new agricultural method, there should be enough water for them to practice using that method. Methods and patterns used should be in line with the community's situation."

4.1.4 The Khok Krachai Nuea Community, Sai Taku Sub-District, Ban Kruad District, Buriram Province

General Characteristics

The Khok Krachai Nuea community (Moo 15) separated from the Khok Krachai Village (Moo 10) in 2005. The first and current community leader is Mr. Somchai Thamnadram. The community has a population of 135 households, which accounts for a total of 532 people, 267 of whom are males and 265 are females.

The Khok Krachai Nuea community has both flood and drought problems but they do not cause severe damage. When a flood occurs, vlowland paddy fields tend to be damaged and some roads are inaccessible. However, the villagers do not need to use boats. The Khok Krachai Nuea community has been more affected by droughts, which occur every year. The drought problem has made the villagers have insufficient water for consumption and they have to delay or stop rice farming and switch to growing other plants requiring less water. The location of the community is also vulnerable to mudslides because it is situated along the Phanom Dong Rak Mountain. The flood and drought management implemented by the Khok Krachai Nuea community can be summarized as follows.

1) Flood Management

During the pre-disaster period, the villagers pack their belongings and move their cattle to higher or safer places. Once receiving a flood warning from the Sai Taku Sub-District Administrative Organization, the community leader informs the villagers through a wire broadcasting system. The villagers also spread flood information by word-of-mouth. According to the community's flood record, the villagers have never had to evacuate to safe spots.

During the disaster period, the villagers are very careful when going outside their house. The flooded roads are fenced with long sticks in order to prevent car accidents.

During the post-disaster period, the villagers clean their house. The Sai Taku Sub-District Administrative Organization assesss thedamage of each household and then provides damage compensation. Most of the assistance from the Ministry of Agriculture and Cooperatives is provided in the form of agricultural seeds.

2) Drought Management

The Khok Krachai Nuea community experiences shortages of water during the dry season. Although the community has a water supply system, the amount of water is not sufficient for consumption. The villagers have solved this problem on their own by storing water in containers before the dry season arrives. Some of them get drinking water from retail shops. Once receiving a formal request for water from the community, the Sai Taku Sub-District Administrative Organization supplies it to every household.

Disaster Management Problems and Obstacles

The Khok Krachai Nuea community lacks key disaster management resources such as boats and life jackets during floods and water for agriculture during droughts. Therefore, it has to wait for assistance from other organizations such as the Sai Taku Sub-District Administrative Organization and the Buriram Provincial Office of Disaster Prevention and Mitigation.

Patterns and Methods of Disaster Management Capacity Building

The Khok Krachai Nuea community's disaster management capacity has been enhanced through knowledge sharing and training provided by the Buriram Provincial Office of Disaster Prevention and Mitigation and the Sai Taku Sub-District Administrative Organization. The community has been able to create an evacuation plan and rehearse its evacuation procedures. However, those plans and procedures have never been implemented because there no big disaster event has occurred after that. In addition, the principles of sufficiency economy and relevant agricultural and occupational knowledge are also provided to the villagers. All of this has made the villagers aware of disaster hazards and they have tried to rely on themselves first.

The Khok Krachai Nuea community has insufficient disaster management resources. When a big disaster strikes, the community askes for help from Sai Taku Sub-District Administrative Organization or neighboring communities. This is considered one form of building a network and cooperation with other organizations. Moreover, the Khok Krachai Nuea community and other communities in the Sai Taku Sub-District also participate in group meetings in order to share disaster management knowledge and know-how regarding implementation. Consequently, the obtained knowledge is transferred to all of the villagers in the community. The Khok Krachai Nuea community has 10 civil defense volunteers to support disaster management capacity building.

The community leader and the community committee play a key role in coordinating with external organizations so as to ask for help and support during the disaster period, such as requesting water from the Sai Taku Sub-District Administrative Organization.

The Khok Krachai Nuea community does not have a specific disaster prevention and mitigation plan. The villagers adhere to traditional practices such as preparing for evacuation after knowing that flooding is about to occur and storing water before the dry season arrives.

Disaster Management Capacity and Community Sustainability

The above patterns and methods of capacity building have enabled the Khok Krachai Nuea community to have more readiness to cope with disasters. Disaster management capacity building also has had an effect on the sustainability of the community in economic, social, and environmental aspects. As for the economic aspect, the villagers are able to do additional jobs apart from farming during the disaster period because they have knowledge and know-how. Regarding the social aspect, the villagers help each other and have unity. In terms of the environmental aspect, the villagers protect the environment during the disaster periods and carefully preserve it during the post-disaster periods.

Capacity Building Approaches to Sustainable Disaster Management

One of the community committee members suggested a way to achieve sustainable disaster management as follows: “We must focus on self-reliance and should not wait for assistance from governmental sector alone.” The community leader also provided further information as follows: “In order to obtain sustainable disaster management, we need to build water reservoir and draining channel that can solve water shortages and supply enough water for agriculture. The community water supply system must not be damaged. Tap water should be accessible to everyone.”

4.1.5 The Pa Wei Community, Koh Kaew Sub-District, Samrong Thab District, Surin Province

General Characteristics

The Pa Wei community (Moo 8) separated from the Ngiew community, Samrong Thab District in 1957. The first community leader was Mr. Lu Sothong. The current community leader is Mr.Chom Boonserm. The community has a population of 35 households, which accountsfor a total of 190 people, 92 of whom are males and 98 are females.

The community mainly consists of flat lands situated in a basin. When a flood occurs, the community has to receive water flowing down from the above areas

and water surging up from the Thab Than and Phok streams. The main occupation of the villagers is rice farming. The Pa Wei community faced the most severe floods in 2011 and 2013, resulting in great agricultural damage. The paddy fields were severely affected and the villagers needed to travel by boat. The Pa Wei community has also suffered from drought problems. The total amount of agricultural water has significantly decreased, resulting in insufficient water for agriculture. The flood and drought management implemented by the Pa Wei community can be summarized as follows.

1) Flood Management

During the pre-disaster period, the villagers are informed to pack and move their belongings to higher ground through the community's wire broadcasting system and by word-of-mouth. The villagers evacuate to safe areas higher from flood-affected areas. The flood situation is continually monitored, and boats and food are also prepared.

During the disaster period, the community arranges for the villagers' cars to be parked nearby safe areas. Boats are provided to transport the villagers and they help each other. External organizations provide help such as survival bags. The villagers are familiar with flood problems because they have experienced them many times.

During the post-disaster period, the villagers clean their house, collect and dispose of garbage, and help to clean the temple, school, and other community areas.

2) Drought Management

The Pa Wei community has been greatly affected by droughts, resulting in insufficient water for agriculture. The villagers have tried to solve the problem by storing water in containers and pumping water from other water sources but not much water is available. Most of the villagers use groundwater. In the past, some well-off families might have bought water from a water truck. However, almost all of the villagers manage to buy water from a water truck at present. The Pa Wei Sub-District Administrative Organization distributes water to the villagers after the community is

officially declared as a drought area. The declaration process takes a long time so the villagers have to rely on themselves first. One of the community committee members gave more information on this as follows: “The provincial office takes a long time to declare the drought areas. The villagers need to help themselves at this stage. If we only wait for the provincial office, we will not survive.”

Disaster Management Problems and Obstacles

The main problem is that flood water comes so fast that the villagers cannot handle it in time. For example, water from the Thab Than and Phok streams quickly moved and flooded the community in 2013. Moreover, the community did not have a boat, which is a key disaster management resource. During the disaster period, the Surin Provincial Office of Disaster Prevention and Mitigation lent the community a boat. At that time the community only had a very small boat called a Ruea E-Pong, so the villagers wanted to have a new community boat. In addition, due to flood and drought problems, the community has insufficient grass to feed livestock and the villagers have needed to replant, harvest, buy, or even ask for it from other communities.

Patterns and Methods of Disaster Management Capacity Building

The Pa Wei community’s disaster management capacity was developed through education and training provided by the Surin Provincial Office of Disaster Prevention and Mitigation and the Koh Kaew Sub-District Administrative Organization. The community-based disaster risk management (CBDRM) program was particularly conducted in order to provide disaster management knowledge. The community leader provided further information as follows: “Knowledge sharing and training can increase disaster management capacity.” One of the community committee members also gave suggestions as follows: “After obtaining knowledge, we prepare to cope with floods in a more careful way. We are able to handle disaster situations and initially rely on ourselves.”

The community lacks important resources for disaster management such as hand-held sirens for disaster warning and life jackets. Thus, the community has to ask for support from other organizations. The villagers also use local wisdom to create

self-help equipment during the disaster periods such as floating gallons and lifebuoys made of car tires. In addition, one of the community committee members provided more information about disaster management as follows: “The community does not have a specific disaster prevention plan or guideline. The villagers just follow what have been done because we are familiar with floods for a long time.” The Pa Wei community has 5 civil defense volunteers to facilitate disaster management activities.

In the Pa Wei community, the community leader, and the community committee has the role of coordinating and asking for assistance from other organizations during the disaster period. One of the community committee members also gave more information as follows: “They are responsible for all matters concerning well-being of the community.”

Moreover, the Pa Wei community has built the collaboration with other communities in the Koh Kaew Sub-District by sharing knowledge and exchanging opinions during group meetings. The community has also received academic assistance from other organizations such as Koh Kaew Sub-District Administrative Organization and the Surin Provincial Office of Disaster Prevention and Mitigation.

Disaster Management Capacity and Community Sustainability

One of the community committee members provided information about the patterns and methods of capacity building as follows: “They enable the community to have disaster management capacity, which can lead to sustainability.” Capacity building has also improved the community’s capacity regarding disaster preparedness and has contributed to the cooperation among the villagers. In addition, disaster management capacity building has affected the sustainability of the community in the social, environmental, and economic dimensions. In the social dimension, the villagers help each other and collaborate in solving disaster problems together. In the environmental dimension, the villagers cooperatively restore natural resources within the community. In the economic dimension, one of the community committee members provided information as follows: “There is no economic sustainability. Flood problems have repeatedly occurred. There is no difference. We have no additional

jobs.” However, the villagers live with water happily and do not want to move to other places.

Capacity Building Approaches to Sustainable Disaster Management

One of the community committee members suggested an approach to sustainable disaster management as follows: “The houses should be raised higher in order to prevent flood damage.” Another committee member provided disaster management suggestions in the following: “Kaem Ling should be built to store water during the rainy season so that we have enough water for use in the dry season.” Building Kaem Ling requires a large amount of budget. What the villagers did was to dredge the canals in the community but this resulted in insufficient water during the dry season. The community leader provided further information as follows: “Sustainability can result from self-reliance of the community.”

4.1.6 The Yang Kao Community, Ba Sub-District, Tha Toom District, Surin Province

General Characteristics

The Yang Kao community (Moo 13) separated from the Tam Pek community (Moo 9) on May 1, 1986. The first community leader was Mr. Pruek Jampathong. The current community leader is Mr. Charoen Phrombut. The community has a population of 44 households, which accounts for a total of 217 people, 108 of whom are males and 109 are females.

The Yang Kao community mostly consists of flat land. The main natural water source is the Rawee stream and the main occupation of the villagers is agriculture. In 2011, the Yang Kao community experienced the most severe flood, which caused great damage to agricultural areas. The villagers had to travel by boats, and there was not enough grass to feed the cattle. In terms of drought problems, the community has been seriously affected by droughts. The villagers have insufficient water for consumption and agriculture. The flood and drought management carried out by the Yang Kao community can be summarized as follows.

1) Flood Management

During the pre-disaster period, the villagers monitor disaster news and information provided by the government and other media. Through the community's wire broadcasting system, the community leader informs the villagers to move their belongings, cattle, and vehicles to safe areas. Some families temporarily move to other places. The community asks for a boat from Surin Provincial Office of Disaster Prevention and Mitigation in advance. The villagers have been familiar with floods for a long time so they find ways to prevent flood damage. Many families raise their houses.

During the disaster period, the community leader and the community committee coordinate and ask for assistance from other organizations such as asking for a motor boat and survival bags from the Ba Sub-District Administrative Organization.

During the post-disaster period, the villagers clean and repaire their house. They also collaborate in cleaning the community areas. The Tha Tum Hospital is asked to provide physical check-ups for the villagers.

2) Drought Management

The Yang Kao community has been severely affected by droughts and has been declared a drought area. The community lacks water for agriculture. In order to solve the problem the villagers are asked not to plant off-season rice and to switch to growing plants requiring less water. In terms of water for consumption, the Ba Sub-District Administrative Organization helps distribute it to all villagers.

Disaster Management Problems and Obstacles

The community does not own a motorboat so it needs to rely on other organizations. The evacuation of sick and elderly people requires a motorboat. A normal boat provided by external organizations is not enough to evacuate a large number of people at night. In addition, during the post-disaster period the community does not have a reservoir that can effectively store water, resulting in insufficient water for agriculture during the dry season.

Patterns and Methods of Disaster Management Capacity Building

The Surin Provincial Office of Disaster Prevention and Mitigation and the Ba Sub-District Administrative Organization have enhanced the Yang Kao community's capacity in disaster management through knowledge sharing and training, especially with the CBDRM program. One of the community committee members provided more information as follows: "The training makes the villagers believe in flood disaster management."

As for disaster management resources, the Yang Kao community has a broadcasting tower and 10 life jackets, but these are not sufficient because a boat normally transports 20 passengers at a time. Moreover, the Yang Kao community has had to borrow a motorboat from Surin Provincial Office of Disaster Prevention and Mitigation because it only has a rowboat with limited capacity. Local wisdom is considered another resource that the community has. The community leader provided insightful information as follows: "The villagers put a wooden pole upright in flood-affected area with one end in the ground and then observing the levels of flood water from the pole." The Yang Kao community has 10 civil defense volunteers to facilitate the disaster management activities.

The community leader and the community committee coordinate with other organizations and ask for external support during the pre-disaster, disaster, and post-disaster periods. One of the community committee members provided suggestions as follows: "The important part of community disaster management is coordination." This was consistent with the suggestion that the community leader provided in the following: "The community should coordinate with and ask for helps from various organizations at the same time in order to receive assistance in a timely manner."

The Yang Kao community has built collaboration with other communities in the Ba Sub-District by exchanging knowledge and experience during group meetings. In addition, a group called "Klum 25 Ta Sapparod" was established in order to provide assistance during the disaster period in conjunction with the community committee and civil defense volunteers. The other communities in the Ba

Sub-District established this group as well. The community obtains disaster management knowledge from vSurin Provincial Office of Disaster Prevention and Mitigation and the Ba Sub-District Administrative Organization. A cooperative disaster management network among local communities has not been created. One of the community committee members explained the reason in the following: “Each community has different contexts and seems to be able to manage its own problems. Therefore, a cooperative network has not been built.”

One of the community committee members provided further information as follows: “The community does not have guidelines or plan for disaster management. The villagers just adhere to traditional practices. However, a disaster management plan will enhance our preparedness and lead to different consequences.”

Disaster Management Capacity and Community Sustainability

The Yang Kao community has no clear pattern or method of disaster management capacity building. The villagers adhere to traditional practices. The community leader provides more explanation as follows: “The community manages to take care of everything, including coordinating with other organizations. The government agencies are quite quick in responding to our request for help.” The Yang Kao community has collaborated with the Ba Sub-District Administrative Organization in constructing a dam, building a water supply system, and dredging the Rawee stream, which has helped to enhance the community’s disaster management capacity. This has enabled the community to store water during the rainy season and to have enough water for use in the dry season. The community also has coordinated with the Department of Community Development in order to provide occupational development knowledge such as fabric weaving and basketwork techniques to the villagers. In addition, the disaster management capacity building has had an impact on the community sustainability in the economic, social, and environmental dimensions. In the economic dimension, the villagers can perform other jobs instead of rice farming during the disaster period. In the social dimension, the villagers are willing to help each other and to solve disaster problems together. In the environmental

dimension, the villagers have cooperatively improved the environment and have replanted trees.

Capacity Building Approaches to Sustainable Disaster Management

One of the community committee members provided a comment about sustainable disaster management as follows*:* "There is no sustainable means or methods to stop floods. Flood problem continues to occur every year."

4.1.7 The Saen Khun Community, Khok Chan Sub-District, Uthumphon Phisai District, Sisaket Province

General Characteristics

The Saen Khun community (Moo 6) separated from the Ban Khok (Chan Kao) community. The community was named after the Saen Khun creek, a water source in the community. The first community leader was Mr. Krod Phenjaem. The current community leader is Mr. Sitthiphong Jampaphong. The community has a population of 111 households, which accounts for 709 people, 337 of whom are males and 372 are females.

The community mainly consists of flat land. Most of its soil is sandy loam suitable for agriculture. There is the Wah stream flowing through the northern part of the community. The main occupation of the villagers is rice farming. The Saen Khun community experiences flood problems almost every year, and the community suffered the most severe floods in 2011 and 2013. Flood water rapidly moves and causes damage to agricultural areas, and the villagers have to get around by boat. The community rarely has had drought problems and has never been declared as a drought area. The flood and drought disaster management implemented by the Saen Khun community can be summarized as follows.

