Proceedings on Engineering Sciences

THE APPLICATION OF COMMUNITY BASED DISASTER RISK MANAGEMENT APPROACH IN FLOOD-PRONE COMMUNITY

Buabuttri Ronnaritivichai[1]
Wanchak Noichan
Rapeepat Juntanintorn

A B S T R A C T

An increase in the frequency of natural disasters around the world had caused a widespread attention to the issue of climate change. This research aimed to study the role of Community Based Disaster Risk Management approach in minimising these hazards by: 1) examining the level of commitment in the people of Lamphaya Subdistrict Municipality community towards Community Based Disaster Risk Management approach; and 2) examining the relationship between the 'prerequisites' and the success determined by preparedness, response, recovery, and mitigation. Through quantitative data analysis, the research revealed that the level of commitment are high in all aspects. Astoundingly, the data showed that the people of Lamphaya also felt the level of disaster management success is high in all aspects even though those same people (all but 1.9 percent) also reportedly claimed being 'moderately' and 'highly' affected by the disasters. Unlike what we learned from an extensive literature review, data from multiple regression model shows that all factors but 'stakeholder' significantly predict the success of Community Based Disaster Risk Management

1. INTRODUCTION

The World Meteorological Organisation (WMO) has revealed that climate change has materialised and is causing a harmful effect worldwide (Taalas, 2022). The increase in global surface temperature had caused weather abnormalities, initiated more droughts and increased storm intensity. Urban flooding is also a result of poorly man-aged waterways such as reservoirs and under-maintained drainage system. Research shows that heavy precipitation is a continuous event and is "projected to increase through the 21st century to a level from 50 percent to as much as three times the his-torical

average" (NRDC, 2019). That means our children will experience 50 percent more heavy rain by the end of the century.

The statistic also shows that Thailand had made it to the top ten disaster rank and lost over 45.46 US billion dollars from the 2011 flood alone. The damage caused by two major catastrophes alone had proved that the top-down disaster relief support alone is not a viable measure for Thailand, and research had proven the same for other countries. A bottom-up disaster risk management approach such as Community Based Disaster Risk Management (CBDRM) is an effective

---

[1] Corresponding author: Buabuttri Ronnaritivichai
Email: buabuttri.ro@ssru.ac.th

measure that functions upon people's par-ticipation and sustainability, which provide inclusive treatments to the community.

Floods in Thailand are caused by torrential downpours. Flash flood and overbank flow are very common and had caused many lives and economic losses, and it is most common between May until September monsoon weather. Statistics showed that flood in Thailand is an ongoing crisis. In 2011, 64 from 77 provinces were affected by the most acute flood in decades. Millions of homes were damaged, 16 million people were af-fected, over a thousand lives were killed, and had caused over 45.7 billion US dollars in damage. Nakhon Pathom for an example, had incurred floods yearly between Sep-tember and October. Some years the water rises over 1 meter, affecting over thousands of households, causing great difficulties to the communities living around Tha Chin River (Bangkok Biz News, 2021).

Since 2004, the Thai government had formulated the Disaster Prevention and Mitigation Act (DPM Act 2007). At present, Thailand's disaster management framework included Disaster Prevention and Mitigation Act of 2007 (DPM ACT 2007); National Disaster Risk Management Plan 2015-2020 (National DRM Plan); National Disaster Risk Prevention and Mitigation Plan B.E. 2564-2570 (2021-2041); Provincial and District DRM Plans; and DRM Annual Action Plan which covers four key strategies incorporating risk reduction, emergency management system, sustainable recovery, and strengthening international cooperation.

Undeniably, the study of CBDRM engages with the study of community relationship of which appertaining to human attitudes and behaviours. Therefore, research analysis required knowledge from theories such as Disaster Preparedness Behaviour (DBP), Protective Action Decision Model (PADM), Protection Motivation Theory (PMT), Person Relative to Event Theory (PrE), and Participatory Development (PD).

