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A Model of Community Disaster Risk Management Based Environmental Education in the Special Economic Development Zone, "Tak" Province

Rataya Saraporn[1], Wee Rawang[2], Shutima Saeng-ngern[3], Patranit Srijuntrapun[4]

Abstract

The purpose of this research was to design a model of community disaster risk management based environmental education in the special economic development zone, "Tak" province, Thailand. A mixed method of quantitative and qualitative research was employed, and data were collected through a questionnaire distributed to 383 villagers, interviews with 28 local experts: representatives of local authority, private and civil society sectors, and small group discussions with 35 local leaders. The research findings revealed that flooding and agricultural damage were the main community disasters because the community topography was mostly basin and foothill plains. However, the villagers commonly presented moderate levels on disaster risk management learning, disaster risk management and disaster risk management participation. This was why they faced low efficiency on preparation for disaster risk management as most villagers confirmed that their community problems were lack of knowledge, understanding and local plan for disaster risk management. Based on these results, the model of community disaster risk management based environmental education in the special economic development zone, "Tak" province comprising 3 stages and 7 factors was designed. STAGE (1) Pre – disaster, included four factors: Factor (1) Analyzing the community situation; Factor (2) Identifying the community disaster; Factor (3) Assessing the community capacity; and Factor (4) Selecting the approaches of disaster risk management. STAGE (2) During – disaster, included a factor: Factor (5) Collaborating the internal and external community, and STAGE (3) Post – disaster, included two factors: Factor (6) Building the community networks; and Factor (7) Developing the community capacity. Moreover, the designed model presented the high efficiency ($\bar{x}$ = 7.84) and positively affected community learning for pre-during-post disaster preparation in the community.

Keywords: *Environmental education, disaster risk management, special economic development zone, "Tak" province.*

1. Introduction

The World Bank (2011) analyzed the disasters impact on the economy; experiencing severe disaster can damage the country's economy and affects the growth trend of Gross Domestic Product (GDP), including a significant loss of economic opportunities. In the year 2019, the disaster caused economic losses of $ 232 billion (Benfield, 2020).

[1] Faculty of Social Sciences and Humanities, Mahidol University, Thailand. Email: tunwasa@gmail.com
[2] Faculty of Social Sciences and Humanities, Mahidol University, Thailand. Email: wee.raw@mahidol.ac.th
[3] Faculty of Social Sciences and Humanities, Mahidol University, Thailand. Email: shutima.sae@mahidol.ac.th
[4] Faculty of Social Sciences and Humanities, Mahidol University, Thailand. Email: patranit.sri@mahidol.ac.th

Economists analyze the disasters impact on the economy, both short-term and long-term. In the short-term, it was found that the damaged companies also affect the business and partner industry, resulting in economic disruption. Experiencing with lower production and sales problems, also result to less per capita income. In the long-term, it is found that frequent disasters have more impact on economic growth than catastrophic disasters that made severely losses (Channuwong, 2018; Ho et al., 2008; UNESCO, 1977).

Thailand is one country, affected by the disaster as often as other countries. According to the Meteorological Department data, there are many types of disasters such as flood, storm, drought, fire, transportation and transportation, earthquake and tsunami. At present, the disaster has increased and not limited to the area, especially floods and droughts that are more severe, which affects the economy and the domestic production chain. Beside there is also a new type of disaster or a different type of disaster (Office of the National Economic and Social Development Board, 2015; Department of Disaster Prevention and Mitigation, 2016) together with the vulnerability and lack of ability to cope with various situations. These are causing a loss of life and property including damage to public utilities, economy and well-being of the people.

Based on the aforementioned reasons, the researchers are interested in studying the model of community disaster risk management based environmental education in the special economic development zone, ”Tak” province. In order to use the environmental education process as a guideline for building the learning process, understanding, awareness, and preparation risk management skills, and knowledge for the community. To solve the problem of disaster risk reduction and increase the potential for the community for preparing per-disaster, during disaster, and rehabilitation will provide effective post-disaster assistance in the future for the community to gain knowledge, understanding, and awareness about sustainable management of natural resources and the environment in their communities. The purposes of this research were: (1) to study the current situations of environment, disaster and disaster risk management; (2) to analyse the community learning on disaster risk management; (3) to synthesize the model of community disaster risk management based environmental education in the special economic development zone; and (4) to design a model of community disaster risk management based environmental education in the special economic development zone, “Tak” province, Thailand.

