CBFRCM and FRACT: Modifications of the Social Amplification of Risk Framework (SARF) towards a Community-based Disaster Risk Reduction

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ABSTRACT

This study was conducted to address the gap in the literature on disaster studies, specifically on risk communication management. The extensive literature on disaster studies has examined risk communication and disaster management as separate concerns which emphasize the significant role of risk communication and management at the level of the communities to enhance community preparedness for disasters like flooding. No literature has been found specifically in the area of risk communication management. This study, therefore, aimed to focus on this gap integrating risk communication with disaster risk management towards a more inclusive approach to risk reduction.

Using a convergent parallel mixed method design, this study was conducted utilizing both the qualitative and quantitative approaches in the data collection and analysis guided by the integrated frameworks of the disaster risk management and the social amplification of risk (SARF). The merging of both results in the analysis and interpretation helped identify the convergence or divergence of the findings. Results of the study revealed that the risk reduction strategies can be further enhanced through risk communication management using a localized and participatory approach in the proper knowledge transfer of flood risk communication among the stakeholders involved, placing the community as the central actor for amplification. Thus, the study proposed a community-based flood-risk communication management (CBFRCM) framework and a Flood Risk Amplification Communication Theory (FRACT). The study recommends the application of the proposed theory to test the operationalization of the modification of SARF as well as its appropriateness to the context of flood vulnerabilities of communities.

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KEYWORDS*: flood-risk amplification communication theory; risk communication management; risk communication; strategic risk communication; community-based risk reduction*

INTRODUCTION

The United Nations estimates that yearly disasters worldwide cause some $520B in economic losses and deplete public funds that can be diverted towards basic services and social protection. With the heightened awareness of risks, governments must make the necessary actions in developing disaster-resilient communities (Bacasmas, 2018). In the Philippine context, the NDRRMC reported in 2017 that the economic cost of typhoons and flashfloods amounted to Php 6446B due to the 22 tropical storms, flashfloods and intertropical convergence zones. Flashflood damages has been estimated to Php 104,229M excluding the damages to private properties, commercial activities and foregone revenues from the hundreds of people who dies as a result of the calamity. Similarly, UNISDR estimated the cost of disaster in the Philippines accounts for 0.8% of the GDP since it affects mostly production of goods and investments, translating to imbalance in payments, employment, exchange rate and inflation (Cordero, 2018).

Flooding, in particular, is a potential threat with serious implications to development initiatives, especially in densely populated urban areas. It also exposes and increases communities to further risks and hazards. As risk is the combination of hazard and vulnerability, representing the potential for loss or damage. Risk is intrinsically linked to vulnerability, representing the potential for harm or loss arising from the interaction between a hazard or threat and a vulnerability. The role of government and financial restrictions are the two major problems that developing, and least developing countries face when managing disasters. It has serious implications as well as open avenues for identifying areas of improvement on the social and physical dimension of a city's development (Auzzir, Haigh & Amaratunga, 2014). Lasco, et al (2009) emphasized that the Philippines, in general, is considered as very vulnerable to climate change as an archipelago. The frequency of typhoons and storms that pass through the Philippines archipelago make it more vulnerable to flooding (Magalang, 2010).

Extensive body of literature on disaster studies emphasize the role of risk communication (Bradley & Clarke, 2014; Comfort, et.al., 2004; Comfort, Ko and Zagorecki, 2004; Mercado, 2016; Pidgeon, Kasperson & Slovic, 2013; Kasperson, et. al., 1988; Kasperson, 1986) on disaster management towards risk reduction. However, studies on this aspect are mostly addressing the different stages of the disaster management cycle (Khan, Vasilescu & Khan, 2008) analyzing social vulnerabilities (Wisner, Gallard & Kelman, 2012; Gall, 2013) and/or operationalize models (Leelawat, et. al., 2015; Lazrus, et. al., 2016; Hocke-Mirzashvili, 2016; Dickens, 2012; Demeritt & Norbert, 2104; Cowles, 2015; Reynolds & Seeger, 2005) as intervention mechanisms, there is a lack of investigation that integrates risk communication and disaster management. The literature examined does not reflect an approach specifically on risk

communication management for risk reduction. Hence, this study will focus on risk communication management as an integration of risk communication and disaster management towards risk reduction strategy for flood vulnerable communities.

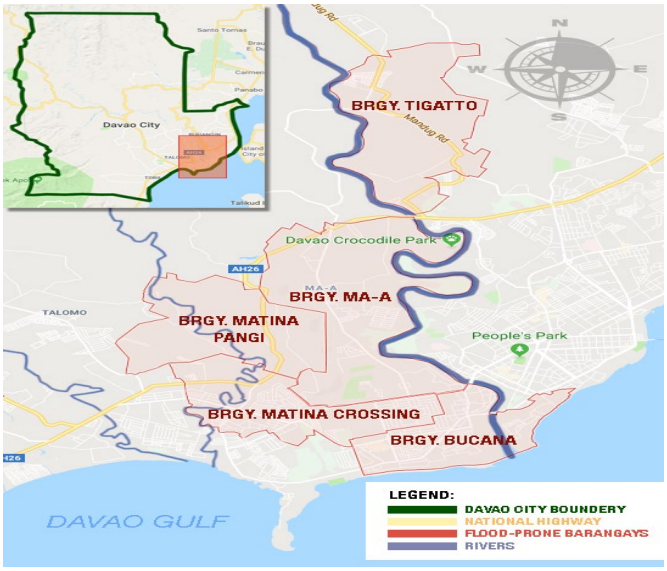
Ejeta (2018) stressed that past direct and indirect disaster experiences invoke preparedness intention and actual preparedness for flood hazards at individuals, communities and organizations levels. Even though the communities repeatedly experienced the flood disasters in the past, provision of information is needed on better emergency preparedness, particularly not only about the risk of flood hazards but also about the ramifications of flood disasters and the cost-effective methods of mitigation measures at the households' level (Grothman and Reusswig, 2006). Non-structural measures including establishment of communication channels between different communities to notify each other during the event of flood disaster, and the existence of flood disaster means of warning complement the structural measures like building of dams, dikes, levees, and channel improvements as means of mitigation measures (Ejeta, 2018). Grothman and Reusswig (2006) further explained that adoption of such non-structured measures is affected by residents' perceptions of previous flood experience, risk of future floods, reliability of public flood protection, the efficacy and costs of self-protective behavior, their perceived ability to perform these actions, and non-protective responses like wishful thinking.