This research, 'The Application of Community Based Disaster Risk Management Approach in Flood-Prone Community', examines the level of commitment in the people of Lamphaya Subdistrict Municipality community towards Community Based Disaster Risk Management approach in the area; and the relationship between the 'prerequisites' which are made up of stakeholder, education and training, resources, information sharing and coordination, risk and vulnerability assessment and early warning systems, and legislation (Sjostedt & Sturegard, 2015, p.9) and the success of CBDRM determined by preparedness, response, recovery, and mitigation.

2. THE PREREQUISITES

Based on extensive literature review (Sjostedt & Sturegard, 2015; Phiri, 2016; Shaw, 2016; Victoria, n.d.; Yore, Kelman, & Tofa, n.d.), it was found that these 'prerequisites' determines the success of CBDRM.

2.1 Stakeholder

'Stakeholder' is the most important element of CBDRM. National, local, media, academic, non-traditional stakeholders, and community must work hand in hand to deliver a successful mitigation program and alleviate losses in the community. There-fore, the first hypothesis was proposed as:

H1: 'Stakeholder' has an effect on the level of CBDRM success.

2.2 Education and Training

CBDRM has never been a compulsory subject at school, therefore, teaching stake-holders can help raise awareness and the importance of CBDRM. Additionally, 'train-ing' allows the community to develop new skills, form new knowledge, and have hands-on experience in processes such as preparedness, response, mitigation, and re-covery skills. First aid skills is perhaps one of the most critical skills required in any individual affected by disasters. Relatively, the second hypothesis was proposed as:
H2: 'Education and Training' has an effect on the level of CBDRM success.

2.3 Resources

The availability of 'resources' had been mentioned occasionally throughout an extensive literature review. 'Resources' has become a critical prerequisite and a success factor of CBDRM. A resource assessment allows community to effectively assess the viability of their supply in terms of skills, knowledge, infrastructure, volunteers, and time to better prepare for and response to the impacts. The third hypothesis was pro-posed as:

H3: 'Resources' has an effect on the level of CBDRM success.

2.4 Information Sharing and Coordination

'Information Sharing' is achievable via multiple means today. Social media is a highly efficient method but may not be a suitable choice during the disaster when electricity is likely to be terminated. Therefore, the use of paper-based information sharing is also important and secondary communication routes must be carefully planned in case of the event. Communication must be consistent and two-way to be effective. Relatively, the fourth hypothesis was proposed as:

H4: 'Information Sharing and Coordination' has an effect on the level of CBDRM success.

2.5 Risk and Vulnerability Assessment and Early Warning Systems

'Risk and Vulnerability Assessment' is usually carried out by the government and the NGOs to assess the vulnerability in the area. Risk and vulnerability assessments can help determine those who had past experiences with disaster in the area. The ability to help describe physical and mental damage can help raise awareness of the disaster to the community. an establishment of Early Warning Sytem in risk prone area help people to prepare and evacuate in time. Innovative technology from non-traditional stakeholders, NGOs, Academics, and Government can be beneficial to the development of advanced EWS. Therefore, the fifth hypothesis was proposed as:

H5: 'Risk and Vulnerability Assessment and Early Warning Systems' has an effect on the level of CBDRM success.

2.6 Information Sharing and Coordination

'Legislation' policies from a bottom-up approach is a type of policy that reflects the true needs of the community. CBDRM method relies on a bottom-up approach policy formulation and is likely to be successful otherwise. Hence, the sixth hypothesis was proposed as:

H6: 'Legislation' has an effect on the level of CBDRM success.

3. METHOD AND MEASUREMENT

The research, The Application of Community Based Disaster Risk Management in Flood-prone Area" adopted a quantitative design method. The data for this study were collected from respondents in Nakhonpathom, Thailand. With the assistance of Lamphaya Subdistrict Municipality, the researchers used a simple random sampling tech-nique to draw 322 samples from the people of Lamphaya Subdistrict Municipality. Using Krejcie and Morgan's (1970 method, it was determined that 322 sets of data must be collected at a 95% level of confidence for population over 2,000. Nakhonpathom Subdistrict Municipality is comprised of 589 households with the population of 1,958 people; therefore 322 sets of data were collected.