1) Flood Management

During the pre-disaster period, a community committee meeting is held to assign disaster response duties because the Saen Khun community does not have a disaster management team. Flood warnings are announced by the government agencies and the Khok Chan Sub-District Municipality. The community leader alerts

the villagers through the broadcasting tower. The disaster information is disseminated by word-of-mouth. The villagers prepare for flooding by moving their belongings to higher places.

During a disaster period, the villagers assist each other and receive support from other organizations such as survival bags. The villagers seem to be familiar with flood problems because they have occurred several times.

During the post-disaster period, the villagers clean their house and other areas in the community. The community asks the Khok Chan Sub-District Municipality to carry out disaster damage assessment. Khok Chan Health Promotion Hospital is also asked to conduct epidemic risk assessment. The community receives agricultural compensation from the Ministry of Agriculture and Cooperatives.

2) Drought Management

The Saen Khun community experiences shortages of water for consumption. The natural water sources in the community have an insufficient amount of water, especially for rice farming, and the villagers have had to switch to growing other plants requiring less water, such as sunn hemp, in order to make up for the money lost from being unable to do rice farming. Some families need to buy drinking water. One of the community committee members provided further information as follows: “Sustainable drought management requires good preparedness, including storing water, switching to growing plants requiring less water, and using net fishing method.”

Disaster Management Problems and Obstacles

The community has insufficient disaster management resources such as boats. The community leader provided more information in the following*:* “The community had an idea to create “Pha Pa Reue” to raise fund to buy a community boat because it was hard to ask for financial aid from the government agencies.” The community also lacks important equipment such as disaster warning sirens and life jackets, which are essential for civil defense volunteers. Due to these problems, the community always has to ask for support from other organizations during a disaster period.

Patterns and Methods of Disaster Management Capacity Building

The Saen Khun community's capacity regarding disaster management was developed through knowledge sharing and training, especially with the CBDRM program, provided by the Sisaket Provincial Office of Disaster Prevention and Mitigation and Khok Chan Sub-District Municipality. The community leader provided more information as follows: "Knowledge sharing and training can contribute to sustainable disaster management. The obtained knowledge makes the villagers able to prepare for and deal with disasters."

The Saen Khun community has limited disaster management resources so it has to ask for support from other organizations. The community has a community plan but has not determined any specific disaster prevention plan. The villagers use local wisdom to prepare for disasters. For example, floods are likely to occur when ants move up to higher places and ground lizards move out of their nests. The community has 7 civil defense volunteers to facilitate disaster management activities without waiting for help from the government agencies.

The community leader and the community committee play an important role in coordinating with other organizations during a disaster period in order to ask for assistance. The personal budget of the community leader and the assistant community leader is allocated to carry out disaster training for the villagers every year.

The Saen Khun community has built collaboration with other communities in the Khok Chan Sub-District through exchanging knowledge and experience during group meetings. The community's civil defense volunteers attend field trips with the civil defense volunteers of other communities in order to gain new ideas that could be adapted for use in the Saen Khun community.

Disaster Management Capacity and Community Sustainability

The above patterns and methods of disaster management capacity building have enabled the Saen Khun community to have better disaster preparedness and have made the villagers willing to help and take care of each other. They also have had an effect on the community sustainability in the economic, social, and

environmental dimensions. In the economic dimension, instead of growing rice the villagers switch to silk weaving in order to earn money during the disaster period. Later, the villagers mainly earn money from silk weaving. In the social dimension, the villagers help each other and cooperate in disaster monitoring and warning. In the environmental dimension, the villagers help keep the community clean by collecting garbage that floats into the community during a disaster period.

Capacity Building Approaches to Sustainable Disaster Management

One of the community committee members suggested an approach to sustainable disaster management as follows: “We need to raise awareness on the importance self-reliance among the villagers and emphasize that they should not wait for external assistance alone.”

4.1.8 The Kra Tam Community, Kha Yung Sub-District, Uthumphon Phisai District, Sisaket Province

General Characteristics

The Kra Tam community (Moo 10) separated from the Ban Phon Muang community (Moo 7). The community is basically flat land so it was named “Kra Tam.” The first community leader was Mr.Thon Sohlor. The current community leader is Mr. Sai Hanukul. The community has a population of 118 households, which accounts for a total of 454 people, 227 of whom are males and the other 227 are females.

The community is surrounded by natural water sources. It is like an isolated island. Flood problems frequently occurd during the rainy season. There is the Samran stream flowing through the community. The main occupation of the villagers is rice farming and fishing. The community experienced big flood events in 2010, 2011, and 2012. However, the most severe flood occurred in 2010. It caused enormous damage to paddy fields, livestock, and transportation. During a disaster period, the community is only accessible by boat and truck. The community seldom has had drought problems because it id surrounded by natural water sources. The flood and

drought disaster management implemented by the Kra Tam community can be summarized as follows.

1) Flood Management

During the pre-disaster period, the villagers are informed to be careful of flooding and to move their belongings to higher places through the community's broadcasting tower. Safe spots are prepared for evacuation. The community also asks for tents from the Kha Yung Sub-District Administrative Organization.

During the disaster period, the villagers cooperate in flood monitoring. The community also receives survival bags from other organizations such as the Kha Yung Sub-District Administrative Organization.

During the post-disaster period, the villagers collaborate in disaster recovery. They clean their houses and other areas in the community. Kha Yung Sub-District Administrative Organization helps to repair the villagers' houses. The most damaged part of their houses has been the front doors. The Ministry of Agriculture and Cooperatives has provided help in terms of agricultural products.

2) Drought Management

The Kra Tam community rarely experiences drought problems because its location is surrounded by natural water sources. Once there is a shortage of water, the villagers buy it for consumption. The community leader provided more information as follows: "The villagers can rely on themselves and solve the problem on their own. They can survive."

Disaster Management Problems and Obstacles

The Kra Tam community has no problem with disaster management. The community leader gave further information as follows: "The community has many experiences in flood management. The villagers continue to help each other. The community also focuses on self-reliance and prepares to cope with floods all the time. Disaster information has always been provided to the villagers. The community committee and the Kha Yung Sub-District Administrative Organization Council members keep providing assistance to the community. The community can survive disasters due to these factors."

Patterns and Methods of Disaster Management Capacity Building

The Sisaket Provincial Office of Disaster Prevention and Mitigation and the Kha Yung Sub-District Administrative Organization have enhanced the Kra Tam community's capacity in disaster management through knowledge sharing and training, especially with the CBDRM program. One of the community committee members provided suggestion as follows: "A multi-community training is not effective because it attends to many communities at the same time. Flood-affected areas should be focused. However, every kind of training is considered useful and can provide knowledge."

The key disaster management resources of the Kra Tam community are boats and large tractors, which are used as vehicles during the disaster period. The villagers also use local wisdom to predict and prepare for disasters. For example, floods are likely to occur when ants and insects move up to higher places. The community has 5 civil defense volunteers to facilitate disaster management activities.

The community leader and the community committee play an important role in disaster management. Although the community does not have a disaster management committee, the community leader and community committee put great effort into coordinating with and asking for support from other organizations. They also take care of the villagers' safety during the disaster period. In addition, the Kra Tam community has built the collaboration with other communities in the Kha Yung Sub-District through knowledge sharing during group meetings and providing reciprocal help during floods. However, the community leaders provided his suggestions as follows: "We should not go on a field trip at other communities because each community has different contextual conditions." Moreover, even though the community does not have a specific disaster prevention plan, it is able to deal with disasters. One of the community committee members gave further information as follows: "The Kra Tam community focuses on practical implementation. The community leader keeps warning us to be careful of disasters. When the community leader gives an order or makes a request, the villagers always obey him."

Disaster Management Capacity and Community Sustainability

Disaster management capacity building has enabled the Kra Tam community to have better disaster responses and has made the villagers eager to help each other. It also has positively affected the community sustainability in the economic, social, and environmental dimensions. In the economic dimension, the villagers can find alternative jobs such as working in construction sites or factories. Therefore, they are able to earn a living during the disaster periods. In the social dimension, the villagers help each other, cooperate in disaster monitoring, and harmoniously live together during a disaster period. In the environmental dimension, the villagers collaborated in cleaning and collecting garbage in the community during the post-disaster period. Therefore, the environment is well taken care of.

Capacity Building Approaches to Sustainable Disaster Management

In order to make the Kra Tam community achieve sustainable disaster management, one of the community committee members provided a suggestion as follows: “The villagers should depend on and take care of each other without waiting for supports from the government agencies. The government agencies come after the community.”

4.1.9 The Khu Sawang Community, Nong Kin Phle Sub-District, Warinchamrab District, Ubon Ratchathani Province

General Characteristics

The Khu Sawang community was founded in 1937. Most of the villagers migrated from Ban Nong Lai, Ban Don Chi, Ban Waree and Ban Kud Chum in Ubon Ratchathani Province. The community was formerly known as Ban Pa Yang because there were numerous Yang trees in this area. Later, a governmental agency cut all of the Yang trees and processed them into wooden boards and poles for use in building the Ubon Ratchathani Central Prison. The community’s name was changed to Khu Sawang in 1953. The first community member was Mr. Siha Chanaphul. The current community leader is Mr. Santi Suphol. The community has a population of

224 households, which accounts for a total of 878 people, 445 of whom are males and 433 are females.

The Khu Sawang community mostly consists of flat land. The community is located close to the Mun River so it is affected by floods every year. In 2013, there was a big flood, causing great damage to the villagers' houses throughout the community. Transportation within the community was difficult. Boats were used as vehicles during the disaster period and the villagers were evacuated to safe spots. The community seldom has serious drought problems because its location is next to the Mun River. It has never been declared a drought area. However, the community experiences shortages of water for agriculture from time to time. The flood and drought disaster management implemented by the Khu Sawang community can be summarized as follows.

1) Flood Management

During a pre-disaster period, the community carries out disaster preparedness, prepares vehicles for evacuation, checks the availability of boats, and assigns boat drivers. The villagers try to rely on themselves first and ask for help from government agencies when they are incapable of supporting themselves, as stated in the following by a community committee member: "We must rely on ourselves first because the government agencies take one to two days to provide helps." The villagers listen to disaster information from the Meteorological Department and receive flood warnings through the community's wire broadcasting system. Evacuation places and safe spots are also determined.

During a disaster period, the community arranges boat pick-up and drop-off services and assignes a security guard team. Moreover, the community asks for an evacuation staff, survival bags, motorboats, emergency toilets, and drinking water from the Nong Kin Phle Sub-District Administrative Organization and the 22nd Military Circle.

During the post-disaster period, the villagers clean and fix their house and also collaborate in cleaning the temple, school, and other places in the community.

2) Drought Management

The villagers look for ways to store water on their own such as dredging canals in the community. They do not ask for help from government agencies because the community is close to water sources. The community leaders gave more information as follows: “In terms of overall drought management, we need water storage places. Dredging large canals requires a large amount of money.” Moreover, one of the community committee members provided suggestions as follows: “Having Kaem Ling in Nong Kin Phle Sub-District will lead to comprehensive water management.”

Disaster Management Problems and Obstacles

Flood victims have different needs, and the community might not be able to serve their needs fast enough, especially in terms of insufficient food and water supply during the disaster period and inadequate boats during emergency situations. However, the Khu Sawang community consequently has its own boat with enough capacity to evacuate a number of people and belongings. This is considered the distinctive and strong point of the Khu Sawang community, which was later called “Khu Sawang Model.” Many other communities affected by floods have visited the Khu Sawang community in order to learn from this disaster management model.

Patterns and Methods of Disaster Management Capacity Building

The Khu Sawang community’s disaster management capacity was developed through knowledge sharing and community-based training provided by the Ubon Ratchathani Provincial Office of Disaster Prevention and the Mitigation and Non Kin Phle Sub-District Administrative Organization. This has been beneficial for the community because those patterns and methods of capacity building have enabled the villagers to cope with disasters in a proper way. In the community, disaster management knowledge is reviewed and transferred among the villagers during community committee meetings.

The Khu Sawang community has many disaster management resources such as hand-held sirens for disaster warning, life jackets, and radio transceivers. These resources are helpful in preventing the community from disaster damage.

The community boats are particularly the key resource of the community because they are fuel saving and are able to evacuate many people and belongings. In addition, the villagers use local wisdom to predict the probability of floods and to prepare for disasters. For example, if the stem of the Indian Heliotrope plant uis erect, a flood is likely to occur. On the other hand, if the stem of the Indian Heliotrope plant is bent, a flood is unlikely to occur. Once the Brown Shike bird sings in September, there is a high probability that no flood will occur and the community will have less water. The community has 15 civil defense volunteers to support disaster management activities.

As for network and collaboration building, the community leader provided information as follows: “The Provincial Office of Disaster Prevention and Mitigation mainly takes us to join the meetings with relevant cooperative networks. Those meetings make us understand the strengths and weaknesses of other communities and contribute to experience sharing among communities.” The main role of the community leader and the community committee is coordinating with other organizations and requesting assistance during the disaster periods.

The Khu Sawang community neither has a specific disaster response plan nor assigns a disaster management committee. The villagers carry out disaster management activities based on public consciousness. Once floods occur, the villagers help each other. The villagers also pay attention to and participate in disaster management training whenever it is conducted.

Disaster Management Capacity and Community Sustainability

One of the community committee members provided his opinion about disaster management capacity building as follows: “It was helpful to the community. It enables the villagers to have more disaster-related knowledge, more systematic procedures to cope with disasters during the pre-disaster, disaster, and post-disaster periods and better disaster preparedness.” In addition, disaster management capacity was seen to have an effect on the sustainability of disaster management: “It contributes to the distribution of knowledge within the community. The villagers adapted and complied with disaster management procedures. They feel unworried and have better

mental state.” It also affects the community sustainability in the economic, social, and environmental dimensions. In the economic dimension, once it is known that floods might occurs, the villagers harvest their agricultural products earlier than usual in order to prevent loss of income. In the social dimension, the villagers help each other during the disaster period. In the environmental dimension, the villagers preserve natural resources before the floods occur.

Capacity Building Approaches to Sustainable Disaster Management

In order to make the Khu Sawang community achieve sustainable disaster management, one of the community committee members provided a suggestion as follows: “The budget should be directly provided to the Sub-District Administrative Organization because this organization understands the problems and the needs of the community.” This is consistent with the following comment provided by a community leader: “The budget can lead to sustainability in terms of construction such as the construction of floodgates.” Moreover, the villagers should have more public consciousness in providing help to the community, and the Sub-District Administrative Organization should play a greater role in supporting disaster management.

4.1.10 The Tha Bong Mang Community, Warinchamrab Sub-District, Warinchamrab District, Ubon Ratchathani Province

General Characteristics

The Tha Bong Mang community was founded 140 years ago. Most of the villagers migrated from Ban Tae Kao, Lao Seue Kok District, Ubon Ratchathani Province. The community was previously known as Tha Bak Mang, which was named after the Bak Mang tree. Later, the community’s name was changed to Tha Bong Mang. The first community leader, who played a key role in founding the community, was Mr. Tami Mahawong. The current community leader is Mr. Montri Phromphanich. The community has a population of 203 households, which accountsfor a total of 987 people, 410 of whom ae males and 577 are females.

The Tha Bong Mang community is situated in a basin adjacent to the Mun River, and therefore it is affected by floods every year. In 2011, the community suffered a big flood event, causing great damage to every household in the community. During the disaster period, transportation within the community was difficult. The villagers had to get around by boat. Most of the villagers evacuated to a temporary evacuation center. The Tha Bong Mang community is barely affected by drought problems because its location is close to water sources and the main occupation of the villagers is not rice farming. Most villagers earn a living by fishing, fish farming, and being general workers. Every household also has tap water. However, the community sometimes experiences water shortages when the tap water stops running or the water pipes are under repair. The flood and drought disaster management implemented by the Tha Bong Mang community can be described as follows.

1) Flood Management

During the pre-disaster period, the community leader holds a meeting with the community committee in order to plan disaster response procedures, determine evacuation routes, and assign disaster management tasks to the community committee, which consists of the following departments: administration and public relations, monitoring and warning, medical care and relief, and evacuation and rescue and security. The community leader announces a disaster warning through the community's wire broadcasting system in order to make the villagers monitor the water levels, move their belongings to higher places, and always keep track of flood information.

During a disaster period, the villagers evacuate to a temporary evacuation center, which is systematically organized. A security guard team is set to monitor the safety of the villagers because there are people from other communities staying in the same temporary evacuation center. The community also asks for an evacuation staff, survival bags, boats, emergency toilets, and water for consumption from the Warinchamrab Town Municipality and the 22nd Military Circle.

During a post-disaster period, the community leader informs the villagers to move back, clean their house, check their electrical equipment, clean the temple and school, and survey whether their house is damaged. Consequently, the Warinchamrab Town Municipality carries out flood damage assessment and provides damage compensation.

2) Drought Management

The Tha Bong Mang community is located close to a river so it seldom has drought problems. Every household has tap water so the villagers almost never suffer from water shortage probems. Whenever the community experiences shortages, the villagers can buy water for consumption. However, the community has an insufficient amount of grass to feed the cattle and the villagers needed to harvest or buy grass from other communities. Flooding tends to cause no agricultural impact on the community because most of the villagers earn their living by fishing, fish farming, and being general workers.