There is a growing consensus among researchers and planners to incorporate local communities in disaster risk management and climate change adaptation planning (Forino, et. al., 2017; Kemp, Parto & Gibson, 2005; Koivisto & Nohrstedt, 2017; Kim, 2017), yet its actualization largely remains a dream (Pearce, 2003 cited in Samaddar, *et al*., 2015). Since it was observed that the Philippines, over the last decade, has been ranked 10th in the 2007 Global Risk Index (Harneling, 2008 as cited in dela Cruz, Ferrer & Pagaduan, 2010), it has been considered as one of the most vulnerable countries in the world due to the occurrence of recent severe disasters.

This study aimed to examine the vulnerability profile and flood experiences of the vulnerable communities of Davao City (see Figure 1) and analyze its contribution to their risk related behaviors. Findings of this study specifically in documenting the experiences, and responses to flooding of the community can be used by the local government units and agencies involved in disaster risk and reduction as inputs to their efforts in their implementation of reduction of flood risks. The results would also enhance the risk communication management of the local government units in addressing the needs and context of the flood vulnerable communities. Moreover, the results may be utilized by the Davao City council for possible policy recommendation that will highlight a community-based framework on risk communication management.

Figure 1

Location Map of the Research Locale (DC-DRRMO)



This paper is part of a study conducted using the Theoretical Frameworks on Social Amplification of Risk (Kasperson, et. al, 1988) and the Disaster Management Cycle (Khan, Vasilescu, Khan, 2008). Figure 2 shows the Conceptual Framework of the study while Figure 3 shows the Analytical Framework of the Methodology implemented. These frameworks cover the integration of the qualitative and quantitative analysis of the study using a Convergent Parallel Mixed method which aimed to propose a community based flood risk communication management framework appropriate for the flood vulnerable communities.

Figure 2

Conceptual Framework of the Study

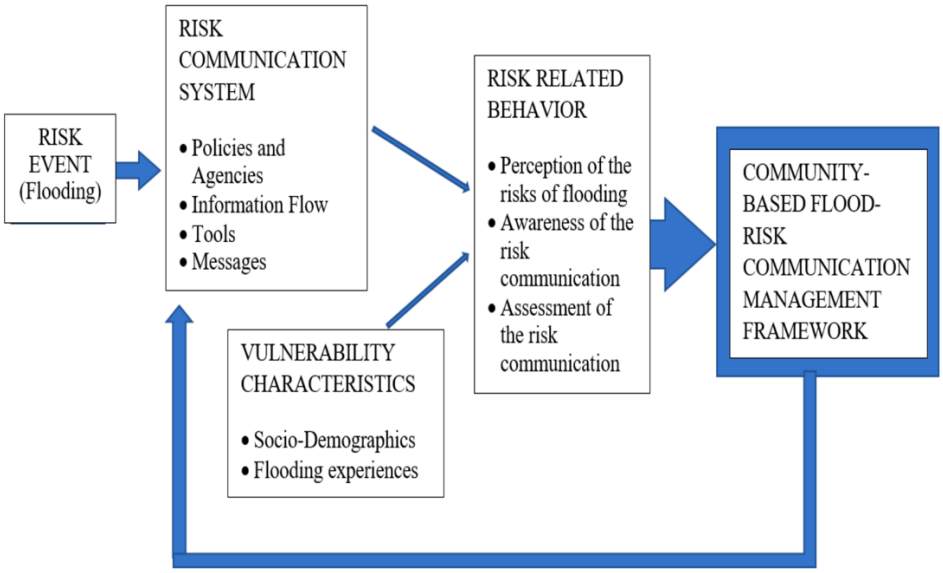
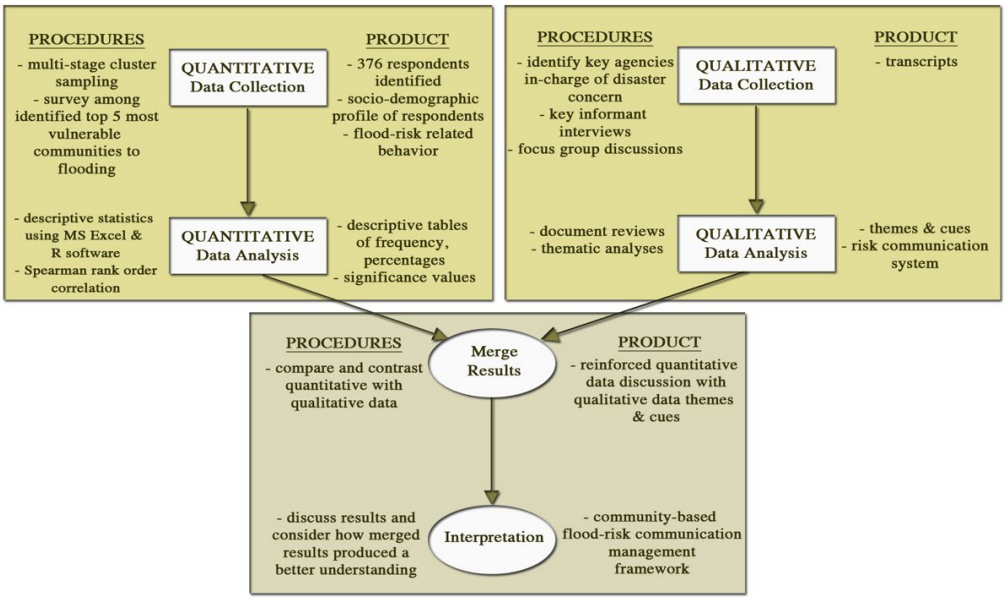


Figure 3

Analytical Framework Using a Convergent Parallel Mixed Method



FINDINGS AND DISCUSSION

Developing a Community-based Flood Risk Communication Management (CBFRCM) Framework for Flood Vulnerable Communities

The emphasis of this paper is the integration of the initial findings of this research which generally covers two major areas : (1) description of the actual and current communication systems of Davao City; and, (2) explanation of the respondents' flood experiences and practices to reduce vulnerability to flooding. These findings have implications on how to recommend an appropriate flood-risk communication and its management and envision the role of flood risk communications in developing resilience at the community levels.