The questionnaires were put through va-lidity and reliability testing process. In terms of validity, the questionnaires are pre-sented to the IOC committee and the Index of Item-Objective Congruence (IOC) to find content validity. After passing, a try-out is performed with 30 participants using Cronbach's Alpha which is a reliability coefficient that measures the internal con-sistency and the reliability of the items, in the other words, that the responses collected are reliable and consistent.

The dependent variable in this study was designed to measure the success of CBDRM as per the level of commitment in the prerequisites. The respondents were asked to rate their level of opinion in the success of CBDRM using Likert scale rating of 1 to 5, 1 representing the least and 5 representing the most success. The questions re-garding trust in the police were divided into 4 phases of CBDRM cycle comprised of 'preparedness', 'response', 'mitigation', and 'recovery'. Respondents were asked ques-tions such as the ability to promptly prepare to response and evacuate from the area; the ability to care for self and others amid crisis; the ability to effectively recover from the event and the ability to assess casualties and ameliorate from the drastic situation; and the ability to mitigate long-term losses from past experiences.

The independent variables is consisted of six categories of stakeholder, education and training, resources, information sharing and coordination, risk and vulnerability as-sessment and early warning systems, and legislation. The respondents were asked to rate their level of commitment in CBDRM based on these categories using Likert scale rating of 1 to 5, 1 representing the least and 5 representing the strongest commitment level.

The questions used were such as the level of participation in the community dissaster-related policy and regulation formulation; school curriculum which incorporates lessons on natural disaster awareness; community skills and knowledge; communica-tion channels and natural disaster information exchange; risk assessment and effectiveness of the early warning system; and practical regulation as well as necessary compensation The conceptual framework is shown in Figure 1.

SPSS (Statistical Program for Social Sciences) analysed the data measuring Mean, Standard Deviation, and Regression and summarised as shown in Table 1.
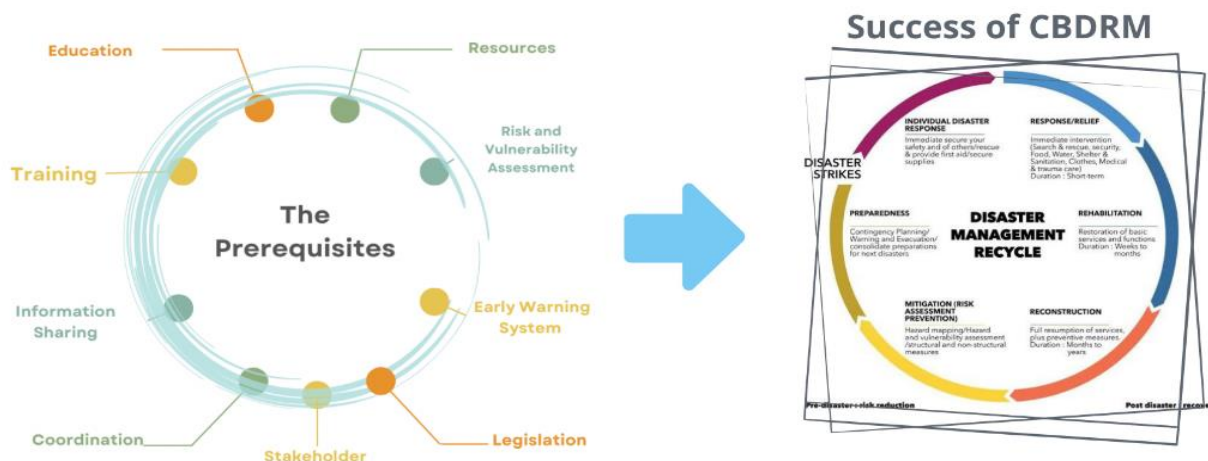
Figure 1. Conceptual Framework

Table 1. Demographic characteristics of Sample (N=322)