Disaster Management Problems and Obstacles

The Tha Bong Mang community is situated in a water catchment area so it is prone to floods every year. The villagers are accepted for this fact and have learned to live with water. They focus on helping themselves before receiving help from other organizations. One of the community committee members provided more information as follows: “The villagers rely on themselves in solving every problem before asking for assistance from external organizations during the pre-disaster, disaster, and post-disaster periods. The villagers easily understand the disaster management procedures because they had experienced flooding almost every year.”

The shortage of evacuation shelters, emergency toilets, water for consumption, and boats are an important problem for the Tha Bong Mang community during a disaster period. The community solves this problem by asking for assistance from government agencies such as the Warinchamrab Town Municipality and the Ubon Ratchathani Provincial Office of Disaster Prevention and Mitigation. Moreover, the community also has had security problems because vpeople from many

communities have had to stay in the same temporary evacuation center. Therefore, the community has had to assign security guards to monitor the safety of its villagers.

Patterns and Methods of Disaster Management Capacity Building

The Warinchamrab Town Municipality and the Ubon Ratchathani Provincial Office of Disaster Prevention and Mitigation provide disaster management knowledge and training to the Tha Bong Mang community through the CBDRM program. As a result, the villagers have more disaster management knowledge to prevent and mitigate disaster hazards and the damage from disasters has been significantly minimized. The disaster management knowledge is also transferred within the community and between communities, which has helped to enhance the disaster management capacity of the Tha Bong Mang community. In addition, the Warinchamrab Town Municipality has also educated the villagers on occupational development.

The Tha Bong Mang community has plenty of disaster management resources such as hand-held sirens, bamboo tubes for disaster warning, 50 life jackets, and 30 cloth tents. These resources help to promote the community's capacity in disaster prevention and mitigation. The community also has local wisdom that can be used to prepare for disasters. For example, it is thought that a flood is likely to occur when the stem of the Indian Heliotrope plant is erect. In contrast, a flood is unlikely to occur when the stem of the Indian Heliotrope plant is bent, as stated above in another context. Further, once ants move their eggs to higher places, it shows that flooding is about to occur. The community has no civil defense volunteers. However, when disasters occurd, the Warinchamrab Town Municipality sends its civil defense volunteers to provide help.

In order to promote its disaster management capacity, the Tha Bong Mang community has collaborated with the other 13 flood-affected communities in the Warinchamrab District in establishing a disaster fund. The money raised by this fund is used to assist the fund member communities during a disaster period. After the disaster fund was established, all 14 communities seemed to receive disaster

information faster because they communicate with each other all the time, which contributes to better disaster preparedness.

In the Tha Bong Mang community, the community leader and the community committee play a key role in disaster management capacity building. They thoroughly take care of the villagers and coordinate with other organizations during a disaster period, resulting in less disaster damage to the community.

In 2013, the Tha Bong Mang community created a disaster response plan according to the Community Safety and Rehabilitation Program through the Community Disaster Preparedness Process. Red Cross Health Station No.7 (Ubon Ratchathani Province) collaborated with the Tha Bong Mang community in developing this disaster response plan. They jointly evaluated disaster risks, created disaster risk map, an evacuation map, and a boat route map, assessed the community's capacity and vulnerability, and defined the role of the disaster response committee. One of the community committee members provided information about the disaster response plan as follows: "The disaster response plan enables the villagers to deal with both ongoing and future disasters, help each other in time, and minimize flood damage."

Disaster Management Capacity and Community Sustainability

The above capacity building patterns and methods can enhance the community's capacity in disaster management and disaster preparedness during the pre-disaster and disaster periods. The villagers are eager to cope with disasters because they acknowledge and understand the impact and damage from disasters. One of the community committee members gave further information as follows: "Presently, we cannot force the nature. However, we can prepare to deal with the nature in order to safely survive when a disaster strikes." In addition, disaster management capacity building has enabled the villagers to help each other, to rely on themselves, and to learn to coordinate with other organizations.

The Tha Bong Mang community's disaster management capacity has had an effect on the sustainability of disaster management. One of the community committee members defined the meaning of sustainability as follows: "It refers to an

ability to normally make a living, picking vegetables like morning glory and water mimosa, catching fish, and selling them." The disaster management capacity has also affected the sustainability of the Tha Bong Mang community in the economic, social, and environmental dimensions. In the economic dimension, the villagers can earn additional income during the disaster period and they adapte themselves using the occupational knowledge obtained from the training provided by the Warinchamrab Town Municipality. In the social dimension, there is collaboration and unity within the community. The villagers are aware of their role in reciprocating support with each other. In the environmental dimension, the villagers have carried out a campaign against throwing litter into the river in order to protect the environment and the natural resources of the community.

Capacity Building Approaches to Sustainable Disaster Management

In order to make the Tha Bong Mang community achieve sustainable disaster management, one of the community committee members provided a suggestion as follows: "Rehearsal of disaster response procedures should be conducted every year because it can reduce disaster damage. The community committee meeting should be held on a regular basis. The knowledge about flood disasters, contextual background of the community, and disaster preparedness should be transferred to the next generations."

Based on the information obtained from 10 communities, the researcher summarizes the disaster management of each community as follows.

Table 4.1 Number of Civil Defense Volunteers and Key Disaster Management Resources

Communities	People	Civil Defense Volunteers	Key Disaster Management Resources
Saad	1,000	32	Broadcasting tower, disaster prevention center, life jackets, natural water sources, and a water supply system

Table 4.1 (Continued)

Communities	People	Civil Defense Volunteers	Key Disaster Management Resources
Prasuk	707	10	Broadcasting tower, natural water sources, and a water supply system
Khok Klang	942	9	Broadcasting tower, disaster prevention center, natural water sources, and a water supply system
Khok Krachai Nuea	532	10	Broadcasting tower, natural water sources, and awater supply system
Pa Wei	190	5	Broadcasting tower, natural water sources, and a water supply system
Yang Kao	217	10	Broadcasting tower, natural water sources, and a water supply system
Saen Khun	709	7	Broadcasting tower, natural water sources, and a water supply system
Kra Tam	454	5	Broadcasting tower, natural water sources, and a water supply system
Khu Sawang	878	15	Broadcasting tower, a disaster prevention center, hand-held sirens for disaster warning, motorboats, knock-down houses, life jackets, natural water sources, and a water supply system
Tha Bong Mang	987	- (Warinchamrab Town Municipality sends its civil defense volunteers to provide help)	Broadcasting tower, a disaster prevention center, hand-held sirens for disaster warning, motorboats, cloth tents, life jackets, natural water sources, and a water supply system

Table 4.2 Flood and Drought Management and Problems and Obstacles of Each Community

Communities	**Disaster Management**		**Problems and Obstacles**
	Flood	**Drought**	
Saad	**Pre-disaster:** Disseminate disaster warning through a broadcasting tower and trained in disaster management by the Provincial Office of Disaster Prevention and Mitigation **Disaster:** Use boats as vehicles, set a community security team, and ask for survival bags **Post-disaster:** Clean houses, move belongings back, and repair damaged houses	Store water for use in the dry season	The villagers cannot work during floods so they have to rely on survival bags from external organizations.
Prasuk	**Pre-disaster:** Disseminate disaster warning through a broadcasting tower, monitor water levels, and determine evacuation areas (the villagers have been familiar with flooding for a long time) **Disaster:** Use boats as vehicles, buy necessary things for each other, set a community security team, and ask for assistance from other organizations such as medical assistance.	Prepare water containers or dig a well in their own land in order to store water	Natural water sources cannot effectively store water.

Table 4.2 (Continued)

Communities	Disaster Management		Problems and Obstacles
	Flood	Drought	
	Post-disaster: Clean houses, ask government agencies to assess the damage in order to receive damage compensation and do additional jobs		
Khok Klang	**Pre-disaster:** Disseminate disaster warning through a broadcasting tower, prepare for evacuation, and move belongings to higher places **Disaster:** Use boats as vehicles and to get around the flood-affected areas with caution. **Post-disaster:** Clean houses, move belongings back, and ask the government agencies to assess the damage in order to receive damage compensation	Store water during the rainy season in order to have enough water for use in the dry season	The villagers have limited disaster management resources so they have to ask for assistance from external organizations.
Khok Krachai Nuea	**Pre-disaster:** Disseminate disaster warning through a broadcasting tower and move belongings to higher places. **Disaster:** Use boats as vehicles and put up signage to warn of flooded areas **Post-disaster:** Clean house and let the government agencies assess the	Prepare containers to store water and buy water for consumption	The villagers lack disaster management resources and have insufficient water for agriculture.

Table 4.2 (Continued)

Communities	Disaster Management		Problems and Obstacles
	Flood	**Drought**	
	damage in order to receive damage compensation.		
Pa Wei	**Pre-disaster:** Disseminate disaster warning through a broadcasting tower, move belongings to higher places, and prepare boats and food. **Disaster:** Use boats as vehicles and move cars to safe spots. **Post-disaster:** Clean houses and cooperate in cleaning the temple, school, and other places in the community	Prepare containers to store water, buy water for consumption, and receive water distributed by the Sub-District Administrative Organization	The community has to receive water from the Thab Than and Phok streams. The villagers do not have enough grass to feed their cattle during flood and drought disasters.
Yang Kao	**Pre-disaster:** Disseminate disaster warning through a broadcasting tower, move belongings to higher places, move cattle and cars to evacuation points, and raise or build houses higher **Disaster:** Ask for help from other organizations **Post-disaster:** Clean and fix damaged houses and cooperate	Stop growing off-season rice, grow plants requiring less water, and receive water distributed by the Sub-District Administrative Organization	Evacuation of sick and elderly people during floods is difficult and can be done only by boat. The community also does not have reservoirs that can

Table 4.2 (Continued)

Communities	Disaster Management		Problems and Obstacles
	Flood	**Drought**	
	in cleaning other places in the community.		effectively store water.
Saen Khun	**Pre-disaster:** Disseminate disaster warning through a broadcasting tower, hold a meeting with the community committee, and move belongings to higher places **Disaster:** Ask for assistance from other organizations and help other villagers in the community **Post-disaster:** Clean houses, cooperate in cleaning other places in the community and ask the government agencies to assess the damage in order to receive damage compensation	Prepare to store water, grow plants requiring less water, and buy water for consumption	The community lack disaster management resources such as motorboats, sirens, and life jackets.
Kra Tam	**Pre-disaster:** Disseminate disaster warning through a broadcasting tower, move belongings to higher places, and prepare evacuation places **Disaster:** Ask for assistance from other organizations and cooperate in taking care of the safety of the	Buy water for consumption	There is no serious problem or obstacle because the villagers have experience in coping with

Table 4.2 (Continued)

Communities	Disaster Management		Problems and Obstacles
	Flood	**Drought**	
	community **Post-disaster:** Clean houses, cooperate in cleaning other places in the community, and ask the government agencies to assess the damage in order to receive damage compensation		disasters and always provide help to each other.
Khu Sawang	**Pre-disaster:** Disseminate disaster warning through a broadcasting tower, determine evacuation places, and check the availability of motorboats **Disaster:** Use boats as vehicles, establish a community security team, and ask for assistance from other organizations **Post-disaster:** Clean houses, cooperate in cleaning other places in the community, and ask government agencies to assess the damage in order to receive damage compensation	Store water for consumption	Flood victims have different needs and assistance cannot be provided to each of them fast enough

Table 4.2 (Continued)

Communities	Disaster Management		Problems and Obstacles
	Flood	Drought	
Tha Bong Mang	**Pre-disaster:** Hold a meeting with the community committee, monitor the water levels, move belongings to higher places, disseminate disaster warning through a broadcasting tower, and determine evacuation places **Disaster:** Use boats as vehicles, ask for assistance from other organizations, evacuate to evacuation places, and establish a community security team **Post-disaster:** Move back from evacuation places, clean houses, cooperate in cleaning the temple, school, and other places in the community, check electrical equipment, and ask the government agencies to assess the damage	Buy water for consumption and find grass from other communities to feed cattle	The community is located in a water catchment area so it is prone to flooding every year. There are shortages of evacuation spaces, toilets, boats, and water for consumption.

Table 4.3 Patterns and Methods of Disaster Management Capacity Building

Communities	Patterns and Methods				
	CBDRM	**Resources**	**Collaboration/ Network**	**Roles of the Community Leader and Community Committee**	**Disaster Prevention Plan**
Saad	Trained in CBDRM by the Provincial Office of Disaster Prevention and Mitigation and the Sub-District Administrative Organization	Have many resources and use local wisdom to prepare for flooding. For example, a flood is likely to occur when ants move their nests.	Collaborate with other communities in sharing disaster management knowledge and experiences	Coordinate with other organizations during the disaster period in order to ask for assistance	Create a local disaster prevention plan on a yearly basis
Prasuk	Trained in CBDRM by the Provincial Office of Disaster Prevention and Mitigation and the Sub-District Administrative Organization	Have limited resources but use local wisdom to prepare for flooding. For example, the probability of floods is high when there are a number of fish spawns.	Collaborate with other communities in sharing disaster management knowledge during group meetings	Coordinate with other organizations in order to ask for disaster management resources such as motorboats and survival bags	Have no local disaster prevention plan but apply previous experience to deal with disasters

Table 4.3 (Continued)

Communities	Patterns and Methods				
	CBDRM	**Resources**	**Collaboration/ Network**	**Roles of the Community Leader and Community Committee**	**Disaster Prevention Plan**
Khok Klang	Trained in CBDRM, agricultural development and occupational promotion by the Provincial Office of Disaster Prevention and Mitigation and the Sub-District Administrative Organization	Have limited resources but use local wisdom to prepare for flooding. For example, the probability of floods is high once a large number of fish are trapped.	Collaborate with other communities in sharing disaster management knowledge and experience during group trainings	Coordinate with other organizations during the disaster period in order to ask for assistance such as survival bags	Have no local disaster prevention plan but organize a meeting to discuss disaster management procedures according to traditional practice
Khok Krachai Nuea	Trained in CBDRM by the Provincial Office of Disaster Prevention and Mitigation and the Sub-District Administrative Organization	Have limited resources but ask for support from other organizations	Collaborate with other communities in sharing disaster management knowledge and experience during group trainings	Coordinate with other organizations during the disaster period in order to ask for assistance	Have no local disaster prevention plan but apply previous experience to deal with disasters

Table 4.3 (Continued)

Communities	Patterns and Methods				
	CBDRM	**Resources**	**Collaboration/ Network**	**Roles of the Community Leader and Community Committee**	**Disaster Prevention Plan**
Pa Wei	Trained in CBDRM by the Provincial Office of Disaster Prevention and Mitigation and the Sub-District Administrative Organization	Have limited resources but ask for support from other organizations and use local wisdoms to create self-help equipment during the disaster period such as floating gallons and lifebuoys made of car tires	Collaborate with other communities in sharing disaster management knowledge and experience during group trainings	Coordinate with other organizations during the disaster period in order to ask for assistance	Have no local disaster prevention plan but apply previous experience to deal with disasters
Yang Kao	Trained in CBDRM by the Provincial Office of Disaster Prevention and Mitigation and the Sub-District Administrative	Have limited resources but ask for support from other organizations and use local wisdoms to deal with flooding.	Collaborate with other communities in sharing disaster management knowledge and experience during group trainings	Coordinate with other organizations during the disaster period in order to ask for assistance	Have no local disaster prevention plan but apply the community's traditional practice to deal with disasters

Table 4.3 (Continued)

Communities	Patterns and Methods				
	CBDRM	**Resources**	**Collaboration/ Network**	**Roles of the Community Leader and Community Committee**	**Disaster Prevention Plan**
	Organization	For example, putting a wooden pole in a flooded area in order to measure and monitor the water levels.			
Saen Khun	Trained in CBDRM by the Provincial Office of Disaster Prevention and Mitigation and the Sub-District Municipality	Have limited resources but ask for support from other organizations and use local wisdoms to prepare for flooding. For example, the probability of floods is high when a number of ground lizards move out of their nests.	Collaborate with other communities in sharing disaster management knowledge and experience during group trainings and field trips	Coordinate with other organizations in order to ask for assistance and allocate the community leader's personal budget to support disaster management	Have no local disaster prevention plan but apply the community's traditional practice to deal with disasters

Table 4.3 (Continued)

Communities	Patterns and Methods				
	CBDRM	**Resources**	**Collaboration/ Network**	**Roles of the Community Leader and Community Committee**	**Disaster Prevention Plan**
Kra Tam	Trained in CBDRM by the Provincial Office of Disaster Prevention and Mitigation and the Sub-District Administrative Organization	Have limited resources but ask for large tractors from other organizations to evacuate and transport people and also use local wisdom to prepare for flooding. For example, the probability of floods is high when ants and insects move to higher places.	Collaborate with other communities in sharing disaster management knowledge and experience during group trainings and meetings.	Coordinate with other organizations during the disaster periods in order to ask for assistance.	Have no local disaster prevention plan but focus on implementing the community's traditional practice
Khu Sawang	Trained in CBDRM by the Provincial Office of Disaster Prevention and Mitigation and the Sub-District	Have many key resources, especially a motorboat that can evacuate a number of people and belongings.	Collaborate with other communities in sharing disaster management knowledge and experience during group trainings and meetings	Coordinate with other organizations during the disaster period in order to ask for assistance	Have no local disaster prevention plan but focus on volunteer-ring to help other villagers in the community

Table 4.3 (Continued)

Communities	Patterns and Methods				
	CBDRM	**Resources**	**Collaboration/ Network**	**Roles of the Community Leader and Community Committee**	**Disaster Prevention Plan**
	Administrative Organization	Use local wisdom to prepare for flooding. For example, a flood is likely to occur when the stem of the Indian Heliotrope plant is erect. On the other hand, a flood is unlikely to occur when the stem of the Indian Heliotrope plant is bent.			
Tha Bong Mang	Trained in CBDRM by the Provincial Office of Disaster Prevention and Mitigation and the Sub-District Municipality	Have plenty of resources and use local wisdom to prepare for flooding. For example, a flood is likely to occur when ants move their	Collaborate with other communities to set up a disaster fund that provides financial support to 14 flood-affected communities. Visit other communities to learn their disaster	Coordinate with other organizations during the disaster period in order to ask for assistance	Determine and review the local disaster prevention plan on a regular basis

Table 4.3 (Continued)

Communities	Patterns and Methods				
	CBDRM	**Resources**	**Collaboration/ Network**	**Roles of the Community Leader and Community Committee**	**Disaster Prevention Plan**
		eggs to higher places.	management practices.		

