Contributions of gaming simulation in building community-based disaster risk management applying Japanese case to flood prone communities in Thailand upstream area

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ABSTRACT

Thailand has a long history of flood disasters. The Great Flood in 2011, for example, affected many parts of the country, including Bangkok. This obviously revealed the limitations of disaster management by the government. Movements in responding and helping communities to manage against flood disasters are still ambiguous and rudimentary; while local communities still rely on external support. This study aims to strengthen community-based disaster risk management (CBDRM) by using gaming simulation (GS) as a tool. This is participatory action research (PAR) using empirical data from applying GS, participatory observation and interviews in selected communities. Three flood prone communities in an upstream province in Thailand that represent successful case, on-going case and non-active case in building CBDRM used as case studies. The GS named 'Community Cooperation Game' (CCG) was designed as a prototype in a Japanese case study on flood management in Sonobe District, Kyoto Prefecture. The CCG was applied in the three flood prone communities in Thailand; that enabled these three communities to simulate flood situations and make mutual decisions on how to manage flood scenarios by following roles, rules and scenarios of the game. The main findings of this study are 1) a list of GS contributions in achieving CBDRM process indicators; and 2) evidence that suggest that GS can be used as a valuable tool to build CBDRM process by promoting social resilience through CCG in local communities in Thailand. The research concludes that the prototype of CCG on building CBDRM can be generalized in Thai local communities.

1. Background

Thailand has experienced flood disaster several times. The Chao Phraya basin (along the main river in Thailand) gets flooded naturally because of its topography and climate. Climate change is likely to increase both flood risk and its severity in the future. However, the primary driver of the increase of severe floods in the basin in recent years is human interventions in the environment such as the rapid urbanization, deforestation and attempts to control water resources for irrigation and power generation [1,2]. The last extreme flood in 2011 affected 12.8 million people, caused 728 deaths, damaged 10.417 million rais (16,668.55 square km) of agricultural area and 9859 factories affecting 660,000 jobs. Overall, the total damage and loss amounted to THB1.43 trillion (USD 46.5 billion), with economic losses accounting for 56% of the total [3]. It was the worst flooding in at least five decades in Thailand. An important lesson is that, with a long history and experiences of flood disasters, better solutions should be developed to prevent or minimize its disastrous recurrence. However, movements in responding and helping the community to manage against flood disasters are still not well developed [4]. It obviously reveals the limitation of disaster risk reduction and emergency responses by the community and government in general [5–7]. The main problem is lack of a well designed disaster management system. Unsystematic and uncoordinated flood response system still depends on each local administrative authority with no single command system. This caused indecisive and inadequate flood fighting activities, supporting measures, and social and political involvement that resulted in confrontation and conflicts during flood operations [6]. This obviously reveals the weaknesses and limitations in the organization of disaster management and emergency responses by the community and government [8].

The Sendai Framework for Disaster Risk Reduction 2015–2030 [9] prioritizes 'enhancing disaster preparedness for effective response and to Build Back Better in recovery, rehabilitation and reconstruction'. One of the expected outcomes is to 'substantially increase the number of

countries with national and local disaster risk reduction strategies by 2020′. The role of stakeholders as community-based organizations is also promoted [9]. There have been several studies on community-based disaster risk management conducted in a number of countries [8,10–16]. However, there appears to be no studies on applying gaming simulation to build CBDRM. Thus, this research aims to contribute to the literature by showing how gaming simulation can be useful in building CBDRM and to promote social resilience in local communities in Thailand.

2. Literature review

For the past 20–30 years, the need for community-based disaster risk reduction (CBDRR) system had been discussed [10]. Thus, community-based approach is not new. Community-based disaster management (CBDM) had been a popular term in the late 1980s and 1990s [10], which gradually evolved to CBDRM, and then to CBDRR. CBDRM and CBDRR are often used with similar meanings [10], with enhanced focus on 'risk'. While CBDRR focuses more on pre-disaster activities for risk reduction by the communities, CBDRM focuses on a broader perspective of risk-reduction-related activities by communities, before, during and after the disaster. The emphasis or need of CBDRR is found to be similar in both developing and developed countries, as argued by Shaw and Goda (2004) [10].