2. Theoretical Framework

Due to the large number of disasters appearing, many countries around the world are trying to find a way to mitigate the effects of disaster, hence many international conferences have been organized to discuss about disaster management. In 1994, a meeting was held on "The Century of International Disaster Reduction" in Yokohama Japan. Later, there was a meeting on "Disaster risk reduction" on January 18-22, 2005 (2005) in Kobe Hyogo Prefecture Japan. There were attendees from 168 countries around the world, has signed to guarantee the Hyogo Framework for Action 2005-2015 for a period of 10 years, by focusing on disaster risk reduction (UNISDR, 2007). Until year 2015, Hyogo's framework has expired. The 3rd UN Conference on Disaster Risk Reduction is held in Sendai, Japan, by establishing the Sendai Framework for Disaster Risk Reduction 2015-2030 or “the Sendai Framework” for a period of 15 years. There are 187 UN member countries certified by focusing on disaster risk management instead of disaster management, to prevent the risk of new disasters, and reduce the risk of existing disasters. The mission is defined in 4 areas, which are 1) understanding the risk of disaster 2) strengthening capacity in disaster risk management 3) investing in disaster risk reduction, in order to be ready to cope and recover in a quick and effective time. And 4) to develop the capacity to prepare for disaster response that is effective and to "Improving

Repair" during the restoration and rehabilitation period (UNISDR, 2015; Department of Disaster Prevention and Mitigation, 2016).

The past disaster management process in Thailand has focused on receiving and mitigating the effects of the disaster. Subsequently, proactive action has been taken to reduce various factors, which cause the risk of disaster (Department of Disaster Prevention and Mitigation, 2014) .By creating mechanisms to manage and reduce the risk of domestic disaster with the Disaster Prevention and Mitigation Act 2007 as the main mechanism for the country manage disasters (Department of Disaster Prevention and Mitigation, 2013) as well as the 2015 National Disaster Prevention and Mitigation Plan to be in accordance with the Sendai framework for disaster risk reduction. The disaster risk management strategy consists of 4 strategies, which are: 1st strategy, focusing on disaster risk reduction, 2nd Strategy: Integration of management in emergencies 3rd Strategy; Increase the efficiency of sustainable rehabilitation, and 4th Strategy: Promoting international cooperation in disaster risk management to use for setting guidelines disaster management at various levels, such as national, provincial, district, and local levels.

For the disaster management in the past, Thailand focuses on solving problems when facing the disaster and doing post-disaster assistance. However, there is still no serious preparation before the disaster from every sector (National Disaster Prevention and Mitigation Commission, 2015). The community's ability to respond the disaster risk management is the most important factor for preparedness in the facing disaster because those who have to deal with the disaster are communities, local government organizations and citizens. "Community" as a person who is directly affected by the disaster, must face a disaster that threatens life, lives and property, is a fate that society generally has a desire to help. Especially the humanitarian role of the government becomes an important role that people expect. At the same time, various aid organizations tend to play a more active role in situations that require urgent assistance. As a result, the role of the community may be neglected by the community, not only as a "victim" of the disaster but also as a "waiting person" for help from outside. Such a view makes the community even more unhealthy and unable to help themselves in the long term (Channuwong & Ruksat, 2022; Juengsathiensup, 2014).

At present, the government has established guidelines for economic development according to the National Economic and Social Development Plan No. 12 by focusing on creating a comprehensive economic growth, setting goals to increase economic activities, social and income opportunities for demographic groups, then develop potential border areas and new economic areas to support economic growth. (National Economic and Social Development Plan No. 12, 2017: 4-6, 16). And most importantly, to prepare for the opening of the ASEAN Economic Community in the border area connecting with neighboring countries in the ASEAN region, and to promote trade and investment as well as improve the quality of people's life (Ministry of Industry, 2017). The concept of area development is to establish a special economic zone in order to diversify development to various areas by using various economic activities as a guide in development, which brings investment and upgrade people's life quality in specific areas and nearby areas. By specifying the area into 2 stages, that is, Special Economic Development Zone Phase 1 as announced by the Thai FDA in 1/2015, consisting of "Tak", Sa Kaeo, Trat, Mukdahan and Songkhla province, and the Special Economic Development Zone Phase 2, according to the announcement of the Thai FDA in 2/2015, consisting of Chiang Rai, Nong Khai, Nakhon Phanom, Kanchanaburi and Narathiwat province, in total 10 areas (Office of the Board of Investment of Thailand, 2015).

3. Research Methodology

Mixed methods of quantitative and qualitative research were used in this study with the following details:

Population and Sampling

A mixed method of quantity and quality research was employed, and data were collected by a questionnaire from 383 villagers, interviews with 28 local experts: representatives of local authority, private and civil society sectors, and small group discussions with 35 local leaders.

Data Collection

1) Survey Research was used for collecting data about the situations of community, disasters and disaster risk management, awareness, attitude, knowledge, and risk management skills with participation and ability to evaluation or prediction on future disaster in the Special Economic Development Zone in "Tak" Province.

2) Research and Development was used for synthesizing the model of community disaster risk management based environmental education in the Special Economic Development Zone, "Tak" Province.