The results of the study revealed that Davao City adopts a communication system that is compliant to the NDRRMP (2011) and the RA 10121 which utilized a top-down method approach in the implementation of its policies, structures, coordination mechanism and program implementation. O'Sullivan (2012) stressed that as long as the communication flow is only top-down, then no change is likely to happen. For risk communication to be translated into an effective disaster risk reduction strategy, community engagements must be encouraged. Moreover, external factors like political and social consequences and other social dynamics that lie within the government, key agencies and authorities, should be considered for a holistic transactional process (Terpstra, et al. 2009; United Nations, 2015; Forino, et. al., 2017). Moreover, results show that the communication systems and protocols of Davao City have little or no room for direct transactional interaction between the main source of the message, the NDRRMC and the local communities which are directly affected by flooding. In addition, messages or communication tools emanating from the original source have been found to be cascaded towards the lower level receivers without any alteration or modifications appropriate for the local residents. This has been confirmed by the respondents that the current set-up, although effective at some points, has disregarded their capacities to function and adapt as the primary actors.

In terms of the residents' experiences and responses to reduce their vulnerability to flooding, Table 1 revealed that since there is limited grasp of the risk perception, the communities' perception of flood risks reflect that it is greatly associated with the perceived reasons for flooding.

Table 1

Distribution of Respondents by Years of Residence and Vulnerability Based on Housing Characteristics

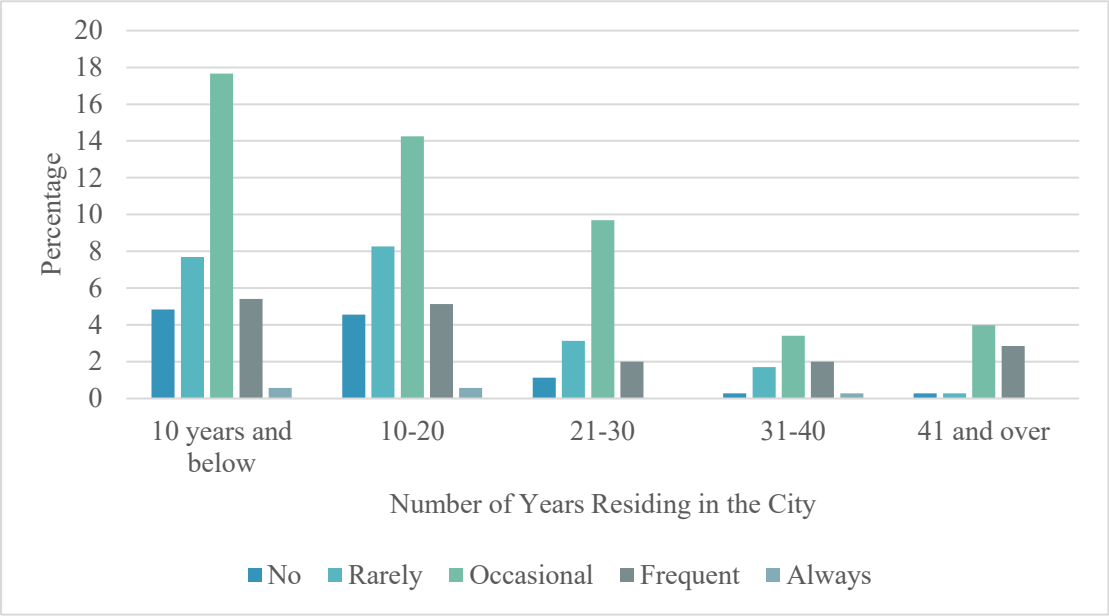
Years of residence in the Area	**FREQUENCY**	**PERCENTAGE**	
0-10 years	127	36.0	
Above 10 years to 20 years	115	32.6	
Above 20 years to 30 years	57	16.1	
Above 30 years to 40 years	28	7.9	
Above 40 years to 50 years	17	4.8	
Above 50 years to 60 years	9	2.5	
Total	353	100.00	MEAN = 13
Ownership			
Owned	208	58.9	
Rent-free	94	26.6	
Rented	51	14.4	
Total	353	100.00	
House Type			
Improvised	22 3	63.2	
Single One storey	69	19.5	
Single Two-storey house	53	15.0	
Attached row house/apartment	8	2.2	
Total	353	100.0	
House material			
Mixed materials	249	70.5	
Concrete	64	18.1	
Wood	18	5.1	
Light materials (*amakan*)	22	6.2	
Total	353	100.0	

Moreover, that flooding is a recurring event in their locality (Figure 4). Thus, the flood vulnerable communities rely on their past experiences (see Table 2) in flooding (Revita, 2018) to address the situation and responds to the eventuality by creating their own adaptation strategies. These include closer monitoring of rainfall in the higher areas through weather reports, the social media, early warning system like the water level markings, alarm system and information relay among neighbors,

barangay captains, zonal leaders and others by word of mouth. However, this is only useful during the flooding incidences. The communities feel that they can still improve their preparedness and alertness level using a more sustained and context-specific approaches on awareness campaign specifically for flooding. Moreover, they would appreciate if they will become part of these initiatives utilizing the context of their experiences and adaptive strategies that they can share among them.