Personal factor		Categoory	Numbers	Percentage
Gender		Male	169	52.5
		Female	153	47.5
Age		18-29	11	3.4
		30-39	99	30.7
		40-49	106	32.9
		50-59	88	27.3
		60	18	5.6
Marital Status		Single	104	32.3
		Married	166	51.6
		Others	52	16.1
Education level		No education	8	2.5
		Primary level (Gr. 1-6)	141	43.8
		Secondary level (Gr. 7-12)	19	5.9
		Vocational Education	58	18
		Diploma	7	2.2
		Higher Education and above	89	27.6
Occupation		Unemployed	17	5.3
		Freelancer	87	27
Occupation		Agricultural/Farming	102	31.7
		Merchant/business owner	37	11.5
		Government officer	70	21.7
		Others	9	2.8
Monthly income		Less than 5,000 Baht	50	15.5
		5,001-10,000 Baht	77	23.9
		10,001-15,000 Baht	102	31.7
		15,001-20,000 Baht	27	8.4
		More than 20,001 Baht	66	20.5
Types **of** natural disaster **most impacted by**		Flood	268	83.2
		Drought	-	-
		Landslide	-	-
		Wildfire	-	-
		Storm	54	16.8
		Others	-	-
Level of impact		No impact	6	1.9
		Low impact	35	10.9
		Medium impact	139	43.2
		High impact	62	19.3
		Very high impact	80	24.8

4. RESULTS AND DISCUSSION

4.1 Results

Level of commitment by 'prerequisites'

Statistical analysis revealed that the respondents had a high level of commitment towards CBDRM in all aspects, with an average mean of 3.70. By aspects, it was found that the people placed highest importance on legislation (3.85), followed by stakeholders (3.76), resources (3.74), risk and vulnerability assessment and early warning systems (3.72), education and training (3.57), and information sharing and coordination (3.56).

Table 2. Level of commitment by 'prerequisites' (N = 322).

The level of commitment by prerequisites	Level of comitment			
	x̄	S.D.	Level	Rank
Stakeholder	3.76	.561	High	2
Education and training	3.57	.744	High	5
Resources	3.74	.652	High	3
Information sharing and coordination	3.56	.848	High	6
Risk and vulnerability assessment and early warning systems	3.72	.698	High	4
Legislation	3.85	.649	High	1
Total	3.70	.542	High	

Note: The score ranged from 1 to 5 with 1 being least committed and 5 being most committed.

Level of CBDRM success

The result shows that the community feels it was a high level of success interpreted by a Mean of 3.74. With a mean of 3.88, 'Preparedness' is at the highest out of the four aspects, followed by 'Response' at 3.78, 'Mitigation' at 3.68, and 'Recovery' at 3.62.

Table 3. Level of CBDRM Success

The level of success of disaster management	Level of opinion			
	x̄	S.D.	Level	Rank
Preparedness	3.88	.609	High	1
Response	3.78	.693	High	2
Recovery	3.62	.762	High	4
Mitigation	3.68	.666	High	3
Total	3.74	.553	High	

The relationship between the 'prerequisites' and the success of CBDRM

Multiple linear regression was used to test if stakeholder', 'education and training', 'resources', 'information sharing and coordination', 'risk and vulnerability assessment and early warning system', and

'legislation' significantly predict the success of CBDRM determined by 'preparedness', 'response', 'recovery', and 'mitigation'. The result shows that the independent variables were able to account for 81.6 percent of the variance in the success of CBDRM in Lamphaya Subdistrict Municipality. At the level of significance of 0.05, 'legislation' was able to account for 40.5 percent (p-value = 0.000), followed by resource at 30.5 percent (p-value = 0.000), information sharing and coordination at 19.7 percent (p-value = 0.000), education and training at 8.8 percent (p-value = 0.03), and risk and vulnerability assessment and early warning systems at 8.7 percent (p-value = 0.01), whereas stakeholder was able to account for 3.2 percent variance (p-value = .296) which was consider not statistically significant at 0.05 (no effect was observed).