3) Quasi-Experimental Research (Q-ER) was used for evaluating the efficiency of the created EE innovation through an operational training on the concept of intention to act, that is to accept presently the innovation and doing actually in future.

4) Small Group Discussion is a group meeting of people, volunteer group and community leaders in the special economic development zone in "Tak" Province in order to process and filter the opinions of citizens and stakeholders regarding the environmental situation, disaster and disaster risk management factors and the model's components in the Special Economic Development Zone in "Tak" Province, including after the environmental education innovations' synthesis. In order to assess the possibility that will lead to the actual implementation of the innovation.

5) In-depth Interview is an interview with local experts about disaster situations and disaster risk management, including factors and elements of disaster risk management model based on environmental education at the community level in the special economic development zone in "Tak" province.

6) A research questionnaire was used to ask 383 villagers about the situations regarding community environment, the disaster situation in the community, communities in the special economic, and situations of disaster risk management.

4. Results and Discussion

In this section, the researchers presented the research findings as follows:

The informants in this research consisted of 3 groups which are (1) people in "Tak" Special Economic Development Zone, (2) local experts in "Tak" Special Economic Development Zone, and (3) community leaders. That is representing various groups in the area of Special Economic Development Zone in "Tak" province.

Environmental and Disaster situations and disaster risk management

For personal information of participants, it was found that most of them were female (62.40%), they had bachelor degree education (24.28%), marital status (59.01%), and 34.47% were farmers. Most of the family members are 4-6 people (60.54%). Most of them (83.03%) were able to look after themselves and 12.27% were not able to take care of themselves, 59.02% were members of the community and received information about disaster from television (52.48%), respectively.

For general community information, it was found that the community has established a career group for farmers in the amount of 50.13% and most of them are a group of farmers 47.78%. In addition, the community has a network of farmers for 58.49 percent. The important or outstanding products resulting from the wisdom of the community are processed food products 25.59%, and in the case of conflicts in the community, there are solutions by means of mediation by the elders in the community 33.16%, respectively. In addition, the grouping is mainly characteristic of the professional group as for the volunteer groups, there are village health volunteers, and the Kujeep Rescue Group regarding the disaster network, the Mae Sot disaster network.

For the situation regarding community environment, it was found that people do not own ownership, and with ownership not more than 10 "rai" (3.95 Acre) in each family, only the document of land use rights in agriculture which is the ALRO Land / Arable rights / NS.3 / NS. 3K, and land allocation project for arable land to the poor in the forest reserve area, including land allocation for agriculture and other uses. In terms of water resources, it is found that the people use water for consumption from the water supply and the tap water. And the water that is used in animal farming areas or in agriculture areas will use water from the community water sources such as rivers and canals (creek) and community reservoirs. As for the weather in the area, currently experiencing problems during the period from December to May, there will be 43.08% dust and 24.02% of the soot in the air that comes from burning to manage agricultural areas and burning forests to find products, including soot from neighboring countries.

For the disaster situation in the community, it was found that most of the disasters were 56.66% of flooding, followed by 50.65% of the windstorm or wind and 35.51% of the fire / haze respectively. In addition, communities in the special economic development zone are at risk with mudslides and wild water flooding. Most of the disaster occurred 10 times or more, which is drought and haze forest fire 10.44%. The cause of the disaster mostly natural disasters, which often causes damage in community areas such as houses, agricultural areas transportation 54.83 percent and the disaster affects houses and buildings. That is the property of the people and government buildings which is the basic structure that is still workable, but must be repaired to return to its original state.

For the situations of disaster risk management, it is found that total average of disaster risk management is at a moderate level ($\bar{x}$ = 2.26). In the implementation of disaster risk management, people think that disaster risk management is the most effective ($\bar{x}$ = 2.33), followed by disaster risk management after disaster ($\bar{x}$ = 2.25), and disaster risk management before disaster ($\bar{x}$ = 2.21). However, the operation during the disaster is very effective. It may be because a responsible department or officer arrives at the scene to help the victims in a timely manner, and able to provide basic assistance in four factors for disaster victims. In addition, disaster risk management before the disaster is the least effective. It maybe because the community is still lacking current information on the conditions of public areas and vulnerable areas in the community Including guidelines / community plans for disaster risk management and regular practice drills.

Analyzing the learning level about disaster risk management

The learning level about disaster risk management revealed that the sample group had a moderate level of learning about disaster risk management ($\bar{x}$ = 3.15). In particular, the 3 highest average scores are (1) the ability to evaluate risk management which the average scores are at a high level ($\bar{x}$ = 3.57), 2) the knowledge about disaster risk management , which the average scores are at a high level ($\bar{x}$ = 3.55) and 3) the awareness which the average scores are at a moderate level ($\bar{x}$ = 3.06)

Synthesizing a model of community disaster risk management based environmental education in the special economic development zone, "Tak" Province

In the synthesis of disaster risk management model; the researcher analyzed the data from the questionnaires, in-depth interviews and small group discussion together with the concept of risk management from all 3 phases, including before the disaster, during a disaster and after the disaster based on environmental education concepts and system theory which is a systematic work process that will assist the community in analyzing the environment both inside and outside the community to strengthen the preparation for future disasters.