Figure 4

Percentage Distribution of Respondents by Number of Years Residing in the Area and Occurrence of Flooding



Similarly, in terms of the existing communication system, the respondents expressed that although *barangay* officials' efforts are evident and appreciated by the flood vulnerable communities, there are still areas that need improvement to empower the individuals and the communities as a whole in building its resilience. Disaster risk reduction and management programs can be transformed from the current "top-down" to a localized and participatory approach by involving the community and making the individuals as the core of the risk communication approach in collaboration with the different sectors, agencies under the guidance of appropriate institutional mechanisms. Furthermore, the results also reflect that despite the efforts done by the *barangays* on awareness and preparedness for flooding, there are still some sectors of the community that are less likely to receive the information for the reasons that (1) they have no time to attend seminars and trainings which are in conflict with their work schedule, (2) some of the residents do not have the opportunity to get the information through electronic channels of communication,

i.e. FB and twitter, (3) others expressed that limited print out of brochures or flyers were disseminated in the households.

Table 2

Distribution of respondents by response of the households on flooding

RESPONSE	FREQUENCY*	PERCENTAGE
Time to Prepare		
When rain falls	147	48.20
When water levels are high	95	31.14
When the news says the weather is bad	89	29.18
When the community alarm rings	79	25.90
When authorities advise us to do so	31	10.16
When floodwater starts to enter the house	5	1.64
Total	446	
Reasons for preparations on flooding		
Safety of family and relatives	159	52.13
Aggressive programs of barangay	117	38.36
Personal experience	84	27.54
Neighbors are also preparing	35	1.48
Knowledge of flood risks	26	8.52
LGU initiatives	16	5.25
Total	437	
Reasons for Evacuation		
Safety of family	201	56.94
Personal/past experiences	125	35.41
Self-decision	47	13.31
Secure important items	25	7.08
Advise of barangay authorities	22	6.23
Neighbors are evacuating	21	5.95
Not relevant to our experience	10	2.83
Advise/messages	7	1.98
Sufficient knowledge on flood risks	6	1.70
Total	464	

*Multiple response

From the survey and the FGDs conducted, residents have revealed that although they are aware and appreciative of the efforts made by the barangay in terms of awareness and preparedness as well as response during flooding incidences, they would appreciate if they can also participate and give inputs on the DRR strategies based on their experiences and current adaptation practices. They perceived that taking part in the planning and crafting of the risk communication and its management would improve their preparedness and response mechanisms to flooding.

Thus, a community-based intervention is necessary whereby community perception, attitudes and behavior towards flooding as a result of their past experiences should be documented and highlighted as the major outcome from interaction between legislation, organizational policies and practice, collaborative and participatory actions that can be transformed into a community norm towards flooding incidences.

A More Integrated Flood Risk Communication Management Approach towards Risk Reduction

In the context of the Davao City's flood vulnerable communities (Basa, 2017; Boquiren, 2017; Bustillo, 2017; Carillo, 2015; DRRMO reports, ND; Figureoa, 2019; Revita, 2018) the approach to its risk communication must consider the integration of flood risk communication with the disaster management cycle. This approach reinforces various studies which revealed that flood risk management is greatly affected by different factors (Kreibich, et. al. 2005; Kreibich, 2011b) and the responses to flooding incidences are affected by changes in preparedness practices (Kreibich, et. al., 2011a; Helsloot & Ruitenberg, 2004; Howard, et. al. 2017; Kerstholt, Duijnhoven & Paton, 2017), the flood vulnerable communities' adaptation practices to flooding are developed through time (Kreibich, et. al, 2017). Moreover, Thieken (2016) emphasized that: (1) flood risk awareness leads to precautionary actions if effective risk communication and management is implemented; (2) flood hazard information, precautionary measures and coping possibilities should be linked more effectively to provide a more context-specific approach; (3) timely and reliable warnings especially to low-lying areas should be given in the event of rainfall in the higher areas; and, (4) training of communities to ensure alertness and precision of flood responses should be encouraged.

In the current set-up of Davao City, the risk communication system is greatly influenced by the existing policies and frameworks in compliance to the RA 10121. Despite the fact that after the 2011 flashflood, the flooding incidents of 2013, 2017 and 2018 (DRRMO reports, ND; Bustillo, 2017; Boquiren, 2017) revealed that communities and agencies involved are better prepared and interoperability among agencies have

been observed, the residents of the flood vulnerable communities expressed that they would be more confident and secured if they can participate in the planning and operationalization of risk reduction strategies. Thus, there seems to be a gap in the implementation at the community level in terms of the lack of a "community-based" approach to empower the communities to practice "self-protection" and "independent coping strategies" (Thieken, 2016; Tselios & Tompkins, 2017). Moreover, survey respondents and FGD participants have expressed that they are willing to participate and provide inputs in the crafting of appropriate risk reduction strategies that will help them in improving their awareness, preparation and response to flooding incidences in their communities.

To address this, the following insights were derived from the results of the study as the guiding parameters in the proposed CBFRCM framework:

(1) Balanced and coordinated strategies for reducing risk and coping with impacts of flooding should emanate from the community levels towards the different agencies involved, involving a simultaneous approach of "top-down", "bottom-up" as well as horizontal communication flow to encourage a transactional communication process among all the involved sectors.

(2) Transboundary and cross-sectional cooperation should be encouraged. Risk reduction and disaster response must be coordinated among various stakeholders and concerns must by systematically identified and anchored in flood-risk management plans that clearly defines the context-specific concerns of the communities.

(3) A localized and participatory approach must encourage the involvement of the communities, in particular, encourage risk dialogue to enable local interests, experiences and knowledge to be integrated into locally adapted risk management strategies.

(4) Formulation of binding regulations or policies for incorporating the community concerns in the planning process to enhance coping mechanisms and capacities.

The findings of this study is consistent with findings from other disaster studies which emphasized the significant role of risk communication (Comfort, et.al., 2007; Mercado, 2016; Pidgeon, Kasperson & Slovic, 2010; Kasperson, 1988; Terpstra, Lindell & Gutteling, 2009; Lindell & Perry, 2012; Duckett & Busby, 2013). Disaster risk reduction (DRR) strategies in this context can be enhanced through proper knowledge development and dissemination of flood-risk communication from the different stakeholders that would eventually implement the strategies presented therein. Consequently, focusing on how the communication tools and messages can be made more relevant to the target recipients (Lindell & Perry, 2004). Effective communicative processes and practices are widely regarded as core to disaster and risk management (Howard, et. al., 2017; Bradley & Clarke, 2014; Clerveaux, Katada & Hosoi, 2009; Cole & Fellows, 2008; Houston, 2018), however, the need for coordination and integration

equally play a significant role (Comfort & Kapucu, 2006; Kubicek, Cimander & Scholl, 2011).

