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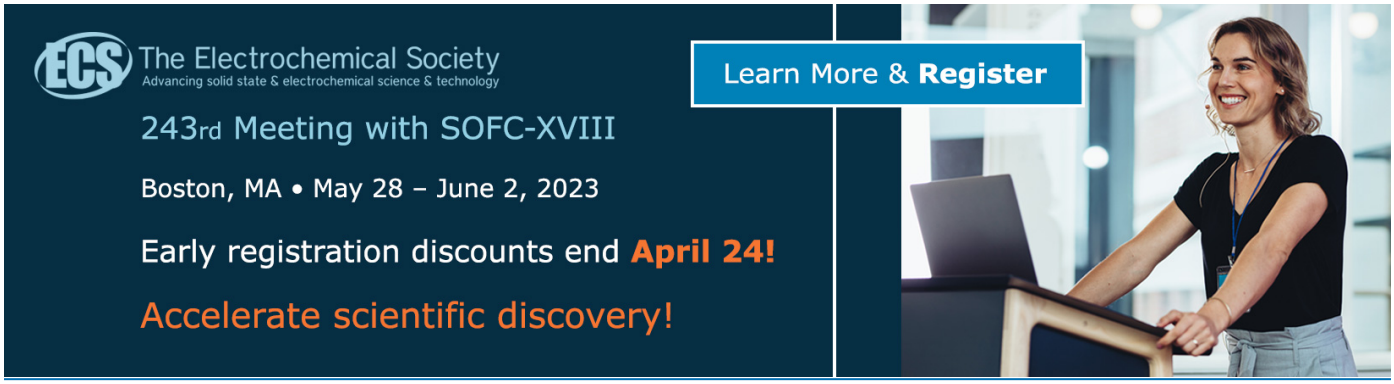

Conceptualization of a Collaborative Decision Making for Flood Disaster Management

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Abstract. Flooding is the utmost major natural hazard in Malaysia in terms of populations affected, frequency, area extent, flood duration and social economic damage. The recent flood devastation towards the end of 2014 witnessed almost 250,000 people being displaced from eight states in Peninsular Malaysia. The affected victims required evacuation within a short period of time to the designated evacuation centres. An effective and efficient flood disaster management would assure non-futile efforts for life-saving. Effective flood disaster management requires collective and cooperative emergency teamwork from various government agencies. Intergovernmental collaborations among government agencies at different levels have become part of flood disaster management due to the need for sharing resources and coordinating efforts. Collaborative decision making during disaster is an integral element in providing prompt and effective response for evacuating the victims.

1. Introduction

Major disaster such as flooding necessitates a coordinated diverse disciplinary (multi-agency) response to guarantee the required relief in the form of food, water, medical supplies and transportation arrives at the right place at the right time (Geale, 2012). Achieving optimal coordination and interoperability between agencies are heavily reliant on dynamic and distributive decision making (Smith & Dowell, 2000). Notwithstanding the pivotal role of collaborative decision making between agencies during multi-agency emergency responses, at present little work has been conducted to determine the factors and processes influencing decision makers during moments of high uncertainty, time pressure and high stakes.

The appropriate factors for emergency responses meant for evacuation of victims, the weight of importance the factors are considered, and how each factor is defined among the decision makers in the lead agencies during the recent flood catastrophe. By having a validated set of factors and their corresponding definitional dimensions, the lead agencies could apprehend the nature and characteristic of the real-time emergency decision making processes compared to the elements outlined in the current Standard Operating Procedures (SOPs). This will further enhance and reinforce the disaster planning and preparedness initiatives to be undertaken in facing any future calamities.

Developing a systematic process and procedure for decision making during disaster especially for evacuation of victims can provide the key stakeholders the information required to maximize the effort taken in search and rescue operations during flood disaster. With a clear perspective of what might transpire during the actual event, a list of proven and tested on the ground factors, definitional dimensions, and weight of importance, the key stakeholders could better anticipate and approach certain scenarios which were not comprehended before.