The disaster management model based on environmental education consists of 3 phases, which consisting of 7 elements. Phase 1 before the disaster (Pre-disaster) consists of 4 components which are 1) community situation analysis 2) community disaster identification 3) Community capacity assessment, and elements 4) selection of disaster risk management procedures. Phase 2 during a disaster consists of 1 component which is 5) internal cooperation with outside the community. And phase 3 after a disaster consists of 2 components which are 6) Create a community network and 7) Community capacity development, in order to have a learning process in the community in preparing the disasters risk management that may occur in the future.

Evaluating the quality and efficiency of environmental education innovation

The researchers conducted the quality and efficiency evaluation on Environmental Education Innovation with the objective to examine the content and structural validity of the innovation, 1) Assessment of quality of environmental education innovation and 2) Assess the effectiveness of environmental education innovation with details as follows;

1) Quality evaluation of environmental education innovation is a study of content and structural consistency of disaster risk management model based on environmental education at the community level in the Special Economic Development Zone in “Tak” Province, with 3 experts have decided to accept the quality of environmental innovation study according to the Index of Congruence (IOC), it is found that when considering the said environmental education innovation, there is a quality that can be used for the purpose as the content consistency is 1.00 and the structure is 1.00.

2) Efficiency Evaluation on environmental education innovation; The objective is to study the feasibility of the operational model of disaster risk management based on environmental education at the community level in the special economic development zone in “Tak” province by bringing the innovation to use with the target group in the research area composed of people. The subjects were 30 volunteers and community leaders. The researcher carried out the Kirkpatrick concept. In this regard, the assessment of the efficiency of disaster risk management model at the community level in the Special Economic Development Zone in “Tak” Province, is found to be at a high level ($\bar{x}$ = 7.84). When ranked in order of efficiency, 1) is an environmental education innovation that promotes learning at a high level ($\bar{x}$ = 8.01), 2) is an educational environment innovation that benefits the public ($\bar{x}$ = 7.89), 3rd) is Environmental education innovations are living habits that are environmentally friendly ($\bar{x}$ = 7.81) and 4) are environmental education innovations that the target groups feel satisfied ($\bar{x}$ = 7.67). In this regard, the participants in the assessment of the efficiency of the environmental education innovation have participated in the disaster risk management program, which can link to learning, innovation, environmental education to disaster risk management and can benefit the public to the community of five projects.

Discussion

Studying the environmental situation, disaster situation and disaster risk management level in the special economic development zone in “Tak” Province

Perception of risk from disasters may realize through real experience in facing with disasters will result in communities being able to face disasters in the future. The communities are able to assess the severity of the risk through direct experience in

disaster response or being affected from the disaster, then will make the community aware of the dangers that will can be received and can be used to prepare for the next disaster. According to Lindell and Perry's research (2004), developing PADM can explain why people decide to take action in preventing the potential impact on their lives and property from disasters. This study is in accordance with the finding of Ho et al. (2008) who stated that people have the potential to recognize the environmental threats that will affect. They will decide to take short-term prevention or further adjustment in the long-term, depends on the disaster experience. People will not protect themselves if they don't believe that their lives are at risk, including the damage factors and the impact of the disaster, affecting people's perception of risk. Patton (1990), Chantawanit (2005) and Photisita (2006) said that various phenomena will help to recognize and stimulate the people's awareness. In addition, Koch (1995) and Miceli et at. (2008) found that experience plays an important role in people's risk perception because the previous disaster experience has caused the people to protect themselves in risk management if flooding again.

Analyzing the levels of learning about disaster risk management in the Special Economic Development Zone in "Tak" Province

In learning level, the researchers used the concept of environmental education as an educational framework for learning about disaster risk management in 6 areas: awareness, attitude, knowledge, skills, participation, and the ability to evaluate the environment are a guideline for measuring learning levels. From the study, it is found that the learning level about disaster risk management is at the medium level. And the skills in preparing for risk management by themselves were lower than those in other areas. As a result, the community lacks knowledge, understanding, and skills to prepare themselves to manage disaster risk systematically.