Results of the study also revealed that Davao City's flood vulnerable communities are resilient since the communities have the capacity to "bounce forward" following an adverse event such as a flooding disaster or crisis (Houston, 2018; Maxey, Casas & Abat, 2013; Rufat, et.al., 2015). However, majority of the respondents are hopeful that they can improve their strategies if they are properly guided and educated about flooding, the risks involved and the appropriate preparation steps that they need to know. Norris et al (2007) states that as different models of community resilience have emphasized various *adaptive capacities* that contribute to collective recovery, capacities of information and communication, community competence and social capital as crucial to community resilience (Australian Red Cross, 2013; Daniel & Meyer, 2015). Ultimately, due to the collective nature of community resilience, communication is a core concept that cuts across other components or elements of the *complex adaptive systems* (Comfort, *et al.* 1999; Dickens, 2012). O'Neill (2004) argues that from a risk communication perspective, both individual and community concerns must be recognized as components of community resilience. As such, it also recognizes that communities and organizations operate as networks and groups rather than as discrete individuals. Thus, instead of focusing only on the implementation of the disaster risk management through the agencies involved, a risk communication on a localized and participatory approach is being envisioned by the flood vulnerable communities.

Modifications in the Social Amplification of Risk Framework as Theory Contribution

A critical prerequisite to effective disaster management is the minimization of related impacts through communication of risk information in a timely manner and in a format that all stakeholders can understand. Attaining this mandate can be a major challenge for disaster managers, especially in an increasingly globalized world characterized by higher levels of multi-culturalism as increasing numbers of people migrate to locations outside their culture-zones where, not only language differs, but also perceptions of and attitude towards hazard/disaster risk (Martin, 2003). The challenge for disaster managers is therefore to design effective tools/strategies that not only span language differences, but also take into consideration cultural perceptions and attitudes so that the objectives of disaster risk-reduction can be achieved. Moreover, it is also best to explore the community based adaptation measures to building more resilient communities as it is 'a community-led process, based on communities' priorities, needs, knowledge and capacities, which should empower people to plan for and cope with the impacts of climate change' (Reid, 2015) and

ultimately makes community more resilient to natural disasters and enable them to pursue dynamic future despite the challenges of these disasters.

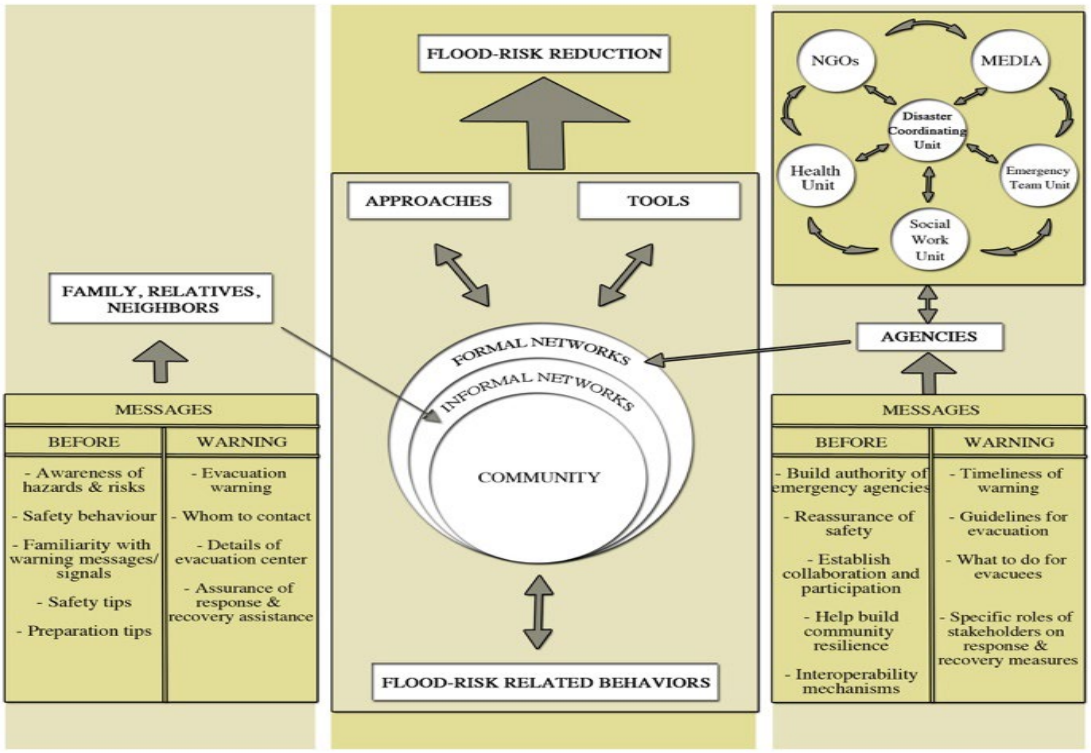
The Social Amplification of Risk Framework (SARF) of Kasperson, *et. al.* (1988) is primarily uni-directional or linear as it reflects only the role of the integration of risk assessment with the psychological, sociological and cultural perspectives of risk perception and risk related behavior. However, the amplification only involves the level of the source of message and considered the receivers as end-user of the risk messages. It therefore lacks the elements of a community based and networked integrated elements necessary for risk event.

Since results of this study revealed that the practice of the communication systems on flood risk is top-down approach and have some areas that can be improved by engaging the communities, a localized and participatory strategy is encouraged. Respondents of this study expressed that sharing of best practices and their experience in flooding can be on strategy to strengthen the awareness and preparedness level among them. Hence, the same strategy as espoused by the Canadian guide to effective flood risk communication (Mackinnon, Heldsinger & Peddle, 2018) can be adopted to address the SARF model's integration of the community as the amplifier or attenuator of the risk messages instead of the concerned agencies. It is hoped that an interactive collaboration would translate into a more appropriate and effective flood-risk communication management for Davao City.