2.1. Community-based disaster risk management (CBDRM)

CBDRM and CBDRR (hereafter simply called as CBDRM for both of CBDRM and CBDRR as they are often exchangeable) refer to both concepts and processes [27]. It is a process of disaster risk management in which at risk communities are actively engaged in the identification, analysis, treatment, monitoring and evaluation of disaster risks in order to reduce their vulnerabilities and enhance their capacities [21]. This means that the people are at the heart of decision making and implementation of disaster risk management activities. The involvement of most vulnerable social groups is considered as paramount in this process, while the support of the least vulnerable groups is necessary for successful implementation [28]. CBDRM approach is people- and development-oriented. It views disasters as an issue of people's vulnerability. It empowers people to address the root causes of vulnerabilities by transforming social, economic and political structures that generate inequality and underdevelopment [21,42]. CBDRM approach covers prevention and mitigation, preparedness, emergency response and recovery [21].

The process indicators of CBDRM include (1) to undertake groundwork for CBDRM, (2) select communities for CBDRM through risk assessment, (3) build rapport and understanding in the community, (4) to carry out participatory disaster risk assessment and management, (5) community-based disaster risk management planning, (6) community managed implementation and (7) participatory monitoring and evaluation [20,21]. Outcome indicators of CBDRM are the creation of (1) community-based organization (CBO) or community disaster risk management organization (CDRMO), (2) community disaster risk reduction fund, (3) community hazard, vulnerability, capacity map (HVCM), (4) community disaster risk management plan, (5) CBO or CDRMO training system, (6) community drills system, (7) community learning system and (8) community early warning system [20].

CBDRM is essentially a bottom-up process. It is important to recognize that the planning process for CBDRM is not just a mechanical set of actions. A common requirement across all processes is a shared set of values and convictions in the community. The focus of the exercise should be on realizing a planning process as a tool for risk reduction, preparedness and response rather than on the production of planning documents. Participatory process here refer to community participation in disaster risk reduction through the adoption of specific policies, the promotion of networking, the strategic management of

volunteer resources, the attribution of roles and responsibilities, and the delegation and provision of the necessary authority and resources [20]. CBDRM and CBDRR are meant to transform passivity and powerlessness into action and resilience [27].

Kumara [14] and Parkash [32] discussed tools for CBDRM that are applicable in Asian contexts. A CBDRM program should emphasize the eventual institutionalization of CBDRM into policy, planning and implementation; implementation of innovative program to explore new dimensions in CBDRM practice; development of frameworks and tools to support the work of decision-makers and practitioners; development of new training tools to enhance the capacity of practitioners; and continued support to the regional entities for promoting CBDRM practices [14]. There are a number of tools available based on local experiences that can be used by CBDRM practitioners in reducing disaster risks. These include different thematic areas such as participatory risk assessment, risk reduction planning, critical guidelines on CBDRM, involvement of media in risk reduction, etc. [14] However, limited knowledge on the use of CBDRM tools in CBDRM and rural development programs is still a challenge

The inception of the idea that CBDRM would be rational and beneficial for society led to development of a suitable methodology for use by the community in its aim to reduce disaster risks [32]. Parkash [32] stated that although several scientific and technological methodologies exist for hazard identification, assessment, monitoring and control; yet based on the Indian experience the community is barely involved in or benefited by their application [32]. Therefore, an attempt has been made to involve and use the community's [32] experiences and knowledge in dealing with the issues of disaster assessment and management while applying scientific principles of disaster management in a broader sense.

2.2. Social resilience

In addition to participation, to enable communities to cope with disasters, they should also be resilient. Resilience is defined as "the ability of a system, community or society exposed to hazards to resist, absorb, accommodate, adapt to, transform and recover from the effects of a hazard in a timely and efficient manner, including the preservation and restoration of its essential basic structures and functions through risk management" [29]. The resilience has been discussed in social, economic, institutional, built, and natural aspects [31]. Focusing on CBDRM, social resilience is a key. Social resilience is referred to as "a social unit or a group to collectively cope with or respond to external stresses and disturbances resulting from social, political, and environmental changes" [30].

In the case of New Zealand [31] social resilience from the view point of disaster researchers, emergency management practitioners and policy makers can have two dimensions each one with corresponding attributes as depicted in Table 1. Each attribute is important to promote resilience in CBDRM. Although their focus comes from specialists' responses in New Zealand, these set of comprehensive attributes could be applied to other areas as they discuss disasters in general and not limited in New Zealand contexts though they work for New Zealand. This study applies their social resilience dimensions and attributes for CBDRM assessment in Thailand.

2.3. Gaming simulation (GS)

For empowering and raising awareness of disaster mitigation among community residents and students, disaster mitigation games have been utilized (such as UNISDR [46]). A game with players' active participation followed by feedback play an important mediation role for learning in disaster education [47]. To discuss games and its application for social problem solving, it is important to summarize their classification.

The history of games can be traced back to the prehistoric times