Table 4.4 Disaster Management Capacity and Community Sustainability

Communities	**Disaster Management Capacity**	**Sustainability**		
		Economic	**Social**	**Environmental**
Saad	The community became stronger, had better disaster preparedness and particularly established the disaster prevention center.	The villagers adapted themselves by doing other jobs and growing plants requiring less water instead of rice.	The villagers were united and helped each other.	Environmental problem rarely occurred.
Prasuk	The community became stronger. It was familiar with disaster problems	The economic sustainability was not clearly shown.	The villagers helped and relied	Garbage was regularly collected and burnt.

Table 4.4 (Continued)

Communities	Disaster Management Capacity	Sustainability		
		Economic	Social	Environmental
	and always prepared to deal with disasters, especially flooding.	The villagers just sold eggs and vegetables during the disaster period.	on each other.	
Khok Klang	The community had better disaster preparedness.	The villagers adapted themselves by growing other plants such as morning glory instead of rice.	The villagers helped each other.	The Garbage Bank project was established in order to add value to the garbage.
Khok Krachai Nuea	The community had better disaster preparedness.	The villagers adapted themselves by doing other jobs rather than rice farming.	The villagers helped each other.	The villagers protected and took care of the environment.

Table 4.4 (Continued)

Communities	Disaster Management Capacity	Sustainability		
		Economic	Social	Environmental
Pa Wei	The community had better disaster preparedness.	There was no evidence of economic sustainability. The villagers did not do any additional jobs.	The villagers helped each other.	The villagers carried out natural resource restoration.
Yang Kao	The community built collaboration with other organizations, resulting in stronger disaster management.	The villagers switched to other jobs during floods such as cloth weaving.	The villagers helped each other.	The villagers improved the environment and replanted trees.
Saen Khun	The community had better disaster preparedness and collaboration.	The villagers switched to doing other jobs during floods such as silk weaving.	The villagers helped each other and monitored the disaster together.	The villagers took care of the community and collected garbage during the floods.

Table 4.4 (Continued)

Communities	Disaster Management Capacity	Sustainability		
		Economic	Social	Environmental
Kra Tam	The community had better disaster preparedness and collaboration.	The villagers had additional jobs during the disaster period such as construction work.	The villagers helped each other, took care of the safety of the community, and happily lived together.	The villagers helped to keep the community clean, collect the garbage, and protect the environment.
Khu Sawang	The community had systematic disaster management procedures and better disaster preparedness.	The villagers harvested their agricultural products earlier than usual.	The villagers helped each other.	The villagers protected the environment before flooding.

Table 4.4 (Continued)

Communities	Disaster Management Capacity	Sustainability		
		Economic	Social	Environmental
Tha Bong Mang	The community had better disaster management. The villagers were more active in helping each other.	The villagers could earn additional income during the disaster period.	The villagers had unity and realized their role in reciprocat-ing support with each other.	The villagers properly disposed of garbage and preserved the environment.

Table 4.5: Capacity Building Approaches to Sustainable Disaster Management

Communities	Capacity Building Approaches	
	Structural	Non-Structural
Saad	Building Kaem Ling and clearly defining the responsibilities of each subcommittee in a systematic way.	Taking care of each other and solving problems on their own.
Prasuk	Developing a systematic irrigation system.	Cooperating in disaster monitoring and applying previous experience to deal with disasters.
Khok Klang	There was no specific approach. The approach should be flexibly adjusted according to situational contexts.	

Table 4.5 (Continued)

Communities	Capacity Building Approaches	
	Structural	**Non-Structural**
Khok Krachai Nuea	Building a reservoir to store water	Focusing on self-reliance
Pa Wei	Raising houses higher and building Kaem Ling.	Focusing on self-reliance.
Yang Kao	There was no sustainable pattern and method. Floods continue to occur every year anyway.	
Saen Khun	-	Building awareness of self-reliance
Kra Tam	-	Taking care of each other without relying on the government agencies
Khu Sawang	Directly providing the budget to local organizations or communities and building a floodgate	-
Tha Bong Mang	-	Rehearsing disaster response procedures, transferring knowledge to the next generation, and harmoniously living with water

4.2 Disaster Management Implemented by the Local Administrative Organizations

Considering the disaster management implemented by the Local Administrative Organizations that took care of the 10 target communities, the researcher synthesized the obtained information and found that the communities for which they were responsible suffered from serious flooding events in 2011 and 2013. Those flooding events caused great damage to rice fields, agricultural crops, and roadways. However, the villagers' houses were not severely damaged.

All 10 Local Administrative Organizations had similar experiences in dealing with floods and droughts. In terms of flood management, during the pre-disaster period the Local Administrative Organizations monitored flood situations and water levels, set up a disaster relief center and a temporary evacuation place, informed the villagers about the water levels, alerted the community leaders to prepare for flooding through radio transceivers, prepared important resources such as boats, tents, toilets, food, drinking water, and medicines, and educated the villagers on how to cope with disasters using a self-help approach. The Local Administrative Organizations also developed an annual disaster response plan and encouraged the communities to propose their ideas. The annual plan was rehearsed in order to make the communities ready to deal with disasters.

During the disaster period, the Local Administrative Organizations helped to evacuate the villagers and their belongings to an evacuation center or safe spot, provided first aid service to sick people and moved them to local hospitals, distributed food or survival bags to flood victims, and coordinated with other organizations such as the Provincial Office of Disaster Prevention and Mitigation, Provincial Red Cross Chapters, District Offices, private organizations, and foundations in order to ask for donations. Moreover, the Local Administrative Organizations provided the communities with temporary tents, drinking water, toilets and security guards to take care of the safety of the communities and to facilitate the transportation.

During the post-disaster period, the Local Administrative Organizations surveyed and repaired damage to houses, electricity systems, water supply systems, and roadways that were caused by disasters as well as collaborated with the villagers in cleaning the communities' areas. They also carried out damage assessment and provided the villagers with damage compensation.

The researcher has summarized that all 10 Local Administrative Organizations had similar flood management processes. During the pre-disaster period, they focused on flood preparedness, flood warning, evacuation preparation, and the establishment of evacuation centers. During the disaster period, they placed importance on coordinating with relevant organizations and mobilizing resources for disaster rescue and relief such as temporary shelters, survival bags, and toilets and water for consumption. During the post-disaster period, they concentrated on surveying, repairing, and restoring flood damage as well as providing damage compensation to flood victims. Each Local Administrative Organization has different flood management capacity depending on the availability of manpower, equipment, and budget, including the strength and collaboration of the community leader and the villagers.

Droughts in this study are natural disasters that normally occur in the northeastern provinces of Thailand. They cause less damage to the communities than floods, and drought management differs from flood management in that its implementation process cannot be clearly divided into the pre-disaster, disaster, and post-disaster periods. Overall, the Local Administrative Organizations implements drought management by focusing on supplying water to each household, building a community water supply system, alerting the villagers to store water for use in the dry season, urging and motivating the villagers to grow alternative plants requiring less water such as sun hemp, and finding markets to sell those alternative plants.

Considering the disaster management problems and obstacles of the Local Administrative Organizations, the main problem was shortages of manpower and resources for disaster prevention and mitigation. Most Local Administrative Organizations had no more than one staff member directly responsible for disaster

management. Therefore, some of them had to ask for manpower support from other organizations. An executive of the Local Administrative Organizations gave more information as follows: “When a disaster occurs, civil defense volunteers are the main force dealing with disaster prevention and mitigation.” Thus, it could be said that the villagers played the key role in community disaster management. When the villagers only waited for help from the government agencies, they could not cope with disasters in a timely manner.

In terms of disaster management resources, most of the Local Administrative Organizations had to ask for support, especially motorboats and survival bags, from the Provincial Office of Disaster Prevention and Mitigation. Moreover, the Local Administrative Organizations had a limited or no budget for disaster management. The budget disbursement process associated with disaster management such as fuel costs was quite slow, which led to less agility in disaster management.

Other problems were that some villagers were not aware of the impacts of disasters, did not believe the warnings of the Local Administrative Organizations, and did not evacuate to safer ground because they wanted to guard their houses and belongings. The staff member of the Local Administrative Organization provided further information as follows: “Providing helps to the communities located close to the water sources is quite difficult. Evacuation of people and belongings cannot be effectively done.”

Regarding the disaster management implemented by the communities, the information obtained from the interviews with the executives and staff of the Local Administrative Organizations indicated that most communities were familiar with flood and drought disasters. Therefore, the villagers were unlikely to panic when disasters occurred. Once floods struck, they prepared for disasters in advance by moving their belongings to higher places, raising their houses, and building two-storey houses. The villagers tended to store water for consumption before droughts occurred. Moreover, some communities such as the Tha Bong Mang community in Ubon Ratchathani Province and the Saad community in Nakhon Ratchasima Province created their own disaster prevention plan, which contributed to better disaster

response. These communities were able to determine a plan because they were trained through the CBDRM program. This program made the communities change. They seemed to have more disaster knowledge and better preparedness during the pre-disaster period such as knowing how to alert other villagers and establishing a committee to prevent and cope with disasters. The executive of the Local Administrative Organization provided more information as follows: “This program makes the villagers recognize their role, become more active in rehearsing and implementing, and know what to do when a disaster occurs.”

However, it was difficult to measure the impact of the CBDRM program on the sustainability of the communities because most communities had never faced serious disasters after attending this program and disasters did not always happen every year. In addition, after the training, most of them neither created a local disaster prevention plan nor continually implemented the plan. As a result, they still needed to rely on assistance from the government agencies. A staff member of the Local Administrative Organization gave more information as follows: “We could not further carry out the CBDRM program on a yearly basis due to a lack of training equipment. We need to ask for assistance from the Provincial Office of Disaster Prevention and Mitigation and other local administrative organizations. We also require serious support from the community leaders.”

According to the suggestions of the executives and staff members of the Local Administrative Organization, an effective approach to sustainable disaster management was that the community leader and the community committee needed to play a role in driving knowledge sharing within the community, leading the community members to rehearse a disaster response plan, and prepare for disasters and educating the children in the community on disaster prevention in order to build disaster management awareness and public consciousness.

The communities should build a strong network and create collaboration with unity, dedication, and cooperative support. An executive of the Local Administrative Organization provided further explanation as follows: “The communities should focus on self-reliance first. They should ask for helps from the government agencies only

when they are incapable of solving the problems." This is consistent with another executive of the Local Administrative Organization, who provided his suggestion as follows: "We should make the villagers recognize that they have a key role in disaster management so that they are willing to rely on themselves instead of waiting for external assistance. The Local Administrative Organization has limited staffs so the assistance may not be provided in time. The villagers need to prepare and help themselves in an initial stage."

In addition, the coordination and communication systems should be thoroughly conducted in a timely manner, and the information from the government agencies should be regularly updated. The community leader has to educate the villagers on how to react when a disaster occurs and inform them about an evacuation place. The community should have disaster management equipment in place, and the villagers should have sufficient knowledge and be trained in disaster management as often as possible. Moreover, the civil defense volunteers are considered a key force in the community's disaster management.

4.3 Disaster Management Implemented by the Nakhon Ratchasima, Buriram, Surin, Sisaket, and Ubon Ratchathani Provincial Offices of Disaster Prevention and Mitigation

According to the synthesis results of the disaster management implemented by the 5 Provincial Offices of Disaster Prevention and Mitigation, it was found that all of them had similar flood management processes. During the pre-disaster period, the disaster management was implemented through the Provincial Disaster Prevention and Mitigation Committee. The Provincial Offices of Disaster Prevention and Mitigation were responsible for all secretarial work. Each provincial office disseminated disaster warnings to the district office and the communities, prepared disaster management resources, conducted a disaster response rehearsal, and held training to provide disaster knowledge to relevant organizations such as the local administrative

organizations and the communities. During the disaster period, the Provincial Offices of Disaster Prevention and Mitigation coordinated with other organizations, including the Local Administrative Organizations, and mobilized resources essential for disaster rescue and relief. During the post-disaster period, they surveyed, repaired, and restored damage caused by flooding as well as provided damage compensation to the flood victims.

Drought frequently occurs in the northeastern provinces of Thailand, and the damage from drought is not as fast or as severe as with flooding. Unlike flood management, the implementation of drought management cannot be clearly divided into the pre-disaster, disaster, and post-disaster periods. The Provincial Offices of Disaster Prevention and Mitigation implement drought management by finding water sources and supplying water to the drought victims, encouraging villagers to store water for use in the dry season, and urging the villagers to save water.

As the owner of the CBDRM program, the Provincial Offices of Disaster Prevention and Mitigation stated that it is difficult to specify if the CBDRM program can improve the communities' ability to cope with disasters. This is because a disaster does not occur every year and after the training the communities still have not faced a serious disaster situation. The Provincial Offices of Disaster Prevention and Mitigation also lack disaster management manpower, have many other responsibilities to fulfill, and have a limited budget, and therefore, they neither followed up nor evaluated the results of the CBDRM program and the CBDRM performance of the communities. Thus, it cannot be said that the CBDRM program had an effect on the community sustainability. In addition, the formal adoption of the CBDRM guidelines was quite difficult most communities just attended the CBDRM program, created a plan, and went back without implementing anything. Moreover, only a few representatives were assigned to join the program. Therefore, it is not certain whether they were able to thoroughly and fully convey the knowledge to other villagers. The adaptation tended to depend mainly on the representatives' ability to transfer the knowledge. Furthermore, sustainability is difficult to measure, as a disaster does not happen every year, as stated above. However, the community's resilience is indicative of sustainable

disaster management. In other words, when the community has disaster resilience, it can contribute to the community's sustainable disaster management.

The chief of the Provincial Office of Disaster Prevention and Mitigation provided more information as follows: "At least the program enables all participated communities to gain knowledge about disaster risk reduction and to apply that knowledge to disaster warning during the pre-disaster period. It also makes the villagers understand their roles and facilitates the coordination between communities. However, the villagers still do not have the disaster awareness. This is because the CBDRM training program takes only two days and the northeastern communities normally do not have serious disaster problems." Another chief of the Provincial Office of Disaster Prevention and Mitigation gave the comment as follows: "The CBDRM approach has not been practically applied to drought disasters because we always solve drought problems by just storing water and digging fresh water wells for the communities."

According to the information provided by the chief of the Provincial Office of Disaster Prevention and Mitigation, the key factors of sustainable disaster management were that the community should have resilience and the community leader and Local Administrative Organization had to place importance on disaster management. The knowledge obtained from the trainings held by the Provincial Office of Disaster Prevention and Mitigation should be regularly implemented, reviewed, and rehearsed, and the villagers should have awareness and understand the importance of disaster risks. The sustainability of the community disaster management also depended on the disaster management experience and self-reliance of each community. This is consistent with the information collected from the communities, which suggested that the non-structural approaches, including focusing on self-reliance, knowledge sharing, and cultivating awareness of disaster hazards, should also be used to build disaster management capacity.

In addition, the information obtained from the Local Administrative Organizations suggested that an effective approach to sustainable disaster management was that the community leader and the community committee had to encourage

knowledge sharing and disaster management implementation within the community, lead the villagers to regularly rehearse disaster response procedures, and prepare for disasters and educate the children in the community on disaster prevention in order to build disaster management awareness and public consciousness.

Based on the information obtained from the communities, the Local Administrative Organizations, and the Provincial Offices of Disaster Prevention and Mitigation, it was found that providing disaster management knowledge and training, which was a non-structural approach, was an important factor that could make the villagers aware of the impacts of disasters, improve disaster preparedness, and develop better disaster management capacity.