Utilizing the results of this research from the concerned agencies and the communities' awareness and assessment of the communication systems and the perception, behavior and experiences of the flood-vulnerable communities provided the inputs on how to design and develop a risk communication management appropriate for the context of Davao City. Figure 5 shows the study's modification in the SARF focusing on a *Community-based Flood-risk Communication Management* (CBFRCM).

Figure 5

Community-based Flood Risk Communication Management (CBFRCM) Framework



The following significant gaps were considered in the proposed CBFRCM framework:

(1) The current communication systems implement a "top-down" approach and the feedback mechanism is weak or very limited.

(2) The concerned agencies, which, may serve as the "amplification channels" can tailor-fit the risk messages according to the context of its target recipients.

(3) The ripple effect as presented by SARF shows that the extent of reach does not transcend towards the household levels.

(4) Risk perception and awareness of risk messages may be present, but the preparedness level of the communities can be attributed to the experiences that they had on flooding.

(5) Assessment of the risk communication systems was significantly based on their familiarity of the communication tools as sources of information on flooding.

The Flood-Risk Amplification Communication Theory (FRACT)

The ***Flood Risk Amplification Communication Theory (FRACT)*** as a contribution to the studies on amplification of risk in communication management reflected in Figure 6 recommends that the community becomes the main actor in the amplification of risk. Hence, a shift from event centered to people centered approach. The flood-risk behaviors of the communities serve as the major source of the messages involving the integration of all the stakeholders into a strategic risk communication approach towards flood-risk reduction. Moreover, it also involves the interdependent transactional process among the following elements:

This study recommends a risk communication management approach which accounts for the integration of the findings of the examination of the current risk communication system as well as the awareness and perception of the flood vulnerable communities toward the risk reduction efforts from the national, regional and local levels. Moreover, the assessment of the flood vulnerable communities of these efforts which reflects the "gap" in terms of the localize and participatory approach.

FRACT integrates the gaps both in the literature and the needs of the flood vulnerable communities in the context of flood risk reduction concerns. The theory is proposed based on the following areas of concern:

(1) ***Underlying principles***

Institutional Mechanism. This includes the policies or legal basis of the agencies task/function, the communication protocols or procedures, and the flow of communication and the expectations of both the organization and the community. Institutional structures and mechanisms for inclusive disaster risk governance can be achieved through participatory processes that can lead to a participatory and collaborative policy making which involves the government institutions, stakeholders and the affected communities.

Alternative Policy Recommendations. Three areas for policy recommendation for a "localized" DRR communication interventions include: (a) creation of the working group to do further research and craft a synthesized reception analysis of the current risk communication system among the 63 flood vulnerable communities; (b) crafting of the manual of protocols for a quick reference guide for all the stakeholders; and, (c) include in the communication plan the period of implementation and the appropriate evaluation and monitoring of the strategies.

(2) ***Guiding parameters***

(a) Balanced and coordinated strategies for reducing risk and coping with impacts of flooding should emanate from the community levels towards the different agencies involved, involving a simultaneous approach of "top-down", "bottom-up" as well as horizontal communication flow to encourage a transactional communication process among all the involved sectors.

(b) Transboundary and cross-sectional cooperation should be encouraged. Risk reduction and disaster response must be coordinated among various stakeholders and

concerns must by systematically identified and anchored in flood-risk management plans that clearly defines the context-specific concerns of the communities.

(c) A localized and participatory approach must encourage the involvement of the communities, in particular, encourage risk dialogue to enable local interests, experiences and knowledge to be integrated into locally adapted risk management strategies.

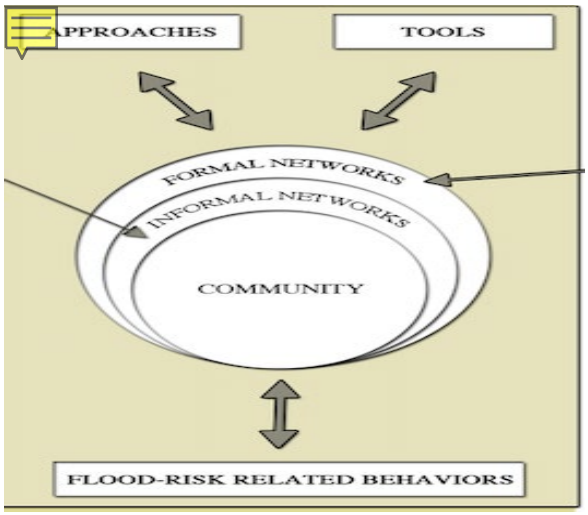
(d) Formulation of binding regulations or policies for incorporating the community concerns in the planning process to enhance coping mechanisms and capacities.

(3) ***Elements of the proposed theory***

Goal towards Flood-risk Reduction. A community-based approach accounts for the implementation stage utilizing a multi-lateral knowledge development approach combined with the interoperability or the dynamic interconnections between and among the agencies involved as well as the inclusion of the community and individuals in the process.

Figure 6

Flood-Risk Amplification Communication Theory (FRACT)



The findings of this study revealed that local residents of the flood-vulnerable communities had experiential knowledge on flooding that has helped them create practices to reduce vulnerabilities, it can become a useful tool in crafting the risk communication appropriate in the context of the flood-vulnerable communities. An effective output that can be developed from a multi-lateral knowledge development is the creation of an integrated Early Warning System (EWS) at the community levels.

The risk communication infrastructure would address the appropriate tools for specific audiences and identify the effective interaction among the main actors such as the scientific community, decision makers, stakeholders, the public and the media. Close coordination between the community, the experts and other concerned groups should work towards a "tailor-fit" and specific approach using the multi-lateral knowledge development approach.