2. Current State of Decision Making During Disaster

Disasters are serious conditions or situations that disrupt the capacity of public and nations to effectively protect their populations and infrastructure, to reduce both human and property loss, and to rapidly recover ((Shaluf, 2007); (Altay & Green, 2006)). Disasters can be classified into three types: (i) natural; (ii) man-made; and (iii) hybrid. Natural disaster such as flooding has become a recurring phenomenal in most parts of the world. Flooding is the utmost major natural hazard in Malaysia in terms of populations affected, frequency, area extent, flood duration and social economic damage. The recent flood devastation towards the end of 2014 witnessed almost 250,000 people being displaced from eight states in Peninsular Malaysia. Having 189 river basins throughout Malaysia, including Sabah and Sarawak, the rivers and their corridors of flood plains fulfil a variety of functions both for human use and for the natural ecosystem (Sukereman, Sulaiman, & Hussin, 2013). This increases the possibility of threat to entire corridor areas. Therefore, an effective and efficient response to disaster should be in place by adopting a well-structured disaster planning strategies.

Disasters like flood will continue hitting our communities, businesses, and economies. How bad it could be? In his recent announcement addressing changes in the global economic landscape, Honourable Prime Minister, Dato' Seri Najib Razak has endorsed almost RM 2.9 billion for rebuilding infrastructure damaged by the recent flood as part of the overarching strategy to strengthen the economic resilience of Malaysia ("Special address on current developments and government's financial position, 20 January 2015, Putrajaya.," 2015). It is in everyone's interest to understand how we can manage disaster effectively and efficiently. Better management of disaster operations will improve readiness, increase response speed, and ease of recovery. Hence, decision making during disaster could be considered as of high importance. The decision making process during a disaster response contrasts considerably from conventional decision making (Dai, Wang, & Yang, 1994). During the state of a disaster, important attributes of the faced problem are uncertain in terms of its nature, scale and time. We must acknowledge that there is very little time for making a decision but information might not be available. This is further worsening in some situations as there might be abundance of information which might not be reliable.

In the event of a flood disaster outbreak, evacuation is considered as a way to prepare people when at risk from an impending hazard ((Taylor & Freeman, 2010); (Murray-Tuite, 2007)). Evacuation is a process with a very long history as in the early fifth century B.C., the Greek Historian Herodotus described Egyptian evacuation in facing seasonal flooding of Nile River (Perry, 1975). The purpose of evacuation encompasses the action of alerting, warning, preparing, moving and as necessary temporarily holding people, animals, personal belongings and supplies from an actual danger to a place which is relatively safer ((*Evacuation and shelter guidance: Non-statutory guidance to complement Emergency preparedness and Emergency response and recovery*, 2013); (*Evacuation Planning*, 2005)). An evacuation should only be carried out if the benefit of leaving an area significantly outweighs the risk of sheltering in place as it is imperative to realize that this process could be traumatic to vulnerable people and it could hamper business and the local economy (("The effect of flooding on mental health," 2011):(Skertchly & Skertchly, 2000);(Ketteridge & Fordham, 1998)). Collaborative decision making by intergovernmental agencies could address on how to reduce the impact of evacuation to the victims

3. Collaborative Decision Making During Disaster

Multi-agency collaboration could be viewed as joint activity by two or more agencies to increase the delivery value for public by working together rather than individually (Bardach, 1998). For flood disaster in Malaysia, among the lead agencies are the District Office, Fire and Rescue Department, Royal Malaysian

Police, Social Welfare Department, Drainage and Irrigation Department, Health Department and Public Works Department. National Security Council (Majlis Keselamatan Negara) in the Prime Minister's Department is responsible as the coordinator for all these agencies. The responsibilities and functions of the above mentioned agencies are dictated in the National Security Council (NSC) Directive 20 (Malaysia, 1997). In disaster management, collaboration encompasses key elements such as coordination, communication formation of network, partnerships, and interoperability (Naim Kapucu, Arslan, & Demiroz, 2010). The underlying link for all these elements is effective and efficient decision making (Cosgrave, 1996), as poor decisions would lead to poor disaster management which can have very serious consequences. Major disasters such as flooding necessitates a coordinated diverse disciplinary (multi-agency) response to guarantee the required relief in the form of food, water, medical supplies and transportation arrives at the right place at the right time (Geale, 2012). (Katuk, Ku-Mahamud, Norwawi, & Deris, 2009) contended that collaborative decision making during disaster management is of great importance. Effective management of such disaster operations requires collaborative and streamlined effort from various emergency agencies (Subramaniam, Ali, & Shamsudin, 2010). The combination of efforts with efficient use of resources needs collaboration among all stakeholders. Achieving optimal coordination and interoperability between agencies are heavily reliant on dynamic and distributive decision making (Smith & Dowell, 2000).