In preparation for disaster risk management, if people in the community have knowledge and understanding about disaster and how to manage disaster risk, they will be able to prepare for disaster response. The result of this study is relevant to a study of Rajeev (2014) who said that communities can cope with disasters based on available resources and use local wisdom to deal with floods, such as observing animal behavior and making basic self-help equipment, such as making lifeboats from gallons of water and car tires including resource allocation from external agencies. It will enable the community to pass through disasters each time. In addition, this is also consistent with the findings of Sirathanakul et al. (2023) and Tekhanmog et al. (2018) who found that knowledge of flood management systematically and sustainably by the community of Phu Kha Sub district Administrative Organization starts with getting ready to prepare by preparing information, preparing people, preparing the house, fighting and living with water, review the experience and set a new production season, establish a coordination center, shelter system, shelter the house and prepare for communication including a plan of action for systematic flood management. The result of this study is relevant to the concept of environmental education of The World Bank (2011), UNESCO (1978) and Meadows (1990) which stated that this process aimed at developing people, to gain knowledge about the environment for understanding, raising awareness of values to develop skills and attitudes, real intention and resulting in decisions, protecting and finding solutions to problems that are faced by oneself and in collaboration with others by using environmental education processes that are lifelong learning processes and the community-driven development. It is also consistent with the concept of Fritzen (2007) who stated that it has a great importance to governance in development management to stimulate learning and be responsible for the process of capacity building for long-term development.

Synthesizing the model of community disaster risk management based environmental education in the special economic development zone, "Tak" Province

The researcher used the framework of disaster risk management concept. The disaster risk management phase is divided into 3 phases, consisting of 7 components consisting of the pre-disaster phase, consisting of the components (1) environmental situation analysis, the elements (2) the identification of community disasters, the elements (3) the evaluation of potential and elements (4) choosing methods of disaster risk management. As for the distance during the disaster, the elements are (5) Internal cooperation with outside the community. And the post-disaster period, comprising: (6) Community network construction and elements (7) Community capacity development which the components will look like a disaster risk management process which has the following details:

1) Analyzing the Community Situation refers to the study of geography, economic, social, cultural, and environmental factors including experiences regarding community disasters, to collect data to create community plans or disaster preparedness plans or risk maps. It will be created an understanding of the current situation by starting from reviewing the information organize information both demographic and illness data (Vulnerable groups), geographic information, communities, etc., in order to be able to analyze the situation and prepare to be ready for disaster response in accordance with the World Bank (2012a; 2012b) which stated that the study of the disaster experience that occurred should be analyzed in making the community plan to be more effective and to find more ways and strategies to prevent and cope with the natural disaster in the future.

2) Identifying the Community Disaster refers to the preparation of community disaster information, such as what kind of danger disasters that occur at any time on a regular basis, Number of occurrences and the severity of the danger by doing it in the form of a disaster calendar. After that, communities will have to jointly select and prioritize what types of dangers can damage their lives, careers and areas in order to focus on the analysis and selection of prevention and mitigation methods of that type first in understanding the disaster in the community is an important factor in organizing disaster information system for analysis together with the community situation and the information will be updated every year, which is in line with the Department of Disaster Prevention and Mitigation (2013) and the Asian Disaster Preparedness Center (2017).

3) The Community Capacity Assessment refers to the evaluation of the community's potential both in terms of geographical conditions, people and infrastructure through community funds, including human capital, environmental capital, economic capital, physical capital and social capital by analyzing the situation (SWOT) for the community to see and use the community potential to manage the risk of disaster both before the disaster, during the disaster and after the disaster corresponding to the Department of Disaster Prevention and Mitigation (2013) said that the community's potential analysis to different types of disasters by analyzing social potential, physical structure, economy and environment. That will understand the root cause and the reason for the community loss which is consistent with the concept of sustainable living, and World Bank (2012b) found that the potential analysis and the disaster management experience in the past to analyze the community plan to be effective.

4) Selecting the Approaches of Disaster Risk Management refers to communities and community organizations can choose ways to manage disaster risk from communities which may be guidelines or community plans or disaster preparedness plans. It is to strengthen the capacity of the community in accordance with the principles of disaster management by using the community as the base. Defining guidelines for disaster risk management in the community will focus on tools that help the community prepare to face the disaster systematically. And it is a learning and participation process for people in the community. By the formulation of community guidelines or plans, the community details should be as clear and as detailed as possible. For the community benefit in preparation for prevention and disaster relief of the community, and should use the community disaster prevention and mitigation plan that is derived from the community participation process to rehearse the plan in order to bring the plan come to improve and

make it more suitable for the community. The result of study is consistent with the studies of Channuwong et al., (2023) and Kusumasari, et al. (2010) who found that in preparation the training and training plan must be an important need in natural disaster management and local wisdom should be applied to manage unexpected natural disasters. In addition, Thongtua et al. (2013) studied disaster management in monotonous flood areas in Ubon Ratchathani Province, found that the community has capacity in disaster management, both in terms of knowledge, local and community wisdom has a disaster preparedness and disaster prevention plan in line with Boonreang and Pattaranarakul, (2017) suggested that in managing floods and droughts, communities should develop a strategic plan for disaster response with community-based wisdom.