The following elements can be utilized in the operationalization of the Flood-Risk Amplification Communication Theory (FRACT) towards community-based disaster risk reduction:

(a) Strategic risk communication aimed towards flood risk reduction

Strategic risk communication can be defined as a "purposeful process of skillful interaction with stakeholders supported by appropriate information" as an essential component of integrated risk management. It can help decision-makers and stakeholders make well-informed decisions leading to effective risk management. Results of the study show that interoperability among agencies is the focal emphasis on disaster management, however, there is still a lack of risk communication management which aims to address the integration of risk communication with disaster management. Since risk communication is described as "an interactive process of exchange of information and opinion among individuals, groups and institutions about the nature of risk, people's perceptions, and actions that can be taken to deal with the risks" (Kafle & Murshed, 2006), it would be beneficial if this can be a replicated approach in all the stages of the disaster management cycle. In this context, the dynamic interconnections between and among the "amplification stations" involved as well as their specific role in the communication process and organizational linkages will be considered central to the implementation of the strategic triad which would consider both the reach of the information and the appropriate approach and tools to be used including the channels and messages therein.

(b) Stakeholders which include the *community*, the formal and informal social networks as major actors of the risk communication process: *informal social networks* includes family-relatives and neighbors; while the *formal social networks* involves the different agencies including the disaster coordinating unit, the mass media; emergency team units; social work unit; health unit and NGOs

(c) Flood-risk related behavior reflecting the lessons from the experiences and practices of the communities that can be shared among the stakeholders.

The individual's risk perception revealed in this study is influenced by the experiences in flooding and therefore creates self-imposed behaviors and responses to flooding incidences. Cantrill (2011) emphasized that the role of individual perceptions is the

result of overlapping sets of cognitions, both arising from experience that create the person's personal vision of their role and connection to the environment. This can provide dynamic and integrative perspective for understanding the relationship between psychological predispositions, social interactions and the perception on a local level. Thus, it can serve the value of consciousness of local citizens to cooperate with others to achieve desired outcomes. Moreover, Weinstein (1989) viewed that personal experience is widely believed to have a powerful impact on the recognition of risk and the willingness to take extra precautions. The interest in prevention that seem to follow disasters is viewed as evidence of the effects of experience. O'Neill (2004) has also noted that several studies have highlighted the role of personal experience of disasters as a driver of heightened risk perception, thus, creates self-protective behaviors. This is also supported by scholars like Krimsky and Plough (1988) who observed that the perception of threats must be viewed as social construction and the social amplification of risk (Kasperson, 2001; Pidgeon, Kasperson and Slovic, 2003) and suggested that individuals encounter interpersonal or mass-mediated account that heighten or diminish the significance of an issue.

(d) Approaches in the strategic risk communication

This would account for the integration of the lessons from the community-based interaction and the strategies for implementation of the communication plan which includes the information flow, multi-lateral knowledge development (Okada, Norio, Matsuda, 2005) and the interoperability (Boquiren, 2017) mechanisms highlighting the integration of communication, control and coordination (Comfort, 2007). Strategically, it would be beneficial that the community's perception, experience and best practices on flooding be made as part of the "technical" communication coming from the concerned agencies, highlighting the gaps and addressing the misconceptions if there are any. This would show how much is their awareness and perception of risk as well as their personal preparedness level on flooding. This however, should be done based on consultative and interactive process, thereby engaging the community in the crafting of the flood-risk messages and risk reduction management.

(e) The communication tools which highlights a study of appropriateness of specific tools for specific target audience. Communication is very essential in risk reduction and management and may utilize different channels and tools such as written tools in the form of posters, brochures and flyers; visual tools such as signages, billboards and directional signages; technology-based tools like GIS, internet, and mobile phones; mass media to include television and radio as well as face-to-face communication through trainings, seminars, drills and word-of-mouth. Comfort (2007) states that in emergency management practice, it has focused on the interoperability of mechanical devices such as hand-held radios, cellular phones and landline or telephone networks. However, Clerveaux, Katada and Hosoi (2009)

mentioned that in some situations, electronic devices may not be appropriate, thus, relay of messages during disaster response can be disseminated through the use of other devices such as loudspeakers, mobile patrol sirens, or oral communication by word-of-mouth among the residents.

(f) Flood-risk messages to account for the significant messages that would address the specific contexts and needs of the informal as well as the formal social networks.

In the context of this study, results show that risk communication has been seen as a system to be implemented ensuring the interoperability of the agencies but disregarded the contribution that may be given by the affected communities based on their experiences. This puts emphasis on the idea that conceptualizing the best way to communicate risk have changed over time, specifically, in regard to the incorporation of the individuals and the community in the risk communication process. Feldman, et. al. (2016) viewed that previous risk communication was seen mostly as a one-way form of communicating with the public being regarded as the recipient of the information based on the expert's view as the salient point of the risk message. However, studies have also shown that gaps in reception were due to the difference of perception of risk between experts and the public (Okada & Matsuda, 2005; Feldman, 2016; Oh, Okada & Comfort, 2014). Thus, it is crucial for a risk communication to consider its audience and encourage a participatory framing of the strategies and tools.

FRACT as a ***proposed theory*** is aimed towards community safety in the events of flooding which encourages community self-reliance, long-term community-based programs that is context-specific. This theory recognizes that people have varied perceptions on risk and adaptive measures and encourages prior assessment of existing knowledge and practices as inputs to the crafting of the flood risk communication management approach. While Figure 5 shows the community-based flood risk communication management framework, adopting the SARF model (Kasperson, et. al., 1988; Renn, et. al., 1992; Renn, 1991, Renn, 2011) to highlight the different stages of the process, Figure 6 highlights the following modifications in the Social Amplification of Risk Framework (SARF), specifically : (1) the community becomes the central focus of the amplification then extends its reach to the informal and formal networks; (2) strategic risk communication triad is highlighted to cover the element of flood risk related behavior which includes the lessons and responses in flooding experiences as major factor in message development, utilizing the approaches and tools to strategize the flood-risk communication towards the target audience. The modification in the SARF is the integration of the community-based inputs like the community's perception of risk, experiences on flooding, awareness of the communication systems, their attitude and assessment and their practices. As the