CHAPTER 5

CONCLUSIONS, DISCUSSION, AND RECOMMENDATIONS

This chapter discusses the conclusions and recommendations from the study, and offers a discussion section. The chapter begins with the conclusions of the present study. The information collected from 10 communities was systematically synthesized in order to find the conclusions. Based on the first research objective, the conclusions about the patterns and methods of flood and drought disaster management capacity building used in the communities in the lower northeastern region of Thailand are presented. The conclusions about the flood and drought disaster management capacity and the problems and obstacles of each target community are provided in accordance with the second research objective. In order to respond to the third research objective, the conclusions regarding the appropriate capacity building approaches to sustainable disaster management for the communities in the lower northeastern region of Thailand are explained.

Then a discussion of the findings is presented. Operational and policy recommendations and suggestions for further research are also offered. The details are as follows.

5.1 Research Conclusions

The findings shown in Table 4.1 to Table 4.5 of Chapter 4 were thoroughly synthesized. The results can be described as follows.

5.1.1 General Characteristics and Resources of the Communities

From Table 4.1, it can be summarized that most communities had a population of more than 500. The Saad community had the largest population (1,000 residents) while the Pa Wei community had the smallest population (190 residents). Each community had civil defense volunteers, which were considered the key force providing assistance and support when a disaster occurred. According to the policy of the Department of Disaster Prevention and Mitigation, the number of civil defense volunteers in each community should be at least 2 percent of the population. Only 4 communities were found to comply with this policy, which were the Saad, Khok Krachai Nuea, Pawei, and Yang Kao communities. Thus, the number of civil defense volunteers in each community should be increased in order to make the communities able to initially cope with disasters before the government agencies' assistance arrives.

Each community had two disaster warning volunteers (Mister Warning), who were important human resources for disaster management. They played a role in monitoring disasters and warning the villagers about emergency situations. Considering the disaster management at the basin level, the Mun River Basin Committee was established according to No. 15 of the Regulations of the Office of the Prime Minister on Water Resources Management 2007 (Department of Water Resources, 2007). Its main responsibilities included developing a water resource management plan, prioritizing water usage, determining the amount of water usage, defining a fair and effective water distribution measure, and mediating and solving the water resource management problems occurring in the basin.

In terms of disaster management resources, all of the communities had a broadcasting tower, which was an important resource for disseminating disaster warnings and relevant information to the villagers. The communities also had natural water sources and water supply systems, which could store water during the rainy season for use in the dry season. These water sources not only were essential for disaster management but also had an effect on the community economy. This was because the main occupation of the villagers was agriculture. Having water sources

that could effective supply water for agriculture strongly affected the community's income generation and economic sustainability.

Some communities (the Saad, Khu Sawang and Tha Bong Mang communities) had plenty of disaster management resources, such as motorboats, disaster warning sirens, life jackets, and tents. On the other hand, the other communities had to wait for the provision of those resources from the Provincial Offices of Disaster Prevention and Mitigation or local administrative organizations during the disaster period. This reflected that the disaster management readiness and capacity of each community varied according to the availability of resources.

5.1.2 Natural Disaster Management

Natural disaster management was divided into flood management and drought management. According to Table 4.2, the natural disaster management implemented by the communities can be concluded as follows.

5.1.2.1 Flood Management can be divided into the following 3 periods.

1) Pre-disaster period: the community leader disseminated disaster warnings to the villagers through the community's broadcasting tower. The villagers were informed to move their belongings, food and cattle to higher ground, harvest their agricultural products earlier than usual, find other places to live or move in with their relatives, get around their community with caution, and monitor the disaster information provided by the governmental sector. The villagers also spread flood news by word-of-mouth and kept themselves up to date on the latest flood reports through the media such as radios, television, and smartphones. Most of the villagers could predict whether a flood was about to occur because they were familiar with flooding.

In order to prepare for the disasters, all of the communities borrowed motorboats from the government agencies except the Khu Sawang community in Ubon Ratchathani Province, which already had its own motorboat. The communities checked the availability of motorboats, fuel, relevant equipment, and boat drivers and evacuation sites. Some communities raised their houses so as to

prevent flood damage such as the Tha Bong Mang community in Ubon Ratchathani Province and the Saad community in Nakhon Ratchasima Province. Each community held a community committee meeting in order to discuss evacuation procedures, and assign tasks and check evacuation vehicles. Most communities, excluding the Tha Bong Mang and Saad communityies, did not have a disaster management committee. Thus, in those communities, the community committee was assigned to handle all disaster management tasks. The Yang Kao community in Surin Province established a group called “Klum 25 Ta Sapparod” to provide assistance during the disaster period in conjunction with the community committee and the civil defense volunteers. One of the community leaders provided the following information: “The community can handle almost everything. We just asked for some additional assistance from other organizations.” One of the community committee members also gave more information as follows: “We must rely on ourselves first because during the disaster period the government agencies take one or two days to provide assistance to the community.” Based on these findings, it could be said that most communities basically prepared themselves for flooding even before it occurred without solely waiting for the assistance from the government agencies, which indicated the prominent role of community-based disaster management.

2) Disaster period: the community leader and the community committee coordinated with the government agencies such as the Provincial Offices of Disaster Prevention and Mitigation and local administrative organizations so as to ask for essential resources such as survival bags, drinking water, toilets, and tents and temporary shelters. Moreover, during the disaster period the villagers evacuated to safe areas such as the office of Sub-District Administrative Organization, temples, and schools in their community. The villagers stayed together in safe areas and supported each other. The evacuation zones were carefully organized. Security teams were established to take care of the safety of the villagers. A boat pick-up and drop-off service was arranged. The flooded roads were fenced with long sticks in order to prevent car accidents. One of the community leaders stated the following: “The villagers easily adopt disaster management because they experience flooding

almost every year.” These findings indicated that the communities had to rely on other organizations during the disaster period because they could not acquire necessary disaster management resources such as survival bags and tents on their own.

3) Post-disaster: the villagers cleaned and fixed their houses, cooperated in cleaning the temple, schools, and other places in their community, got their belongings back, and checked their electrical equipment. The community leader asked the local hospital to provide physical check-ups for the villagers. The Sub-District Administrative Organization was also asked to repair the roads and damaged houses. Furthermore, the communities received compensation for agricultural damage from the Ministry of Agriculture and Cooperatives. These findings suggest that during the post-disaster period the villagers tried to recover from the flooding. They still needed to rely on financial aid from other organizations in the form of flood-damage compensation because the communities had a limited budget to help the villagers.

5.1.2.2 Drought Management

It was found that droughts caused less impact and damage to the communities than floods did. As drought problems had continually occurred in the lower northeastern provinces every year, the villagers seemed to be familiar with them. Moreover, almost all 10 communities were located on flat plains close to water sources so they were affected by floods more often than droughts. The implementation of drought management could not be clearly divided into the pre-disaster, disaster, and post-disaster periods. The communities carried out drought preparedness and drought response both before and during the droughts. The details are as follows.

1) Drought preparedness: the villagers prepared containers to store water before the dry season arrived and dug a well to store water. In addition, the government agencies urged the villagers to save water and grow plants that required less water such as sun hemp, developed a water supply system for every community, and looked for suitable areas for a dam construction, which required a large budget.

2) Drought response: the villagers could buy water for consumption without waiting for any assistance from the government and grow plants requiring less water such as sunn hemp. As for the communities with serious drought

problems, the community leader formally submitted a request for assistance to the Sub-District Administrative Organization. Once it received the formal request, the Sub-District Administrative Organization had to tell the Provincial Administrative Organization to list those communities in drought-declared areas before providing assistance to the villagers. The drought declaration process took a very long time. One of the community committee members shared his opinion on this issue as follows: “The provincial office takes a long time to declare the drought areas. The communities need to rely on themselves. If we only wait for the provincial office, we will not survive.” Further, one of the community leaders suggested a way to deal with droughts as follow: “W*e* need water storage places. Dredging large canals requires a large amount of budget.” In addition, one of the committee members from the same community suggested the following: “Having Kaem Ling will lead to comprehensive water management.” This was consistent with the following suggestion given by another community committee member: “An effective way to solve drought problem is building Kaem Ling to capture water during the rainy season.” These findings indicated that in order to cope with droughts the communities still needed construction-related support from the government agencies because the communities had limited budgets and resources to conduct a construction project on their own. The communities could not store a large amount of water so they frequently had drought problems.

5.1.3 Patterns and Methods of Disaster Management Capacity Building

From Table 4.3, it can be summarized that the patterns and methods of disaster management capacity building, which were applied by the communities in the lower northeastern part of Thailand, could be divided into the following three levels.

5.1.3.1 Capacity building at individual level: capacity building at the individual level means that the villagers in each community are encouraged to build and enhance their disaster management knowledge and skills. Based on the results of this study, every community was educated and trained through the community-based disaster risk management (CBDRM) program, which was initiated and carried out by

the Provincial Office of Disaster Prevention and Mitigation and the local administrative organization responsible for each community. This program aimed to reduce disaster losses and promote disaster preparedness among the villagers, especially those that lived in disaster-prone areas, as well as to encourage the villagers to be aware of the adverse effects of disasters, participate in disaster prevention, and jointly solve disaster problems in order to ensure the safety of their community.

The information obtained from the interviews with the community leaders and the community committee members from the 10 communities suggested that the CBDRM program made the villagers in disaster-prone areas have a better understanding of local disasters, be aware of the importance of participating in disaster management in the form of a community organization, and create a community disaster response plan and rehearse an emergency evacuation procedure.

In addition, the CBDRM program enabled the villagers to have more disaster knowledge and disaster awareness. The knowledge obtained from the program was transferred between the villagers, which contributed to better disaster preparedness. The villagers knew what should be done when a disaster occurred and could rely on themselves. The CBDRM program also encouraged the communities to create a local disaster prevention and mitigation plan, resulting in the establishment of various committees to implement disaster prevention and mitigation tasks such as disaster monitoring and warning, evacuation, search and rescue, and disaster relief. This plan could reduce disaster impacts and had an effect on the disaster management capacity and the sustainability of disaster management.

However, the knowledge obtained from the CBDRM program was not seriously applied because what the villagers were trained in did not match the real situations. For example, the villagers had been trained about flood response but later in that year they experienced a drought problem. Thus, it was quite difficult to quantitatively evaluate the results of the CBDRM program. The losses occurring before and after conducting the CBDRM program could not be systematically compared because the communities did not experience the same disaster every year and each year the losses were different based on the disaster situations. Moreover, the

CBDRM program was a multi-community training that might not be able to serve the specific needs of every community. Therefore, in the future the program should be specifically designed for each community. Overall, the CBDRM program was beneficial because it enabled the villagers to obtain better disaster management knowledge and skills and have better disaster response awareness.

5.1.3.2 Capacity building at the organizational level: capacity building at the organizational level enabled the communities to manage their disaster management resources, build collaboration or a network with other organizations, and have a community leader and community committee that actively played a role in disaster management. It was found that most communities in this study had limited disaster management resources so they had to wait for assistance from external organizations during the disaster period. Essential resources such as motorboats and life jackets were only provided to the communities during the disaster period. However, the Tha Bong Mang, Khu Sawang, and Saad communities were found to have plenty of resources, including tents, disaster warning sirens, and life jackets. It should be highlighted that the Khu Sawang community had its own motorboat and knock-down house so it did not need to borrow those resources from the government agencies. The motorboat of the Khu Sawang community was fuel-saving and was able to evacuate a number of people and belongings. Having these resources helped enhance the community's disaster management capacity.

Although the communities mostly had limited resources and capacity in terms of equipment, they used their local wisdom to prepare for flooding in advance. The villagers frequently observed the behavior of animals in order to predict the occurrence of flooding. For example, it was thought that flooding tended to occur when ants moved their nest to higher ground, insects climbed up to higher places, ground lizards moved out of their nests, fish laid so many eggs, or the Brown Shike bird sang in September. Some plants could also be used to predict flooding; for example, once there were a large number of the jig flowers, the probability of floods was high. Moreover, a flood was likely to occur when the stem of the Indian Heliotrope plant was erect. In contrast, a flood was unlikely to occur when the stem of

the Indian Heliotrope plant was bent. The villagers also used local materials to create self-help equipment such as flood measuring sticks, floating plastic gallon containers, and lifebuoys made of car tires.

Considering network and collaboration building, it was found that the communities did not create a formal cooperative network with external organizations. Most of them coordinated with external parties in order to provide support to other communities or asked for assistance during the disaster period such as borrowing motorboats from the Provincial Offices of Disaster Prevention and Mitigation and asking for water for consumption from the Sub-District Administrative Organizations. In addition, it was found that most cross-community collaboration associated with disaster management was initiated by the government agencies. The Provincial Offices of Disaster Prevention and Mitigation or the Sub-District Administrative Organizations usually invited and took the communities to join a network or attend meetings with other related communities. One of the community leaders provided the following suggestion: “We have never made a field trip to other communities because each community has different contextual conditions. But we provided help and support to other communities when disaster occurs. Each community can take care of itself so there is no need to create a network.” However, the communities were likely to collaborate on infrastructure development projects such as road construction. Thus, it could be concluded that the communities did not have a strong network to deal with disasters. They conducted their own disaster management activities rather than cooperating with other communities.

However, the Tha Bong Mang community in Ubon Ratchathani Province was the only community that collaborated with other flood-affected communities in the Warinchamrab Town Municipality in establishing a disaster fund. This collaboration building helped enhance disaster management capacity, knowledge transference, and cooperation between the communities. Knowledge sharing among the communities during group trainings or meetings and visiting other communities in the form of field trips was very helpful for the disaster management because it enabled the villagers to understand the strengths of other communities, apply the knowledge to

their community, and transfer the obtained knowledge to other villagers. Every kind of collaboration could motivate the communities to have new ideas to deal with disasters. Based on these findings, it could be said that most communities did not build any formal disaster management collaboration so they had no clear capacity in terms of a collaborative network. The communities mainly relied on themselves and asked for additional support from the government agencies rather than other communities because each community had limited disaster management resources and budget and also had differences in disaster management needs and problems.

The community leader's and the community committee's role in disaster management was another important part of capacity building at the organizational level. The community leader and the community committee were the key persons involved in community management and development. Once they placed importance on disaster prevention and preparedness, the disaster damage could be significantly reduced. According to the research results, it was found that the community leader and the community committee had a role in coordinating with other organizations in order to ask for disaster management equipment and other support during the disaster period. One of the community committee members provided related information as follows: "The community leader not only is responsible for disaster management but also takes care of all matters concerning the well-being of the villagers." Further, the community leader of the Saen Khun community in Sisaket Province also used his own money to hold disaster management training for the villagers every year. These findings indicated that the community leader and the community committee played a critical role in leading the villagers to overcome disaster crises using their leadership skills and abilities to coordinate with other organizations during the disaster and post-disaster periods.

Some communities, including the Tha Bong Mang community in Ubon Ratchathani Province and the Saad community in Nakhon Ratchasima Province, established a disaster prevention and mitigation committee to specifically deal with disasters. These committee members were divided and assigned to take care of different tasks such as disaster monitoring and warning, and evacuation and disaster

relief. One of the community committee members gave further information as follows: “The establishment of this committee makes each community member aware of his or her role and leads to more systematic disaster management.” Although most communities did not have a specific disaster management committee, the community leader and the community committee put their effort into assisting the villagers during the disaster period. These findings suggested that having a community disaster management committee helped empower the villagers to have more capacity in disaster response and management and enhanced the participation of the villagers in disaster management.

5.1.3.3 Capacity building at the systemic or institutional level: capacity building at the systemic or institutional level promotes the communities’ disaster management readiness in terms of disaster management policy, regulations, and plans. The results indicated that most communities did not have a specific disaster management plan or policy. The communities tended to focus on the implementation and traditional practice resulting from familiarity with disasters. Most of the villagers knew what should be done when disasters occurred. They helped each other based on public consciousness. However, one of the community committee members shared his opinion as follows: “Having a disaster management plan will enhance our preparedness and lead to different consequences.”

The community projects, which were included in the 3-Year Development Plan of the Local Administrative Organization, were mostly associated with infrastructure construction; disaster management projects were not taken into account. Therefore, most of the communities tended to lack capacity building at the systemic level. The Tha Bong Mang community in Ubon Ratchathani Province and the Saad community in Nakhon Ratchasima Province were the only communities that could create a local disaster prevention and response plan by cooperating with other organizations, namely the Red Cross Health Station No.7 (Ubon Ratchathani Province) and Dong Yai Sub-District Administrative Organization, respectively. One of the community committee members provided further information as follows: “The disaster response plan enables the villagers to deal with both ongoing and future

disasters, help each other in time, and minimize flood damage." Moreover, the local disaster prevention and response plan helped the community to achieve better disaster preparedness and greater disaster management capacity.

In addition, based on the document study, it was found that there was no policy, law, or plan that directly addressed disaster management capacity building. The Disaster Prevention and Mitigation Act 2007 only mentioned disaster management authorities at the provincial, district, and sub-district levels. The communities were encouraged to build and enhance their disaster management capacity through the Community Capacity Building in Disaster Prevention and Mitigation program, which was initiated in 2004. The community-based disaster risk management approach was used to conduct this program. Although the communities had continuously created an annual community plan, the plan only focused on the general conditions of the communities rather than concentrating on disaster management capacity building. Thus, it could be concluded that having policy, laws, and plans that directly focused on community-based disaster management could enhance the disaster management capacity in a more systematic way. Particularly, the community disaster prevention and mitigation plan was a critical element of strategic disaster management and community-based disaster management.