A predictor coefficient equation is calculated to predict changes in the success of CBDRM as follows:

$$y = .308 + (0.032x_1) + (0.066x_2) + (0.259x_3) + (0.129x_4) + (0.069x_5) + (0.345x_6)$$

The result shows that the independent variables which show a positive coefficient with the success of CBDRM (y) at a significant level of 0.05 are 'legislation' (x_6), 'resource' (x_3), 'information sharing and coordination' (x_4), 'education and training' (x_2), and 'risk and vulnerability assessment and early warning systems' (x_5) with the coefficient values of .405, .305, .197 , .088, .087 consecutively. This indicates that 'legislation' (x_6), 'resource' (x_3), 'information sharing and coordination' (x_4), 'education and training' (x_2), and 'risk and vulnerability assessment and early warning systems'(x_5) are factors which predict the outcome of the response variable, in this case, the success of CBDRM.

Table 4. The relationship between the level of comitment in prerequisites and the success of CBDRM

The relationship between the level of commitment in prerequisites and the success of CBDRM	B	Std. Error	Beta	t	Sig.
Stakeholder	.032	.030	.032	1.048	.296
Education and training	.066	.031	.088	2.119	.035
Resources	.259	.031	.305	8.328	.000
Information sharing and coordination	.129	.026	.197	4.895	.000
Risk and vulnerability assessment and early warning systems	.069	.028	.087	2.470	.014
Legislation	.345	.030	.405	11.349	.000
(Constant)	.380	.103		3.68	.000
$R = .905^a$, $R^2 = .819$, $R^2_{Adjusted} = .816$, Sig = .237					

4.2 Discussion

The research revealed that the level of commitment in CBDRM prerequisites are high in all aspects. The people of Lamphaya Subdistrict Municipality placed the highest importance on legislation (Mean of 3.85), followed by stakeholders (Mean of 3.76), re-sources (Mean of.74), risk and vulnerability assessment and early warning systems (Mean of 3.72), education and training (Mean of 3.57), and information sharing and co-ordination (Mean of 3.56). In terms of 'legislation', the data showed that natural dis-aster policy of Lamphaya Subdistrict Municipality was formulated by the people and that the community had participated in policy formulation process which is unlike the results revealed by Angsusignha (2015) and Lassa et.al (2018)'s research which found that the 'legislation' system in their research community had to be reevaluated. Ang-susingnha (2015) described policy formulation in Governing by Emergency Manage-ment Network for Catastrophic Floods as 'ad-hoc' and 'bureaucratic' which limited freedom of communication and coordination among the community. Lassa et.al, stressed from a prolonged study of CBDRM in Indonesia that effective CBDRM will incorporate policy planning on nutrition, land management, shelter, education, and social policy planning.

Moreover, they felt highly and individually 'participated' in disaster prevention planning and disaster alleviation planning with other stakeholders. They felt they have high 'resources' and are equipped with sufficient skills, knowledge, manpower, lead-ership, and fund to prevent and withstand natural disaster. Moreover, contradictorily to research studied in Thailand by Boonreang (2017) and Wongwatthanaphone (2017), the people of Lamphaya felt they have highly effective 'risk and vulnerability assessment and early warning system' because the system is accessible to everyone. The people of Lamphaya Subdistrict Municipality felt they have high 'education and training' on natural disaster. Data revealed that the community was regularly offered preparedness and response training courses that were applicative and practical. They have high 'in-formation sharing and coordination' level as they possess an active communication channel for disaster-related news of which they regularly exchanged information on the issue and coordinated effectively for disaster prevention and mitigation in the area.

To answer the second research question, the people of Lamphaya also felt the level of disaster management success is high in all aspects. Interestingly, the following re-sults notably contradicted the data presented by official sources such as the Climate Change Knowledge Portal (2021) and the Thailand Disaster Management Reference Handbook (2022) that the frequency of flood and storms are rising and the effect of it had not been any easier on the households in the past year. Preparedness was ranked the highest, followed by response, mitigation, and recovery.

While Sjostedt & Sturegard stressed that 'stakeholder' is the most important ele-ment of CBDRM as they work cooperatively to deliver CBDRM program (2015, p.9), contradictorily, data from multiple regression model shows that all factors but 'stake-holder' significantly predict the success of CBDRM. This means 'education and train-ing', 'resources', 'information sharing and coordination', 'risk and vulnerability as-sessment and early warning system', and 'legislation' significantly predict the success of CBDRM determined by 'preparedness', 'response', 'recovery', and 'mitigation' which infers that the difference in the level of 'stakeholder' commitment does not implicate a different level of CBDRM success in all phases.