results of the study show that the extent of reach as to the barangay level only covers level of officials of the barangay, it should be part of the proposed theoretical framework that the community level should be considered as the sources of information as regards their experiences and adaptation practices on flooding incidences. The central element, then, would be the individuals at the community level who amplify the experience through an integrated amplification system which integrates the amplification stations with the "ripple effect" or reach of the community's flood experiences and practices to include the informal social networks (family, relatives, neighbors) as well as the formal social networks (opinion leaders, different volunteer groups, media and non-government agencies). From this, a strategic triad for risk communication would determine the appropriate messages that are context-specific to the different vulnerable communities reflecting the lessons based on the experiences and its role in the communication planning that would account for the selection of the approaches and tools. The information mechanisms involved shall be coupled with the selection of the appropriate communication messages that will be utilized in the communication materials. This, however should be guided by the institutional mechanisms that have been crafted integrating the local communities' context, dynamics and capacities. The strategic risk communication can be utilized for the risk reduction and management at the community levels, utilizing the interoperability of the agencies involved and inclusion of the BDRRMCs who implements the strategies, monitor its outcomes and gather feedbacks at the level of the communities. Compared to the original SARF which has a linear "top-down" communication system, the proposed theoretical framework will generate its information system from the community's inputs as to their reception of the risk messages, awareness of risk, their flooding experiences and their level of preparedness.

The study revealed that despite the "ripple-effect" at the social amplification stations, the individual is not considered as a major element in the social amplification of risk framework which is contrary to most researches on risk amplification which focused on the social components of the framework. It does not consider that the individual can provide significant contribution for amplification in the process. The respondents' direct experiences on flood risks increases memorability and imaginability of the hazard, as well as provide feedback on the nature, extent and manageability of the hazard, creating better perspective and enhanced capability to avoid the risk. Thus, it can serve as a risk amplifier as well as act to attenuate risk.

The ***Flood-Risk Amplification Communication Theory*** (FRACT) in Figure 6 also highlights the modification in the amplification process of SARF which can be a guide to address the following concerns found to be absent in the current communication system of Davao City: the lack of communication protocols at the barangay level; the insufficiency of communication approaches; failure to involve all

the affected residents; and the lack of coordination and management on communicating flood risk. The respondents expressed that the current set-up of risk communication can still be improved in terms of its strategies and management since more people are living in flood-prone areas and risk of flooding increases due to climate change and urbanization, hence, it is increasingly important to communicate flood risk to the public (Haer, Boltzen and Aerts, 2016). Nyondo in 2006 (as cited in Skinner & Rampersad, 2014) also emphasized that if the process of communication is difficult in our ordinary and daily lives, it is far more so in times of disaster (Hocke-Mirzashville, 2016). The challenge remains to not only respond with accurate, understandable and complete information as quickly as possible during a disaster, but also to communicate in a proactive way that involves members of communities to reduce the potential risk of a disaster.

Ensuring that risk reduction and management at the community levels is achieved for the flood vulnerable communities of Davao City, the risk communication management approach should consider the integration of flood risk communication integrated with the disaster management cycle. The approach used in designing the proposed framework has the following objectives:

(1) Empower the communities to work towards self-reliance specifically on flooding eventualities.

(2) Create interoperability at the levels of the community.

(3) Build community capacity and preparedness through a more sustained risk communication management.

(4) Engage community participation and develop strategies that are context-specific.

(5) Deliver programs that can address flood risk communication as well as disaster management in an integrated and complementary approach.

CONCLUSION

The flooding experiences of the flood vulnerable communities in Davao City have provided the residents the adaptive measures to respond to flooding occurrences that they seem fit to be appropriate. Some of these community strategies (Mayhura, ND) included the following preparations whenever there is threat of flooding: (1) food storage in case they are stranded at the second floor of their house; (2) packed necessities in the event of evacuation; (3) elevating electronic appliances to protect from flooding; and, (4) evacuation first of the children and senior citizens to safer areas even prior to evacuation orders by the LGUs. Moreover, the male members of the household in most cases of evacuation decided to stay for the security and protection of their properties and belongings. The respondents, however, expressed that a more sustained risk communication may help improve the risk reduction strategies at the community level for a more coordinated response to flooding occurrences.

The lack of a standardized or structured management of both risk communication and disaster response translates into poor communication interaction during and after a flooding incident happens. This is observed during the 2011 flashflood incident which resulted to 29 fatalities and destruction of properties in the Matina area (Cayamanda & Lopez, 2018). Thus, a more defined and clear flood risk communication management may help define the specific protocols that can improve the coordination and flooding responses at the community level.

IMPLICATIONS and RECOMMENDATIONS

A proposed community-based flood risk communication management (CBFRCM) framework may address the gaps and standardize localized approach to specific contexts of the flood vulnerable communities. It may also help identify the key persons that can help plan and strategize appropriate communication messages and tools in collaboration with the residents, coordinate and manage the preparedness and response strategies to reduce risk and ensure that management, coordination and interoperability is observed at the community level. The framework can also address the limitation of SARF which covers only the risk-centered approach to amplification and has been observed as a linear approach to the communication of flood risks.

Consequently, the Flood Risk Amplification Communication Theory (FRACT) is proposed as a modification in the Social Amplification of Risk Framework, utilizing a community-based, localized and participatory approach. This will address the limitation of the current SARF as a linear approach towards a shift from a risk-oriented to people-centered focus of amplification. The community becomes the main source of amplification, utilizing flood-risk behavior as part of the message development with the integration of all the stakeholders into a strategic risk communication approach towards flood risk reduction.

It is, however, recommended that the proposed Flood Risk Amplification Communication Theory be utilized to test the feasibility of the modification of SARF. Moreover, the planning and crafting of the details of the program should entail the adoption of the following reminders:

- Flood risk communication planning cycle should be present in every stage of the disaster management cycle.
- The objectives of the communication plan should be dependent on the context of the community and its target audience.
- To ensure effective implementation of the flood risk communication, it is imperative that human and material resources are sufficient and adequate.
- Resources and activities are dependent on the following functional areas: research, monitoring and evaluation, policy matters, media placement, training and capacity building and community-based education and development activities.

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