5.1.4 Disaster Management Capacity and Problems and Obstacles

According to Table 4.4, the disaster management capacity building made the villagers in the target communities have more disaster management knowledge, be aware of the impacts and hazards of disasters, and apply the obtained knowledge to prepare for and cope with disasters in a more appropriate way. One of the community committee members provided more information as follows: "Although we cannot force the nature, we can presently prepare to deal with the nature in order to safely survive when a disaster strikes." One of the community leaders also stated the following: "The villagers were familiar with water for a long time. Once there was a large amount of water coming, they will prepare for flooding by placing sandbags or preparing a water pump." From these findings, it can be concluded that the

communities basically had the capacity to survive disasters using traditional practices or with their familiarity with floods and droughts. However, their disaster management capacity was built and enhanced after the capacity building approaches were implemented, including the CBDRM program. When a disaster occurred, the community leaders could effectively fulfill their role in coordinating with other organizations so as to ask for assistance. During the pre-disaster period, the communities carried out disaster management planning and disaster preparedness. Some communities, which included the Tha Bong Mang community in Ubon Ratchathani Province and the Saad community in Nakhon Ratchasima Province, created a disaster prevention plan and specifically established a disaster management committee. The disaster prevention plan and the disaster management committee helped the communities to deal with disasters in a more systematic way. During the disaster period, disaster rescue and relief were conducted, and there was coordination and mutual support among the villagers in each community and between the communities with other organizations such as the Provincial Offices of Disaster Prevention and Mitigation, the Local Administrative Organizations, and the neighboring communities, which resulted in less disaster damage and better disaster response capacity. During the post-disaster period, the communities applied their disaster management knowledge obtained from the capacity building activities to disaster rehabilitation and recovery, such as repairing the damaged houses, temples, and schools and earning money by doing additional jobs rather than rice farming. Further, continuous capacity building could lead to sustainable disaster management. One of the community committee members gave further information as follows: “Capacity building enables the community to develop disaster management capacity, which can lead to sustainability.” Thus, it can be summarized that the disaster management capacity building at the individual, organizational, and systemic or institutional levels was necessary for enhancing the communities’ capacity during the pre-disaster, disaster, and post-disaster periods.

Considering the disaster management problems and obstacles, it was found that most communities experienced shortages of flood management resources such as motorboats, temporary shelters, and water for consumption and toilets. Therefore, they had to ask for those resources from the government agencies. Moreover, there were difficulties in working, living, and with transportation during floods. In terms of drought management, the main problem was inadequate water storage facilities and the ineffectiveness of water storage. In addition, providing assistance to some communities was difficult because the villagers wanted to guard their belongings and refused to evacuate to a safer place. Thus, the government agencies needed to make the disaster victims aware of the impacts of disasters and understand the importance of disaster evacuation rather than worrying about their belongings.

However, most of the villagers seemed to be familiar with floods and droughts. They tried to prevent and solve the disaster problems on their own before receiving assistance from other organizations, such as moving cattle and belongings to higher places before flooding occurred, repairing damaged houses after flooding, and storing water before the dry season arrived. One of the community committee members provided more information as follows: “The villagers always rely on themselves before asking for helps from external organizations during the pre-disaster, disaster and post-disaster periods.” One of the community leaders also provided similar information in the following: “The community focuses on self-reliance and prepare to cope with floods all the time. Disaster information has always been provided to the villagers. The community committee and the Sub-District Administrative Organization Council members keep providing assistance to the community. The community can survive disasters because of these factors.” The communities could survive the disasters partly because they had effective disaster management human resources, which were the civil defense volunteers and disaster warning volunteers (Mister Warning). These enabled the communities to initially cope with disasters without assistance from the government agencies.

5.1.5 Capacity Building Measures and Approaches to Sustainable Flood and Drought Disaster Management

The patterns and methods of disaster management capacity building shown in Table 4.3 and the disaster management capacity presented in Table 4.4 could contribute to the sustainability of the communities in the following three dimensions.

5.1.5.1 Economic dimension: the villagers switched to doing other jobs during the disaster period when they could not do rice farming. They used their occupational development knowledge obtained from the local administrative organizations to perform additional jobs during floods such as weaving silk fabric and working at construction sites or factories. They could make a living without having to rely on agricultural work. Some of the villagers prepared herbal products such as turmeric and cassumunar ginger even before the flooding and sold them after the water reduced in order to make money for their family.

During droughts, the villagers changed to growing other plants that required less water, such as sun hemp. However, one of the community committee members stated the following: “Although we change to growing other plants, it generates less income than rice farming does.” In some communities the economic sustainability resulting from the disaster management capacity building was not clearly evident. One of the community committee members provided information as follows: “Flood problems have repeatedly occurred in this area. There is no change. We have no additional jobs.” This reflected that the villagers’ economic conditions and occupations mainly depended on rice farming or agriculture. Therefore, effective water management could enable the communities to have sufficient agricultural water and help the villagers earn money, which would consequently lead to economic sustainability.

5.1.5.2 Social dimension: the villagers were united and could harmoniously live together during the disaster period. They realized their role in reciprocating support for each other with generosity and were aware of their social responsibility. For example, the villagers helped move each other’s belongings and set a security team to monitor the community’s safety during floods.

5.1.5.3 Environmental dimension: the villagers were encouraged to keep their house clean, put garbage in black bags, dispose of the garbage at designated points, and not throw the garbage into the river. In order to preserve the trees, some of them were removed before the flooding and replanted after it. The villagers also cooperated in collecting garbage and weeds during the post-disaster period.

One of the community committee members defined the meaning of sustainability as follows: “It refers to an ability to normally make a living, picking vegetables, catching fish and selling them.” One of the community leaders also provided the definition of sustainability as follows: “It refers to knowledge distribution within the community that can be adapted in terms of procedures. It makes the villagers feel less worried and have better mental state.” Thus, the most important element of sustainability was the ability to adapt to emergency or disaster situations. In addition, in order to achieve sustainable flood and drought management, the communities should comply with the capacity building approaches shown in Table 4.5. The details are as follows.

The villagers should prepare for disasters, recognize the importance of self-reliance, and focus on helping themselves as much as possible without relying on government agencies, which might be unable to provide assistance in time. One of the community committee members provided more information as follows: “In order to achieve sustainability the villagers must rely on themselves and take care of each other. The responsibility of each committee member should be clearly and systematically defined.” The villagers should ask for assistance from the government agencies only when they cannot solve the problems on their own. One of the community leaders provided the following suggestion: “The community should coordinate with and ask for helps from various organizations at the same time in order to receive assistance in a timely manner.” Moreover, being prepared for living with disasters could also contributed to sustainability. One of the community committee members provided further information as follows: “Sustainability can result from the community’s familiarity with floods and droughts. The villagers encourage each other

in disaster management, which leads to reciprocal helping and more effective disaster monitoring. The villagers can live harmoniously with nature."

Community committee meetings are also important for sustainable disaster management and should be held on a regular basis. Knowledge concerning the impact of disasters and the contextual background of each community should be transferred to the next generation. A disaster management plan and disaster response procedure should be determined and rehearsed every year in order to reduce disaster losses. The villagers should depend on each other and volunteer to help each other. All of these could contribute to sustainable disaster management. Based on these findings, it can be concluded that the sustainability of disaster management mainly depends on the capacity of each community. The communities had to focus on self-reliance, be aware of disaster hazards, prepare for disasters, create a strategic disaster management plan, and transfer disaster-related knowledge to youth, which were considered an essential key to sustainable disaster management.

In addition, the villagers placed importance on the sustainable construction of disaster management facilities such as the Kaem Ling, irrigation system, floodgates, and a community water supply system. One of the community leaders stated his opinion as follows: "The important thing is how to store water for use in the dry season." This was consistent with another community leader, who provided his opinion as follows: "In order to obtain sustainable disaster management, we need to build water reservoir and draining channel that can solve water shortages and supply enough water for agriculture. The community water supply system must not be damaged. Tap water should be accessible to everyone." The communities tried to dredge the canals in their areas but it was not quite successful. After dredging, the canals could not store water as effectively as expected. The construction of those disaster management facilities required a huge budget, and therefore the government agencies should allocate additional money to the communities at risk of floods and droughts. One of the community committee members provided insightful information as follows: "The budget should be directly provided to the Sub-District Administrative Organization without waiting for approval

from the provincial office because this organization understands the problems occurring in the community. The villagers should be allowed to discuss their needs concerning flood prevention and solution." This also enabled the local administrative organizations to play a greater role in supporting disaster management. Further, the villagers tried to deal with disasters by using sustainable approaches such as raising their houses to prevent flood damage and tying small boats together like a raft to evacuate more people and belongings. These findings indicated that the governmental sectors still played a key role in disaster management. They provided the communities with a disaster management budget, and equipment and training, which helped strengthen the communities' ability to cope with disasters. However, in parallel with receiving support from the governmental sector, the communities should raise awareness on disaster preparedness and responses among the villagers in order to truly achieve sustainable disaster management.

On the other hand, some communities argued that there was no sustainable approach to disaster management; they thought that flooding would definitely occur every year anyway and that there was no specific way to stop it. One of the community committee members shared his opinions as follows: "There is no specific method or pattern because the world and climate is naturally fluctuating. Education and training provision is essential but there should be enough resources for the villagers to apply the obtained knowledge. For example, when the villagers were trained about a new agricultural method, there should be enough water for them to practice using that method. Methods and patterns used should be in line with the community's situation."

From the above conclusions, the researcher divided the communities into 4 groups according to their strengths regarding disaster management as shown in Table 5.1.

Table 5.1 Strengths, Weaknesses, and Sustainable Approaches to Disaster Management Capacity Building of Communities in Lower Northeastern Provinces

Strengths	Weaknesses	Sustainable Approaches
Group 1 included the Tha Bong Mang, Saad and KhuSawang communities, which had higher and more outstanding flood management capacity and plenty of disaster management resources. They had a community disaster prevention and mitigation committee and also built collaboration/networks with other organizations. **Group 2** consisted of the KhokKlang, Kra Tam, and SaenKhun communities, which had outstanding flood management capacity. They had strong community leaders and community committees focusing on disaster management.	Most communities had similar weakness, which were the shortage of a flood management budget and resources such as motorboats, toilets, drinking water, survival bags, temporary shelters, and disaster warning sirens. In terms of drought management, the weaknesseswere inadequate water storage places and the ineffectiveness of water storage.	**1. Structural measures:** building irrigation systems and water storage sites (Kaem Ling), raising houses and building floodgates **2. Non-structural measures:** cooperating in disaster monitoring, focusing on self-reliance, clearly assigning responsibility of each committee member, rehearsing disaster response plans, and transferring knowledge to the next generation

Table 5.1 (Continued)

Strengths	Weaknesses	Sustainable Approaches
Group 3 comprised the Prasuk, Khok Krachai Nuea, and Pa Wei communities. Their villagers were familiar with disaster problems and could adapt themselves to disaster situations by focusing on self-reliance. **Group 4** included the Yang Kao community, which focused on coordinating with other organizations. Group 3 and Group 4 had similar disaster management capacities. They were small communities with limited disaster management resources. In addition to relying on themselves, they needed to ask for help from other organizations. Therefore, their flood and drought management capacity was not clearly presented.		**3. No specific approaches**: disaster management should be adjusted according to actual situations.

Table 5.1 suggests that the 10 target communities of this research could be divided into the following 4 groups based on their strengths in disaster management.

1) Group 1 was the communities that had a community disaster management committee, built collaboration or networks with other organizations, and had a lot of disaster management resources. The Saad community in Nakhon Ratchasima Province and the Tha Bong Mangand Khu Sawang communities in Ubon Ratchathani Province were categorized in this group.

2) Group 2 was the communities with strong community leaders and community committees. Their community leaders particularly placed great importance on disaster management and used their leadership skills to give orders and assign tasks to the community committee and the villagers during the disaster period. The Khok Klang community in Buriram Province and the Kra Tam and Saen Khun communities in Sisaket Province were included in this group.

3) Group 3 was the communities with the ability to adapt themselves during the disaster period. They focused on a self-help approach. The villagers were familiar with disaster problems for a long time. The Prasuk community in Nakhon Ratchasima Province, the KhokKrachai Nuea in Buriram Province, and the Pa Wei community in Surin Province were in this group.

4) Group 4 was the communities that focused on coordinating with other organizations in order to ask for help during the disaster period. The Yang Kao community in Surin Province was categorized in this group.

According to the synthesis results, it was found that almost all communities, excluding the communities in Group 1, had a similar weakness, which was the shortage of a disaster management budget and resources, including motorboats, toilets, survival bags, temporary shelters, and disaster warning sirens. The communities in Group 1 had more resources than Groups 2, 3, and 4. A motorboat was an essential resource during floods because the villagers needed to use it as the main vehicle. The villagers had boats but they were small and could not evacuate many people or belongings. Therefore, the motorboat was very important for flood

management capacity building in terms of structural measures, which included the allocation of resources, equipment, and budget needed for disaster management. As for the drought management, the weaknesses were inadequate water storage places and the ineffectiveness of water storage, which resulted from a lack of budget for construction. Both the communities and the Local Administrative Organizations had an insufficient budget to construct a large reservoir. They could only dredge small canals and develop a community water supply system.

After analyzing all of the weaknesses, the researcher found that the communities required structural measures, including the provision of equipment and facilities that could prevent and mitigate the impacts of disasters, such as motorboats, toilets, sirens, and water storage facilities, to solve the disaster problems. However, the structural measures such as building the irrigation systems and water storage places (Kaem Ling), raising houses and building floodgates should be implemented together with the non-structural measures, such as helping and taking care of each other, focusing on self-reliance, assigning the responsibility of each committee member, rehearsing disaster response plans, and transferring knowledge to the next generation in order to truly achieve sustainable disaster management. However, some communities thought that there was no specific measure or method for dealing with disasters and that disaster management should be adjusted according to situational contexts.

Moreover, the disaster management capacity of the communities in the same province was compared and analyzed. The details are as follows.

The communities in Nakhon Ratchasima Province were Saad and Prasuk, and these two communities were strongly affected by floods and droughts. The villagers had to adapt themselves to disaster situations and focus on self-reliance. The Saad community seemed to develop better capacity because it could establish a disaster management committee and a disaster prevention center at the community level, which made the community stronger in terms of disaster management.

The communities in Buriram Province were Khok Klang and Khok Krachai Nuea. The Khok Klang community was more affected by floods while the

Khok Krachai Nuea experienced both floods and droughts. However, these two communities had similar disaster management capacity; they had strong community leaders and community committees. The villagers were familiar with floods and droughts so they had no problem coping with disasters.

The communities in Surin Province were Pa Wei and Yang Kao. These two communities were severely affected by floods. They had a small population and limited disaster management resources. Therefore, they both focused on self-reliance and asking for help from other organizations.

The communities in Sisaket Province were Saen Khun and Kra Tam. These two communities suffered from both floods and droughts. They also had similar disaster management capacity. Both of them had strong community leaders and a community committee, who took good care of the well-being of the villagers, especially in terms of disaster prevention and mitigation. Their community leaders had leadership skills and the ability to cope with disaster crises.

The communities in Ubon Ratchathani Province were Tha Bong Mang and Khu Sawang. These two communities suffered more from floods than droughts. Their locations were close to the Mun River so they were prone to flooding every year. These two communities had similar disaster management capacity. Their villagers were aware of the importance of disaster management. With plenty of disaster management resources, they were ready to deal with disasters and could create a community disaster prevention committee and develop a disaster response plan at the community level.

Based on the comparison and analysis results, it was found that the communities in the same area or province tended to have similar disaster management capacities because their geographical environment, the disaster problems, and the need for solutions were not different. In addition, their disaster management knowledge and resources came from the same source, which was the Provincial Office of Disaster Prevention and Mitigation. The Local Administrative Organization responsible for each community also similarly implemented disaster management based on standard patterns and procedures, which were prescribed by law. Thus, the factors that could

determine the differences in disaster management capacity of each community were the strengths of each community, leadership, resource management, and the villagers' ability to cope with disasters.

The researcher could conclude that the disaster management capacity mainly depended on the strengths of each community, which included a strong community leader, a community committee, and the villagers. Especially, the community leader should have leadership skills in order to help the community during disaster crises, make the villagers aware of the importance of disaster impacts and damage, and encourage the villagers to be more active in disaster preparedness during the pre-disaster period, which could minimize disaster damage during the disaster and post-disaster periods. The government agencies involved with the communities were the local administrative organizations and the Provincial Offices of Disaster Prevention and Mitigation. They had the role of supporting and assisting the communities in building and enhancing their disaster management capacity through the provision of disaster management training and the allocation of a disaster management budget and resources, which could strengthen disaster management readiness.

5.2 Discussion

This section of the dissertation discusses the study results according to the objectives of the present research. The details are as follows.