5) Collaborating the Internal and External Community refers forming partnership within and outside the community to manage disaster risk, both before the disaster, during disaster, and after the disaster so that the community can respond to the disaster in time and seek for help from external agencies such as the office of disaster prevention and mitigation, local government organization, civil society and the private sector involved through community communication systems. This is consistent with the finding of Kusumasari et al. (2010) that said that in the face of disaster, the important thing is the exchange of information, and a coordination and cooperation between agencies. This is in line with the finding of Boonreang and Pattaranarakul (2017) who said that during and after the disaster, people will focus on coordination and cooperation between the community and external agencies and communication is an important activity in flood management in order to be able to coordinate and operate efficiently.

6) Building the Community Networks refers to the community needs to have a communication channel to request support from organizations outside the community and coordinate and contact for help both in time to prepare and to prevent before the disaster, practice for suppressing and mitigating during disaster and helping to rehabilitate the victims after the disaster. The process of creating a network is considered the beginning of the network that should be considered and created the right way to maintain the network for as long as possible, which will lead to promotion. develop strong communities, both professionally social and environment in the community, which is consistent with the Department of Disaster Prevention and Mitigation (2015) who said that the creation of a network of people in the form of volunteers, to support and assist in disaster risk management, including preparation coping and rehabilitation after the disaster. Moreover, Poosiri (2007) said that external factor in self-sufficiency is a network that is relevant to many communities to support the needs of people in the community.

7) Developing the Community Capacity refers the development of knowledge and ability of community members to be up to date with changes in situations. Risk needing ongoing activities with the development of training to increase skills and expand the network of participation, even more community capacity development, empowering communities with self-sufficiency. The community must change the thinking process. That emphasizes the importance of thinking processes, learning the process of creating community capital which is consistent with UNISDR. (2007) that is a development guideline to enhance human potential to be able coping with the conditions that have an immediate and severe impact, can sustain life including careers, economy, and ecological stability. The goal is to enable the people to be strong and can sustain or sustain life regardless of any incidents and the concept of community development of Puangngam (2010) who stated that the community has the ability to self-management or community capacity development. The role of the public sector should be promoted in disaster management capabilities based on resources in the community themselves.

Evaluating the quality and efficiency of a model of community disaster risk management based environmental education in the special economic development zone, "Tak" Province

The researchers conducted a Quality and Efficiency Evaluation on Environmental Education Innovation with the objective to examine the content and structural validity of the innovation. There are 2 important points which are 1) Innovation Quality Assessment and 2) Innovation Efficiency Assessment. With details as follows:

1) Innovation qualities assessment: the researcher evaluated the quality of innovation from 3 experts consisting of one environmental education expert, one environmental management expert and one disaster risk management using IOC (Index of item objective congruence). Innovation is intended to validate both the content and the structure of the innovation. "Model of disaster risk management based on environmental education at the community level in the special economic development zone of “Tak” province" by experts before applying the said innovation to practice in the research area, in this regard, the researcher developed the evaluation form for constructing the quality assessment form from the concept and the operation definition by dividing into the content and structural validity assessment which is consistent with Polit & Beck (2012) that says content validity is a measuring instrument that matches the measurement object or the objective that needs to be measured. This can be done by considering the consistency of the questions and the operational definitions and theories that need to be measured.

2) Innovation Efficiency Evaluation by using Kirkpatrick evaluation model (Kirkpatrick D. L. et al, 2006) the model comprises total 4 levels which are 1) satisfaction level 2) learning level 3) behavior level and 4) public benefit level: The researchers have applied the innovation to the target group in the Special Economic Development Zone in “Tak” Province, which consists of people, volunteer groups and 30 community leaders using sub-group discussion methods in 3 areas, which are Mae Sot District, Mae Ramat and Phop Phra districts found that the result of the innovation efficiency evaluation was at a high level ($\bar{x}$ = 7.84) and the target groups were able to connect learning on environmental education innovation that leads to disaster risk management, and benefit the public for the community out into 5 disaster risk management projects.

A Model of Community Disaster Risk Management Based Environmental Education in the Special Economic Development Zone, “Tak” Province

The objective of model is to raise environmental awareness among people in the community, before getting involved in disaster risk management in the Special Economic Development Zone in “Tak” Province. However, the mentioned format consists of 3 phases, consisting of 7 elements, namely, Phase (1) Pre-disaster consists of 4 components which are components (1) Analysis of Community Situation, elements (2) Identification the Community Disaster, elements (3) Assessing the Community Capacity and the element (4) Choosing the method of disaster risk management. Phase (2) During Disaster consists of 1 component which is the element (5) internal cooperation with outside the community and Phase (3) This Post-disaster consists of 2 components which are (6) Community Network Building and elements (7) the potential development of the community. However, after the community has developed its capacity to a certain extent. Then the community can go back and analyze the environmental situation in the community to prepare. And systematically plan to manage future disaster risk as follows:

Phase (1) Pre-disaster consists of 4 components as follows:

Factor (1) Analyzing the Community Situation refers to the study of geography. Economic, social, cultural, and environmental factors including experience regarding community disasters to collect data to create community plans or disaster preparedness plans or risk maps.