Although respondents rated disaster management in Lamphaya Subdistrict Mu-nicipality as highly successful, ironically, they have also reported being highly affected by water induced disasters which occurred more frequently in the past years.—So, how is it possible that the same group of respondents, who reported being 'moderately' and 'highly' impacted by such disasters, also contrastingly claimed that their disaster management method was a 'success'? To emphasise, 139 respondents accumulated for 43.2 percent and 62 respondents made up of 19.3 percent, as well as another 80 re-spondents accounted for 24.8 percent reported that the level of impact from flood and storms were medium, high, and very high consecutively. Only around 1.9 percent of respondents reported no impact. Such data fail to imply a high success of CBDRM be-cause a high success of CBDRM would mean more respondents reported having no impact from the disasters.

We proposed that the success of Lamphaya Subdistrict Municipality disaster management is questionable. Perhaps the success had been high, but it was not high enough to lessen the impact to a low level. In the other words, we suspected that Lamphaya community had been mostly self-reliance and the local audience has hitherto acted as a primary facilitator of CBDRM, that they operated independently with only little contribution from other parties such as the academic, the media, and the NGO. Hence, any differences in the level of stakeholder commitment will not determine the outcome of CBDRM success differently.

The solution would be to establish CBDRMO to engage stakeholders from both inside and outside the community, to gain more knowledge, skills, technological ad-vancement, and funding for the protection and recovery of the community. As well as, to create a new set of reception, attention, and comprehension of warnings or exposure, attention, and interpretation of environmental/social cues following the Protective Ac-tion Decision Model (PADM) (Lindall & Perry, 2012, p.616). This would help the

community to create a new set of awareness, sense of urgency, and reconsider the threats and risks of natural disasters. A fear-arousing model (Person Relative to Event Theory or PrE) and an education-based motivational model such as the Protection Motivation Theory (PMT) can be used to elevate a sense of severity, vulnerability, and the reward to the situation.

TPB theory explains how the Subdistrict Municipality community may feel they have a high level of success even though they reportedly claim being moderately and highly affected by the disasters. In reality, 'stakeholders' is the essence to community engagement and participation development which are the basis to the success of CBDRM. In a participative CBDRM community, any difference in the strength and the validity of stakeholdership should infer a difference in CBDRM success as illustrated by the Three Pillars of CBDRM.

Therefore, the Subdistrict Municipality must reestablish a new set of reception, attention, and comprehension of warnings or exposure, attention, and interpretation of environmental/social cues following the Protective Action Decision Model (PADM) (Lindall & Perry, 2012, p.616). This would help the community to create a new set of awareness, sense of urgency, and reconsider the threats and risks of natural disasters. A fear-arousing model (Person Relative to Event Theory or PrE) and an education-based motivational model such as the Protection Motivation Theory (PMT) can be used to el-evate a sense of severity, vulnerability, and the reward to the situation. CBDRMO needs to be rethought and reestablished. At the very least, higher stakeholders engagement from outside the community can amplify and enumerate extra skills and resources such as technological advancement, knowledge, education, and even funding to help facili-tate higher and continuous CBDRM success for Lamphaya Subdistrict Municipality.