5.2.1 Patterns and Methods of Flood and Drought Disaster Management Capacity Building Used in the Lower Northeastern Communities

The most prominent disaster management capacity building method used in the 10 communities was providing knowledge through the community-based disaster risk management (CBDRM) program, which was considered capacity building at the individual level. This is consistent with the Capacity for Disaster Reduction Initiative (CADRi, 2012) carried out a research entitled "Basis of Capacity Development for

Disaster Risk Reduction" and which found that the capacity of each individual can be built through formal education, training, learning by doing, hands-on learning, lessons learning, and coaching and advising. It is also in line with the "Good Practices in Community-Based Disaster Risk Management," a study conducted by the UNDP (2002). The study suggested that building the community capacity through community-based disaster preparedness such as providing the villagers with training programs on disaster rescue, first aid, and psychological support for self-reliance can be considered the most appropriate pattern.

Providing education and training through the CBDRM program enabled the villagers to gain more knowledge of disaster management, understand disaster risks, and prepare for disasters, and also helped to reduce the damage from disasters and make the community stronger. This is consistent with White and Rorick (n.d.), who conducted a study entitled "Cost-Benefit Analysis for Community-Based Disaster Risk Reduction in Kailali, Nepal" and which found that training and capacity building activities make the community have a stronger ability to manage and prepare for floods. This is also in line with Jahangiri et al. (2011), who carried out a study entitled "A Comparative Study on Community-Based Disaster Management in Selected Countries and Designing a Model for Iran." They suggested that the community-based disaster management approach is expected to strengthen the community's ability in terms of disaster preparedness, disaster impact reduction, and disaster situation assessment based on initial experiences. Moreover, this is similar to the ideas of Luna (2007), who conducted a research entitled "Mainstreaming Community-Based Disaster Risk Management in Local Development Planning," where it was found that, through long-term change and short-term improvement, the CBDRM concept is expected to reduce disaster vulnerability, minimize loss of life, property, resources, and environment caused by disaster hazards, empower individuals and community organizations, and enhance the quality of people's lives.

Considering disaster management capacity building at the organizational level, it was associated with resource management, building networks or collaboration with external organizations, and the role of community leaders and community committees.

It is quite similar with the concept of Adedeji et al. (2012), who carried out a research entitled “Building Capabilities for Flood Disaster and Hazard Preparedness and Risk Reduction in Nigeria: Need for Spatial Planning and Land Management” and which revealed that capacity building at the organizational level refers to a process or method that has an effect on organizational performance, including resources, linkage of networks, partnerships and, leadership. This level of capacity building tends to focus on overall organizational performance and management.

Having sufficient disaster prevention resources such as boats, life jackets, and tents could improve the community’s capacity regarding disaster prevention and mitigation. However, most of the communities in this research were found to have limited disaster management resources. This phenomenon seems to be consistent with Rajeev (2014), who conducted a research entitled “Sustainability and Community Empowerment in Disaster Management” and which suggested that the communities in developing and underdeveloped countries had limited resources to deal with disasters—disaster victims were mostly poor people living in the communities with a lack of resources, infrastructure, and access to social services.

However, the communities in the present research could cope with disasters by using the existing resources and asking for additional support from other organizations. The resource management of these communities is in line with a study entitled “Governance and Capacity Building of Handling the Flood Issues in Bojonegoro Municipality, Indonesia” by Ulum and Chaijaroenwatana (2011). The research results indicated that the factors enhancing flood disaster management include resource mobilization and allocation and resource planning, which determine the use of resources such as manpower, materials and equipment. This is consistent with Hori and Shaw (2014, pp. 101-120), who carried out a study entitled “Elements for Sustainable Community-Based Disaster Risk Management” and in which it was found that the impact of disasters can be minimized if local communities and governments have sufficient CBDRM equipment, including radio communication equipment and storm detectors for farmers. The CBDRM equipment is a key to

creating a sense of community ownership and building sustainable community-based disaster risk management.

Building networks and collaboration with external organizations such as the neighboring communities, the local administrative organizations, and the Provincial Offices of Disaster Prevention and Mitigation could lead to knowledge transference, experience sharing, and field trip learning. The communities could apply and transfer the disaster management knowledge to their villagers. This is in line with a research entitled "Government-Communities Collaboration in Disaster Management Activity: Investigation in the Current Flood Disaster Management Policy in Thailand," which was conducted by Raungratanaamporn, Pakdeeburee, Kamiko and Denpaiboon (2014). The research results suggested that promoting close relationships between the communities and the local administrative organizations can affect disaster response effectiveness. This is also consistent with Jensantikul and Suttawet (2014), who carried out a study called the "Factors Affecting the Efficiency and Effectiveness of Policy Formation and Management according to Public Policies and the Appropriate Management Model in Response to Disaster: Case Study on Floods in Thailand during 1942-2012" and in which it was found that in Thailand there should be capacity and knowledge development and exchange of experiences among policy-makers, those that follow the policies, stakeholders, and other communities in order to inform them of the faults, weaknesses, and strengths of the procedures concerning water management.

The role of the community leader and community committee can enhance the community's capacity at the organizational level because they are the key drivers of community management and development. If the community leader and community committee take account of disaster prevention and preparedness, the damage from disasters can be reduced. Based on the results of this research, the community leader and community committee played a key role in coordinating with external organizations in order to ask for disaster management support and sponsorship and helping the villagers during the disaster period, which reflected their responsibility and commitment to saving the villagers from disaster crises. This is consistent with

Wongpreedee and Sudhipongpracha (2014), who conducted a research entitled "Disaster Management that Works: Flood Management Strategy and Implementation in Nakorn Pakkred Municipality" and which suggested that the leadership, decision-making skills, flood situation knowledge, and sense of responsibility of the Mayor of Nakorn Pakkred greatly contributed to the effectiveness of the Nakorn Pakkred municipality's emergency operation center. Moreover, these ideas are similar to those in a study entitled "Capacity Building for Flood Management in Developing Countries under Climate Change," which was conducted by Katsuhama (2010). The research results indicated that leadership and decision-making capacity are necessary under increased flood risk situations.

The disaster management capacity building at the systemic or institutional level focuses on the conditions or circumstances that enable the communities to manage or develop their disaster management capacity such as policies, laws, and plans. The results of this research suggested that there were some communities that created a local disaster prevention plan on their own, which made the villagers more involved in disaster management and prepared for disasters in a more effective way. This phenomenon is in line with a study called "Disaster Risk Reduction, Governance and Development" of the UNISDR (2004). The results suggested that community engagement and ownership building, decision-making in the project planning process and implementation are the success factors of disaster risk reduction. Due to the local disaster prevention plan, the villagers were assigned to join the community committee and to take care of disaster management tasks such as disaster monitoring and warning, and evacuation and disaster relief, which resulted in systematic disaster management during the pre-disaster, disaster, and post-disaster periods.

Another condition that helped to strengthen the disaster management capacity of each community was the CBDRM program, which was carried out by the Provincial Offices of Disaster Prevention and Mitigation. It encouraged and drove the villagers to participate in disaster management, develop a local disaster prevention plan, and obtain higher disaster management capacity. This is in line with Newport and Jawahar (2003), who conducted a research entitled "Community Participation and

Public Awareness in about Disaster Mitigation" and who found that vulnerable communities should take part in the disaster impact reduction process in order to enhance their capacity regarding disaster response. This is also consistent with Jahangiri et al. (2011), who conducted a study entitled "A Comparative Study on Community-Based Disaster Management in Selected Countries and Designing a Model for Iran" and suggested that disaster-prone communities should be empowered with appropriate training, access to necessary information, and participation in various disaster management cycles.

From the above information, it can be said that if there is capacity building at the systemic or institutional level such as having policies, laws, and plans essential for disaster management, it will consequently impact the disaster management capacity at individual and organizational levels. For example, the disaster management capacity of the villagers was strengthened through the CBDRM training program. The program made the villagers aware of the impact of disasters and better prepared for disasters. The disaster management capacity of the disaster-prone communities was enhanced through the allocation of a disaster management budget and resources provided by the government agencies. Therefore, it can be concluded that the capacity building at systemic or institutional level is the fundamental and necessary condition that can build and enhance individual and organizational capacity. All three levels of capacity can contribute to the sustainability of disaster management in the economic, social, and environmental dimensions.

5.2.2 Flood and Drought Disaster Management Capacity and Problems and Obstacles in the Lower Northeastern Communities

Once the patterns and methods of disaster management capacity building mentioned in the previous section are implemented, the community will have higher capacity. If the hazards, exposure, and vulnerability decrease, the community will have less disaster risk, which is consistent with the following disaster risk equation (Collins, 2009, as cited in Sitko, 2012; Zhang et al., 2006).

$$\text{Disaster risk} = \frac{\text{Hazard x Exposure x Vulnerability}}{\text{Capacity}}$$

Thus, in order to reduce the disaster risk, the disaster management capacity needs to be built and enhanced at individual, organizational, and systemic or institutional levels. The disaster exposure and vulnerability should be prevented by urging the villagers not to live in disaster-prone areas.

The disaster management capacity can be divided into three periods: pre-disaster, disaster, and post-disaster. During the pre-disaster period, only some communities prepared for disasters by establishing a community disaster response committee. In most communities, the community leader and the community committee were responsible for disaster management. All of these reflected the communities' capacity during the pre-disaster period. Some communities also created a local disaster response plan, which was indicative of disaster preparedness. In addition, the villagers were aware of their role in preparing for disasters. In case of flooding, they moved their belongings to higher places and evacuated to safe spots. The villagers prepared for droughts by storing water for use in the dry season and growing plants that required less water. These capacities are in line with Kreps et al. (2006), who conducted a research called "Facing Hazards and Disasters: Understanding Human Dimensions" and Kadel (2011), who carried out a study entitled "Community Participation in Disaster Preparedness Planning: A Comparative Study of Nepal and Japan." The results of these two studies suggested that the disaster preparedness process includes having disaster management plans and advanced planning for upcoming threats. They are also consistent with the suggestions of Khan (2008), who conducted a research entitled "Disaster Preparedness for Sustainable Development in Bangladesh." He suggested that knowledge, awareness, and effective frameworks are the most important components of the community preparedness for natural disasters.

During the disaster period, the communities were less damaged than before due to the disaster management capacity building, and the villagers cooperated with

and took care of each other in a more supportive way. The communities also built collaboration with external organizations such as the surrounding communities, the local administrative organizations, the Provincial Offices of Disaster Prevention and Mitigation, and the private sector in order to acquire disaster relief resources. This reflects the communities' disaster response capacity during the disaster period, which is consistent with the concept of Khan, Vasilescu, and Khan (2008), who carried out a study entitled "Disaster Management Cycle: A Theoretical Approach." They suggested that during the disaster period the disaster management process is associated with relieving the sufferings ofdisaster victims and responding to their needs. This is also in line with Raungratanaamporn et al. (2014), who studied "Government-Communities Collaboration in Disaster Management Activity: Investigation in the Current Flood Disaster Management Policy in Thailand" and found that the collaboration between the government and communities in disaster management can be considered a key point of professionalism in disaster management activities.

During the post-disaster period, the communities were in a state of recovering from disasters. The villagers relied on themselves first. In terms of flood disaster, the villagers moved back to their homes from the evacuated places, cleaned and fixed their houses, and carefully checked and used the electrical equipment. As for drought disaster, the villagers looked for ways to capture and store more water for use during the next dry season. This kind of recovery is in line with the concept of Coppola (2007), who was the author of "Introduction to International Disaster Management." He indicated that disaster recovery is the process of getting the disaster victims back to a normal situation after the disaster by restoring buildings and houses, providing disaster knowledge, and reviewing and improving community disaster prevention plans in order to give the people the ability to cope with future disasters. Khan et al. (2008) did a study called the "Disaster Management Cycle: A Theoretical Approach" and similarly suggested that disaster response activities are aimed to achieve the early recovery and rehabilitation of affected communities immediately after a disaster strikes. This is in line with the disaster recovery concept of Carter (1991), the author

of "Disaster Management: A Disaster Management's Handbook." He suggested that disaster recovery is a post-disaster process associated with restoration, rebuilding, rehabilitation, and disaster mental health treatment. Long-term recovery can lead to development and include reviewing disaster management plans, raising public awareness on disasters, and the integration of disaster management at local, provincial, and national levels. However, the communities in the present research did not review or improve their disaster prevention plans on a continuous basis so their activities were not consistent with Carter's concept (1991).

Although the communities had more disaster management capacity, they still had to deal with the major problems, which were shortages of resources such as motorboats, toilets, drinking water, and water storage facilities and lack of interest in disaster management on the part of politicians. This is in line with Lavell and Maskrey (2014), who studied the "Future of Disaster Risk Management" and found that the most discussed problems concerning disaster risk reduction were 1) lack of political will and 2) limited decentralization of power and (financial and technical) resources to local administrative organizations and communities. Most of the communities in the present research coped with the problems by relying on themselves as much as possible before receiving help from other organizations, such as moving their belongings to higher places or storing water in advance. This practice is consistent with the research findings of Jahangiri et al. (2011), who did a study entitled "A Comparative Study on Community-Based Disaster Management in Selected Countries and Designing a Model for Iran" where it was suggested that the community-based approach is expected to strengthen the community's capacity in disaster preparedness, disaster impact reduction, and disaster situation assessment based on initial experiences. The ideas in that article are also similar to the theory of Iglesias (2011), who did a study entitled "Community-Based Disaster Risk Management can lead to Good Urban Governance" and suggested that community-based disaster risk management helps to ensure that people in the community can handle and survive a disaster and respond to emergency situations before governmental or non-governmental assistance arrives.

The disaster management capacity had an effect on the sustainability of the communities in the economic, social, and environmental dimensions. As for the economic dimension, the villagers could earn money from additional jobs such as silk weaving and working at construction sites without having to rely on agriculture during floods. In the case of droughts, the villagers could grow other plants requiring less water. Although it generated less income than rice farming, at least it enabled the villagers to earn additional money during the disaster period. In the social dimension, the villagers relied on and supported each other, and lived together happily even during the disaster period. In the environmental dimension, the villagers cooperated in protecting and preserving the environment such as dumping waste at designated areas, not throwing waste into rivers, and collecting waste and planting new trees. This is consistent with the research findings of Grobicki et al. (2015), who carried out a research entitled "Integrated Policies and Pactices for Food and Drought Risk Management" and found that integrated water resource management is associated with three sustainable development issues: economic efficiency, social equity, and environmental sustainability. This is also in line with Harris (2000), who studied the "Basic Principles of Sustainable Development" and suggested that the three main aspects of sustainable development were "1) economic sustainability and the ability to produce goods and services on a continuing basis, to maintain manageable levels of government and external debt and to avoid extreme sectoral imbalances that damage agricultural or industrial production: 2) social sustainability and the ability to achieve distributional equity and adequate provision of social services, including health and education, gender equity, and political accountability and participation; and 3) environmental sustainability and the ability to maintain a stable resource base, biodiversity, and atmospheric stability and to avoid over-exploitation of resources. "

However, the integrated water resources management approach could not be successfully implemented in Thailand because the river basin management still mainly relies on governmental mechanisms rather than community participation. Most of the basin committee members were also representatives from government sector organizations. Moreover, there were many water-related governmental agencies in

Thailand so it was difficult to integrate water management both in terms of authority and responsibility. Thus, ordinary people should be allowed to join the basin committee in order to strengthen its operations. The water users or communities in the basin area should be educated and trained in how to develop a clearer procedure for water resource and disaster management.

5.2.3 Capacity Building Measures for the Sustainable Flood and Drought Disaster Management of the Lower Northeastern Communities

The capacity building measures that could mitigate the impact of disasters and enhance the disaster preparedness consisted of the following.

5.2.3.1 Structural measures, which included the construction of Kaem Ling, irrigation systems, floodgates, and community water supply systems and raising houses or constructing two-storey houses. Among these measures, building Kaem Ling can prevent both floods and droughts. This is because it can capture and store water during the rainy season for use in the dry season, which is considered the integration of water resource management. However, building Kaem Ling as well as other structural measures requires a lot of money for construction, and the communities still need to rely on the budget and resources from the government agencies. What the villagers could do with their own money is to raise their houses or build two-storey houses to prevent flood damage. These measures are consistent with the disaster management concept of Vitoria (2001), who carried out a study on “Community Based Approaches to Disaster Mitigation” and found that physical measures such as building bridges, dams and weirs can mitigate and limit the adverse impact of disasters.