Factor (2) Identifying the Community Disaster refers to the preparation of community disaster information, kind of danger disasters that occur at any time on a regular basis, number of occurrences and the severity of the danger, by doing it in the form of a disaster calendar. After that, communities will have to jointly select and prioritize which types of

hazards cause damage to their lives, careers and areas in order to focus on the analysis and selection of prevention and mitigation methods of that type first.

Factor (3) Assessing the Community Capacity refers to the community's potential assessment both in terms of local conditions, People and infrastructure through community funds, including human capital, environmental capital Economic capital, physical capital and social capital by SWOT, for the community to see and apply the potential of the community to manage disaster risk, both before the disaster when disaster strikes and after the disaster.

Factor (4) Selecting the Approaches of Disaster Risk Management refers to communities and community organizations can choose a community disaster management approach, which may be guidelines or community plans or disaster preparedness plans, communities capacity building in accordance with disaster management principles by using community-based.

Phase (2) During Disaster consists of 1 component as follows:

Factor (5) Collaborating the Internal and External Community refers to collaborating within and outside the community to manage disaster risk, both before the disaster, when disaster strikes and after the disaster. So that during a disaster, the community can respond to the disaster in time and can ask for help from external agencies such as the Office of Disaster Prevention and Mitigation, Local government organization, Civil society and the involved private sector through community communication systems.

Phase (3) Post-disaster consists of 2 components as follows:

Factor (6) Building the Community Networks refers to the community needs to have a network to request support from agencies outside the community, and coordinate and contact for help both in time to prepare to prevent before the disaster, practice for suppressing and mitigating during disaster and helping to rehabilitate the victims after the disaster.

Factor (7) Developing the Community Capacity refers to the knowledge and ability development of community members to keep abreast with the changing situations and risk, so it requires ongoing activities. There is development, training, skills increase and expand the network of participation even more (Figure 1).