5. CONCLUSION

In sum, this research examined the level of commitment in the people of Lamphaya Subdistrict Municipality community towards Community Based Disaster Risk Man-agement (CBDRM) approach in the area; and the relationship between the 'prerequi-sites' and the success of CBDRM determined by preparedness, response, recovery, and mitigation. The results revealed that the commitment of CBDRM are high in all aspects with the highest on legislation, followed by stakeholders, resources, risk and vulnera-bility assessment and early warning system, education and training, and information sharing and coordination. Surprisingly, the data showed that the respondents also felt the level of disaster management success is high in all aspects even though those same people reportedly claimed being 'moderately' and 'highly' affected by the disasters. Preparedness was ranked the highest, followed by response, mitigation, and recovery. Unlike what we learned from an extensive literature review, data from multiple re-gression model shows that all factors but 'stakeholder' significantly predict the success of CBDRM. The research proposed that CBDRMO and stakeholder engagement must be reexamined to increase resources brought into the community which consequently in-creases CBDRM success level. 'Stakeholders' is the key to CBDRM. In a participative CBDRM community, any difference in the strength and the validity of stakeholdership should infer a difference in CBDRM success as illustrated by the Three Pillars of CBDRM. The research proposed that a newly established stakeholder engagement plan must be formulated to respond to a short-term and long-term CBDRM planning. Stakeholders must incorporate formal and informal networks as key partners. Together, the community will help reevaluate the situation in different phases included the pre-paredness, the response, the recover, and the mitigation; and reassess the awareness, the severity, the impact, and the frequency of natural disaster from 'stakeholder', 'ed-ucation and training', 'resources', 'information sharing and coordination', 'risk and vulnerability assessment and early warning systems', and 'legislation' perspectives.

References:

Angsusingha, A. (2015). *Governing by Emergency Management Network for Catastrophic Floods.* [Doctoral Dissertation, National Institute of Development Administration].

Bangkok Biz News. (2021). *Floodwall Destroyed as Water Overflows Lamphaya District, Nakhon Pathom Province.* Retrieved from https://www.bangkokbiznews.com/news/970867

Boonreang, E. (2017). *The Capacity Building of the Community regarding Flood and Drought Disaster Management in the Provinces of the Lower Northeastern Region of Thailand.* NIDA Wisdom Repository.

Lindell, M. & Perry, R. (2012). *The Protective Action Decision Model: Modifications and Additional Evidence. Risk Analysis*, *32*(4). Retrieved from https://pubmed.ncbi.nlm.nih.gov/21689129/

NRDC. (2019). *Flooding and Climate Change: Everything you need to know.* www.nrdc.org/stories/flooding-and-climate-change-everything-you-need-to-know

Phiri, A. (2016). Theoretical Orientation of Community Based Disaster Management. Research Gate. Retrieved from https://www.researchgate.net/publication/328047916_Theoretical_Orientation_of_Community_based_Disaster_Risk _Management.

Shaw, R. (2016). Community-Based Disaster Risk Reduction. Oxfordre. Retrieved from https://oxfordre.com/naturalhazardscience/display/10.1093/acrefore/9780199389407.001.0001/acrefore-9780199389407-e-47;jsessionid=F23B413B0812C1A75EA1213E3FAFBF76

Sjostedt, F. & Sturegard, V. (2015). Implementation of Community Based Disaster Risk Management in the Mekong Delta, Vietnam. Lund University. Sweden.

Victoria, L. P. (n.d.). Community Based Approaches to Disaster Mitigation. ALNAP. https://www.alnap.org/help-library/community-based-approaches-to-disaster-mitigation

Wongwatthanaphong, K. (2017). Community Based Disaster Management: A case study of Bangrakam District, Phitsanulok Province. *The 4th National Conference on Public Affairs Management*, Public Affairs Management Under Thailand 4.0, COLA.

Yore, R., Kelman, I, & Tofa, M. (n.d.). Community0based Disaster Management (CBDRM). Reuters (2023) Earthquake death toll tops 33,000, Turkey starts legal action. Retrieved from https://www.preventionweb.net/files/61520_communitybaseddisasterriskmanagemen.pdf

Buabuttri Ronnaritivichai
Suan Sunandha Rajabhat University, Bangkok,
Thailand
Buabuttri.ro@ssru.ac.th
ORCID 0009-0002-3676-8938

Wanchak Noichan
Suan Sunandha Rajabhat University, Bangkok,
Thailand
Wanchak.no@ssru.ac.th
ORCID 0009-0000-9848897X

Rapeepat Juntanintorn
Suan Sunandha Rajabhat University, Bangkok,
Thailand
Rapeepat.ju@ssru.ac.th
ORCID 0009-0005-5797-3748