5.2.3.2 Non-structural measures, which consisted of raising self-reliance awareness, transferring knowledge to the next generation, creating a local disaster response plan, and looking out for each other. These measures were being extensively discussed because they were considered community-based disaster management practices aiming to make the communities more self-reliant and disaster resilient. This is in line with the research findings of Bradford et al. (2012), who

carried out a study entitled “Risk Perception – Issues for Flood Management in Europe” and found that the current flood and drought risk management approach tend to focus on non-structural measures such as improved land-use planning, relocation, and flood forecasting and warning. This is similar to the research entitled “Structural and Non-Structural Measures for Flood Risk Mitigation in the Bâsca River Catchment (Romania),” which was conducted by Minea and Zaharia (2011). The research results there indicated that the non-structural measures such as legislation, catchment management, land and urban administrative planning, education, insurance and forecasting, and hydrologic warning are elements that make the structural measures more complete and contribute to reduced loss of life and less economic damage. This is also in line with Vitoria (2001), who carried out a research entitled “Community-Based Approaches to Disaster Mitigation” and found that non-structural measures such as community risk assessment, community risk reduction planning, public awareness building, and providing advocacy on disasters and development issues are considered disaster risk prevention and mitigation practices that can lead to sustainable disaster management planning. Similarly, Shaw (2009) conducted a research entitled “Earthquake Risk Management: Problems and Prospects” and found that the key to sustainable disaster management is focusing on disaster prevention and mitigation before disasters occur, providing appropriate knowledge, and training and building awareness.

5.3 Recommendations

Recommendations are made and proposed based on the conclusions and the discussion of the findings in the previous sections. The details are as follows.

5.3.1 Operational Recommendations

The operational recommendations for the key disaster management stakeholders are listed below.

5.3.1.1 Communities

1) Communities should create a specific disaster prevention plan on a yearly basis and regularly review and rehearse the plan. Moreover, the communities should be the initiator of the disaster prevention plan and may ask for recommendations from the Local Administrative Organizations and Provincial Offices of Disaster Prevention and Mitigation. Having a disaster prevention plan will make the community disaster management more systematic. The disaster management tasks will be clearly divided and assigned to each group of committee such as disaster monitoring and warning, search and rescue, and disaster relief. All of these will contribute to comprehensive disaster management during the pre-disaster, disaster, and post-disaster periods.

2) Communities should build more networks and collaboration with other communities in the same or different sub-districts and with the government agencies such as local administrative organizations, Provincial Offices of Disaster Prevention and Mitigation, and educational institutions and private agencies. Collaborative networks and collaboration should be practically built, such as signing a memorandum of understanding on disaster management, establishing a disaster fund, and building disaster management networks at sub-basin and provincial levels in order to enhance mutual support during the disaster period, make the communities stronger, and reduce the shortage of resources. Once the communities build collaboration with other communities and government agencies, it will result in the exchange of resources, including budgets, materials, and equipment and knowledge, contributing to better disaster management capacity.

3) There should be a forum for exchanging disaster management opinions and experiences among the communities in order to transfer community-based disaster management skills and knowledge and to enhance the villagers' capacity to be a trainer in disaster management. This will help disseminate disaster management knowledge without having to rely solely on the assistance from government agencies.

The first recommendation should be implemented first so as to develop more systematic disaster management. Then the second and third recommendations can be simultaneously implemented in order to empower the communities in the aspects of knowledge and resources.

5.3.1.2 Local Administrative Organizations

1) There should be disaster management strategies that focus on community capacity building, such as initiating disaster management promotion programs, community and local disaster knowledge management, and a community-based disaster preparedness plan. These strategies are considered non-structural measures for enhancing disaster management capacity. Local Administrative Organizations should survey the needs of the villagers first in order to determine the strategies and operations that can truly serve their needs and concerns.

2) There should be more cooperation and networking with other Local Administrative Organizations such as the local administrative organizations that are also affected by disasters or located in neighboring areas. This will help promote an exchange of disaster management knowledge and resources because most Local Administrative Organizations seem to have limited resources for disaster management, including manpower, budgets, and equipment.

The first and second recommendations should be implemented at the same time in order for the Local Administrative Organizations to gain more knowledge and resources from external organizations and to use them to build the disaster management capacity of the communities.

5.3.1.3 Provincial Office of Disaster Prevention and Mitigation

1) There should be more follow-up and evaluation activities to assess the results of the CBDRM program in each community. A continuous knowledge review should be provided to the communities through various community-based disaster management projects or activities in order to make them aware of disaster prevention and preparedness. These activities are considered non-structural capacity building measures.

2) There should be strategic plans to allocate a disaster management budget and resources such as motorboats, life jackets, and survival bags to the Local Administrative Organizations and the communities in disaster-prone areas. The construction of water storage and flood prevention facilities such as weirs and floodgates should also be planed and prepared. All of these comprise structural capacity building measures, which can solve the problem of the limited disaster management budgets and resources that most communities are facing.

The first recommendation should be implemented first because it can directly strengthen the communities' disaster preparedness knowledge and skills, enabling them to effectively deal with disasters without having to solely rely on the government agencies' assistance. The implementation of the second recommendation requires a lot of money, takes a long time to complete, and involves many stakeholders such as politicians, Local Administrative Organizations, and governmental agencies and communities. As it is important to focus on the communities directly affected by the disaster, the first recommendation should be taken into account first.

5.3.2 Policy Recommendations

5.3.2.1 The problems and needs of each community should be studied before determining a policy to enhance the disaster management capacity at sub-district, district, and provincial levels. This is because each community has different problems and needs, and the policy set by the central government at national level may not be able to respond to local problems and needs. Therefore, the policymakers should determine the disaster management capacity building plans, projects, and activities that can serve the needs and solves the problems of the communities in each sub-district, district, and province. In addition, both structural and non-structural capacity building measures should be taken into account in order to ensure sustainable disaster management.

5.3.2.2 There should be a disaster management policy that can respond to local problems and provide comprehensive solutions to the communities. Floods

and droughts are water resource-related disasters that the policymakers should pay attention to when designing a disaster management policy. In order to achieve comprehensive disaster prevention and resolution, an integrated disaster management policy that can prevent floods and mitigate droughts at the same time should be determined, for example, constructing a reservoir to capture water during the rainy season and store water for use in the dry season. Moreover, there should be a policy that places importance on all processes of the disaster management cycle such as disaster prevention, mitigation, preparedness, and response and recovery. In addition, the disaster management policy should focus on the knowledge and abilities of all stakeholders, including the key stakeholders such as flood-affected people and communities, the government agencies providing assistance and acting as local authorities and policy followers, and politicians formulating policy. This is to ensure that the disaster management policy is carefully designed, fair, and practical. Furthermore, there should be fair policy for controlling the allocation of donations during the disaster period.

5.3.2.3 There should be established of community center in the time of flood and drought crucially required. This is to help solving the distribution of donated stuff which always faced in non-systematic in the past.

5.3.3 Suggestions for Further Research

5.3.3.1 Disaster management capacity building should be studied at broader levels such as capacity building at the basin or region level in order to promote knowledge sharing among disaster-affected communities.

5.3.3.2 A comparative study on disaster losses before and after the implementation of the capacity building activities, especially the CBDRM program, should be conducted in order to measure how effective the CBDRM is in reducing the quantitative losses resulting from disasters, such as the governmental budget, and community expenses and mortality rates. This comparative study should be carried out in the communities that have continually been affected and similarly

damaged by disasters every year so that the results of the CBDRM program can be clearly evaluated.

5.3.3.3 It would be beneficial to build on the findings of this research by studying the community-level strategic planning and sustainable capacity building measures that can contribute to the sustainability of community disaster management and ensure the good governance and transparency of disaster management.

5.3.3.4 The relationships among disaster risks, hazards, exposure, and vulnerability and community capacity should be studied in order to examine the impact of the community's capacity regarding disaster risks, hazards, exposure, and vulnerability.

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APPENDICES

Appendix A

Interview Form

The Capacity Building of the Community Regarding Flood and Drought Disaster Management in the Provinces of the Lower Northeastern Region of Thailand

Explanation

1. The purpose of this interview is 1) study the patterns and methods of community-level disaster management capacity building, 2) analyzes the capacity, problems, and obstacles, and 3) proposes approaches to the development of sustainable flood and drought management capacity building among local communities in Thailand's lower northeastern provinces

Informants are 1) community's leaders and committees, 2) executives and officers of Local Administrative Organization which respond to each community, and 3) executives and officers of the Provincial Office of Disaster Prevention and Mitigation of Nakhon Ratchasima Province, Buri Ram Province, Surin Province, Si Sa Ket Province, and Ubon Ratchathani Provinces.

2. Your answers are confidential and not effect to your position or authority. If you provide the true data and consistence with your opinion, it will get correct data and will be beneficial to natural disaster management. Your answer will be used for benefit to the only academic and research.

Thanks you very much

Eakarat Boonreang
Student of Doctoral of Public Administration
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National Institute of Development Administration

The interview questions and group discussion topics for selected communities

1. How does your community handle natural disasters before, during, and after their occurrence?

2. Has your community received or practiced any of the following disaster management capacity building methods?

- Training under the CBDRM program
- Resource management
- Roles of the community leader and community committee
- Building cooperation with external agencies
- Policies, laws, and plans

3. How has the disaster management capacity building as per No. 2 affected your community's disaster management capacity?

4. What are some of the disaster management-related problems or obstacles faced by your community?

5. How has community-level disaster management capacity building as per No. 3 affected your community's sustainability in terms of economic, social, and environmental aspects?

6. What are some of the recommended approaches for the development of sustainable disaster management capacity building at the community level?

The interview questions for the executives of the Provincial Offices of Disaster Prevention and Mitigation and Local Administrative Organizations

1. How were the flood and drought situations occurred during 2011 – 2016?

2. What are the flood and drought management processes before, during, and after a natural disaster occurrence?

3. How has disaster management capacity building based on the principle of community based disaster risk management (CBDRM) affected your community?

4. What are some of the recommended approaches for the development of sustainable disaster management capacity building at the community level?

Appendix B

The Lists of Informant and Interview Date

Community

1. Saad community, June 9, 2016
   - Mr. Suchad Nunkang, community's leader
   - Mr. Mleen Phedee and Mr. Samorn Khaharn, community's committees
2. Prasuk community, June 9, 2016
   - Mr. Prajob Sonnong, community's leader
   - Mr. Thaim Thongnuk and Mr. Panunt Utsakarn, community's committees
3. Khok Klang community, June 2, 2016
   - Ms. Chanisara Aonnuang, community's leader
   - Mr. Sangwaly Phithaksa and Mr. Phirom Sudtasay, community's committees
4. Khok Krachai Nuea community, June 1, 2016
   - Mr. Somchai Tamnudrum, community's leader
   - Mr. Seri Chaisunthorn and Mr. Paed Yunprakon, community's committees
5. Pa Wei community, April 28, 2016
   - Mr. Chom Boonsem, community's leader
   - Mrs. Chotikarn Silanon, Mr. Nawl Naknawl, and Mr. Somsak Boonserm, community's committees
6. Yang Kao community, May 16, 2016
   - Mr. Chareoan Phombut, community's leader
   - Mr. Saman Champathong and Mr. Ding Saothong, community's committees

7. Saen Khun community, May 3, 2016
   - Mr. Sitthipong Champapong, community's leader
   - Mr. Sombat Penggam, community's committees
8. Kra Tam Community, April 28, 2016
   - Mr. Sai Hanugul, community's leader
   - Mr. Samai Maneeboon and Mr. Sathien Jarunai, community's committees
9. Khu Sawang community, April 7, 2016
   - Mr. Santi Supol, community's leader
   - Mr. Sangkom Phansatit and Mr. Saennapha Dephokang, community's committees
10. Tha Bong Mang community, April 21, 2016
   - Mr. Montri Prompanich, community's leader
   - Mr. Saengkhun Khadthawe, Mrs. Kosiy Sekhamthae, Mrs. Kuhlab Thongchai, Mrs. Thongchan Khruthchaphan, Mr. Suraphon Jankagit, Mrs. Chanthana Sritasarn, and Mr. Wittaya Thongchai, community's committees

Local Administrative Organization (LAO)

1. Dong Yai Sub-district Administrative Organization (SAO), Dong Yai Sub-district, Phimai District, Nakhon Ratchasima Province, March 10, 2016
   - Mr. Prayun Laowattana, Chief Administrator of the SAO
   - Mrs. Srathorn Laowattana, Chief of the Office of the SAO
   - Mr. Uthai Madphimai, Plan and Policy Analyst Assistant
2. Prasuk Sub-district Administrative Organization, Prasuk Sub-district, Chum Phuang District, Nakhon Ratchasima Province, March 10, 2016
   - Mr. Terapol Plengsanthei, Disaster Prevention and Relief Officer
   - Ms. Kanitta Kaosook, Plan and Policy Analyst
3. Khok Klang Sub-district Administrative Organization, Khok Klang Sub-district, Lam Plai Mat District, Buri Ram Province, February 25, 2016
   - Sergeant major Chaiya Eiydchabok, Clerical Officer

4. Sai Taku Sub-district Administrative Organization, Sai Taku Sub-district, Ban Kruad District, Buri Ram Province, June 1, 2016
   - Mr. Thongliam Suphakam, Deputy Chief Executive of the SAO
   - Mr. Teim Kriprakhon, Chairman of the SAO Council
   - Mr. Ophas Phengprakhon, Legal Officer
5. Koh Kaew Sub-district Administrative Organization, Koh Kaew Sub-district, Samrong Thab District, Surin Province, February 10, 2016
   - Mr. Prachob Nhonyai, Chief Executive of the SAO
   - Mr. Peraphong Dangboonleid, Chief Administrator of the SAO
   - Mr. Kongkiet Jainuan, Disaster Prevention and Relief Officer
   - Mr. Prasit Janthor, Disaster Prevention and Relief Officer Assistant
6. Ba Sub-district Administrative Organization, Ba Sub-district, Tha Toom district, Surin Province, February 24, 2016
   - Mr. Sutin Lukasorn, Chief Executive of the SAO
   - Mr. Idsraphong Wongchalad, Chief Administrator of the SAO
   - Mr. Nuntawewat Soichit, Disaster Prevention and Relief Officer
7. Khok Chan Sub-district Municipality, Khok Chan Sub-district, Uthumphon Phisai District, Si Sa Ket Province, January 28, 2016
   - Mr. Suwat Wannamard, General Administration Officer
8. Kha Yung Sub-district Administrative Organization, Kha Yung Sub-district, Uthumphon Phisai District, Si Sa Ket Province, February 9, 2016
   - Mr. Chokpipat Suwannapant, Clerical Officer Assistant
9. Nong Kin Plane Sub-district Administrative Organization, Nong Kin Plane Sub-district, Warinchamrab District, Ubon Ratchathani Province, February 23, 2016
   - Mr. Utid Praditsin, Chief Executive of the SAO
   - Miss Euechit Chumpasa, Chief of the Office of the SAO
10. Warinchamrab Town Municipality, Warinchamrab District, Ubon Ratchathani Province, March 22, 2016
    - Mr. Chitchai Tungwongchai, Chief of the Subdivision of Disaster Prevention and Relief

Provincial Office of the Disaster Prevention and Mitigation

1. Nakhon Ratchasima Province, November 18, 2015
   - Mr. Rocchanun Kulinchiraroch, Chief Electrician Specialist
2. Buri Ram Province, January 29, 2016
   - Mr. Peera Praseidphong, Chief Mechanical Senior
3. Surin Province, January 15, 2016
   - Mrs. Panadda Puchareongsilp, Executive of Office of the Disaster Prevention and Mitigation Province
4. Si Sa Ket Province, January 13, 2016
   - Miss Tippawan Panyakom, General Service Officer and Chief of the Subdivision of Disaster Prevention and Operation
   - Mr. Thongsak Sathapananun, Plan and Policy Analyst
5. Ubon Ratchathani Province, February 3, 2016
   - Mr. Adisorn Boonmak, Mechanical Engineer

Appendix C

Figure of Collection Data and the Communities' Previous Disaster Management


แผนที่


ศูนย์อาสาจัดการภัยพิบัติโดยชุมชน คูสว่าง
เครือข่ายชุมชนเพื่อการปฏิรูปสังคมและการเมือง
"สู้ภัย ด้วยใจ ชุมชน"


แผนที่แสดงพื้นที่เสี่ยงภัยของบ้านคูสว่าง หมู่ที่ 7
แผนที่แสดงตำแหน่งที่ตั้งบ้านเรือน พื้นที่เสี่ยงภัย พื้นที่ปลอดภัย และเส้นทางอพยพ


ศูนย์เตรียมพร้อมป้องกันภัยประจำชุมชน
ชุมชน ท่าบ้งมั่ง
ตำบล วารินชำราบ อำเภอ วารินชำราบ
จังหวัดอุบลราชธานี
กรมป้องกันและบรรเทาสาธารณภัย กระทรวงมหาดไทย





กรบริหารส่วนตำบลดงใหญ่


ห้ามข้าม
น้ำท่วมทาง
ห้ามผ่าน

BIOGRAPHY

NAME	Eakarat Boonreang
ACADEMIC BACKGROUND	Bachelor's Degree with a major in Politics from Kasetsart University, Bangkok, Thailand in 1999 Master's Degree with a major in Public Administration from National Institution of Development Administration (NIDA), Bangkok, Thailand in 2003
PRESENT POSITION	Lecturer, Faculty of Political Science, Ubon Ratchathani University, Ubon Ratchathani Province, Thailand
EXPERIENCE	Received a scholarship from "Office of the Higher Education Commission" project in 2012 for enrolling in the doctoral level program at the School of Public Administration, National Institute of Development Administration (NIDA), Bangkok, Thailand