In the development and assessment of policy for disaster mitigation and response, human behavioural factors are often the least well quantified, understood, and modelled (Carlson et al., 2014). Although comprehensive disaster management follows an all-hazard approach, generalizing policies and plans for all kinds of emergencies, it is interesting to note that we may find different optimal approaches for different specific incidents ((Altay & Green, 2006);(Cosgrave, 1996)). Therefore, we could reach an initial understanding that evacuation process for flood related disaster would be unique compared to other evacuations. As different government agencies have different operational approaches, during disaster, collaborative efforts could be of a vital issue ((Chen, Sharman, Rao, & Upadhyaya, 2008); (McEntire, 1999);(Frishammar, 2003)). Multi-agency working has been recognized as much more difficult to achieve as single-agency strategies due to the different aims and agendas of partners, communications challenges due to organizational differences, more complex accountability issues, inequalities of power and struggles for dominance, and legacy issues (Ranade & W., 1998). Smith & Dowell, (2000)reinforced this notion mentioning each agency diligently pursued its own duty but there was lack of liaison between them. Perception of collaboration during disasters may vary significantly due to differences in organizational goals, objectives, and cultures (Naim Kapucu et al., 2010). However, (Quarantelli) construed that informing other agencies of one's operations could be perceived in two ways: (i) as normal information exercise; and (ii) mutual agreement on which agency is going to perform effectively. Drawing on research into decision making, effective and efficient disaster management operations require the ability of decision making under pressure which is subject to a number of pitfalls: (i) unique situation; (ii) data deficit; (iii) emotional denial; (iv) gambling on probabilities; and (v) positive reinforcement ((Shapiro, 2010); (*The politics of crisis management*, 2005)). Thus, successful disaster operations such as evacuations must be able to leverage the existence of all lead agencies on the ground via collaborative decision making.

4. The Way Forward: Successful Joint Operation During Disaster

Several types of decision making are required in disaster management such as analytical, naturalistic, procedurally based, creative, and distributive decision making (Sinclair, Doyle, Johnston, & Paton, 2012). It is evident that effective and efficient measures during disaster depend on sharing and using information between multi-agencies to make critical decisions under uncertainty (N. Kapucu, 2006). Decision making process during this state is more likely to be a challenging issue due to involvement of great uncertainty, sudden and unexpected events, risk of possible mass casualty, great time pressure and urgency, severe resource shortage, large scale impact and damage, and the disruption of infrastructure support necessary for coordination (Chen et al., 2008). This is further complicated by factors such multi-authority, personal involvement, and conflict of interest (Chen et al., 2008).

These shortcomings provide the basis and motivation of this undertaken study, which represents the initial steps in development of a comprehensive, predictive framework that incorporates human factors in decision making for disaster mitigation and response. One can argue that collaborations are not appropriate

in situations where rapid decision making process are needed like disasters. Nevertheless, the culture of working together established through social relations can substantively increase the speed of decision making (Ansell & Gash, 2007). Grounding on Resource Dependence Theory (RDT), this paper will fathom the exchanges of information between organizations. Resources are a driving force in the relationships among organizations, and resource dependence is theorized to shape the nature of relationships among organizations, having both positive and negative connotations (Zakour & Gillespie, 2013). Developing a systematic process and procedure for collaborative decision making during disaster especially for evacuation of victims can provide the key stakeholders the information required to maximize the effort taken in search and rescue operations during flood disaster.

Each year, natural disaster results in significant loss of life, the destruction of homes and public infrastructure, and economic hardship. Disasters strike both rich and poor indiscriminately. Vulnerable population such as the physically challenged, elderly, non-native speaking, children, chronically ill, mentally ill, the impoverished and geographically or culturally isolated, often suffer worse effects from disasters than others. Disaster planning seeks to minimize the consequences resulting from those events. Developing a decision making model is resource intensive and requires the planning and regular participation of key members of a management team and regular practice exercises. A well-developed model includes pre-disaster and post disaster actions and evacuation processes that minimize the short term and long term impacts of natural disaster (Vicki, 2007).

5. Conclusion

The collaborative decision making practice in the Malaysian context of disaster management especially in the area of evacuation for flood disaster encourage broader community of government agencies to improve their decision making process as part of Disaster Risk Reduction (DRR) strategy to face any future calamities. Recommendations will be offered to guide and assist decision makers to achieve successful evacuation decision making without leaving much impact on the flood victims. It contributes mainly in the development of an intergovernmental collaborative decision making model that (i) acts as a reference to better understand the dynamics of decision making during a disaster, and (ii) act as a basis to develop future emergency planning and preparedness exercise for lead agencies.

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