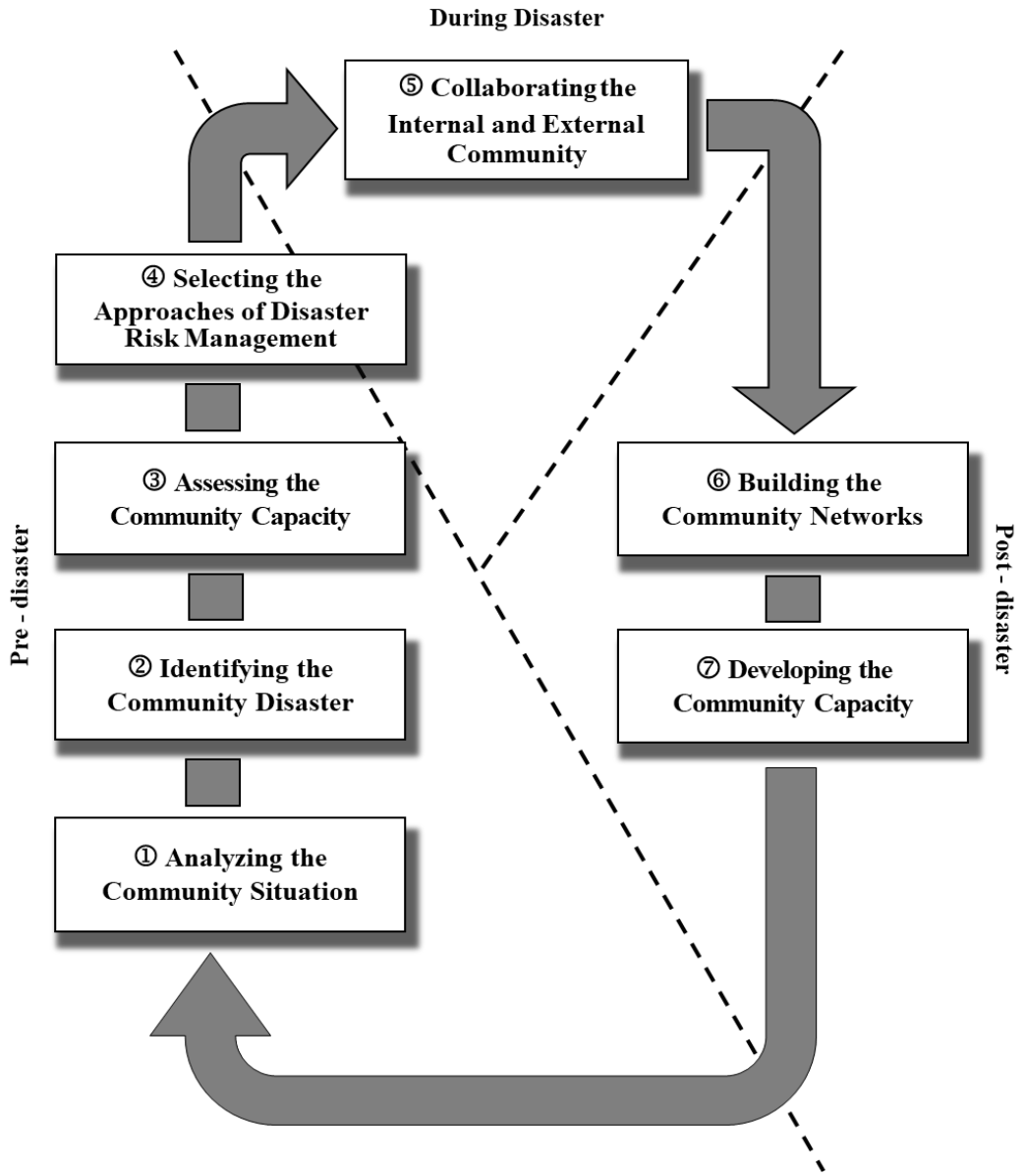

Figure 1 A Model of Community Disaster Risk Management Based Environmental Education in the Special Economic Development Zone, "Tak" Province.

Source: Synthetic from research results based on the concept of disaster risk management environmental education in the special economic development zone in "Tak" province, Thailand.

5. Conclusion

The disaster situation in the community showed that most of the disasters were flooding, followed the windstorm or wind, and the fire / haze respectively. In addition, communities in the special economic development zone are at risk with mudslides and wild water flooding.

For the situations of disaster risk management; it is found that the mean score of disaster risk management is at a moderate level. In the implementation of disaster risk management, people think that disaster risk management is the most effective, followed by disaster risk management after disaster, and disaster risk management before disaster. The learning level about disaster risk management showed that the sample group had a

moderate level of learning about disaster risk management. In particular, the 3 highest average scores are the ability to evaluate disaster, the knowledge and awareness, which are at moderate level.

The disaster management model based on environmental education consists of 3 phases and 7 elements. Phase 1 before the disaster (Pre-disaster) consists of 4 components which are 1) community situation analysis 2) community disaster identification 3) Community capacity assessment, and elements 4) selection of disaster risk management procedures. Phase 2 during a disaster consists of 1 component which is 5) internal cooperation with outside the community. And phase 3 after a disaster consists of 2 components which are 6) Create a community network and 7) Community capacity development, in order to have a learning process in the community in preparing the disasters risk management that may occur in the future.

Contribution of this Research to the Society

The results of this study help the society to understand the current situations of environment, disaster and disaster risk management, to provide the community learning on disaster risk management, to synthesize the model of community disaster risk management based environmental education in the special economic development zone, and to design a model of community disaster risk management based environmental education in the special economic development zone, "Tak" province, Thailand in order to prepare for disaster risk management. If people in the community have knowledge and understanding about disaster and how to manage disaster risk, they will be able to prepare for disaster response. Individual potential can be enhanced by providing education, training, learning, experience and advice. This study provided recommendations to the society to cope with disasters based on available resources and use local wisdom to deal with floods such as observing animal behavior, and making basic self-help equipment such as making lifeboats from gallons of water and car tires including resource allocation from external agencies. It will enable the community to pass through disasters each time.

Recommendations

1) From the study, it was found that the learning about disaster risk management in general is at a medium level. Therefore, there should be knowledge and understanding support, and skills in disaster risk management including other necessary information, such as tools and equipment, including guidelines for analyzing community potential from community areas data. In addition, the experience and use of local knowledge should be used in creating understanding, prevention and solution of disaster risk management.

2) From the study, it was found that community capacity in disaster risk management is at a moderate level and disaster risk management during a disaster at a medium level which people in the community consider local authorities and community leaders lack experience in coping during a disaster, such as communication and coordination in the community. Therefore, the capacity of local administrative organizations and community leaders should be increased in commanding events during disasters, both during the disaster and the use of laws, regulations, and regulations that help people, including the use of budgets and collaboration between agencies.

3) From the study, it was found that public participation in disaster risk management is at a moderate level. Therefore, there should be providing more cooperation or participation of people, including establishing a network between communities and external agencies to manage concrete disaster risks for the community to be able to apply new knowledge in disaster risk management in the community.

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