CHAPTER 6

The Case of the Flood-vulnerable Communities

The previous discussion shows that although there exists a substantial literature on disaster and its related concepts, no related study or literature has been found specifically on risk communication management. Hence, this study would integrate risk communication and disaster management focusing on a localized urban flooding incident and how it can contribute to the development of a community-based flood risk communication framework utilizing the data collected from the flood-prone communities.

Risk communication management in the context of this study include elements such as policies or legal basis of the agencies task/function, the communication protocols or procedures, and flow of communication and messages; the inter-governmental management reflecting the dynamic interconnections between and among the agencies involved as well as their specific role in the communication process and

organizational linkages; and the communication processes on the efforts and strategies used for risk communication. Risk communication management at the community level would ensure that specific needs, expectations and levels of access to disaster related information are integrated into the risk communication approaches. Thus, empowering the communities to build resilience and capacities to respond appropriately to flooding incidences.

This study attempts to describe and explain the functions of the over-all system involved in disaster management by focusing on the relationships between various social institutions. Specifically, it covers the analysis of the role of institutions, the community, as well as the policies and governance that are involved in the performance of disaster risk reduction management. The multi-disciplinary framework of development communication is highlighted in this study.

Davao City as an Urban area vulnerable to flooding

Flooding is a common occurrence in different parts of the Davao City and its effects are catastrophic in proportion costing damage to properties and disruption of development initiatives and economic activities, and even loss of lives in some cases (Cayamanda & Lopez, 2018). The National Disaster Risk Reduction and Management Council's (NDRRMC) assessment and identification of the flood risk

areas are based on the hazard maps developed by different agencies such as the United Nations, and the Meteorological and Geosciences Bureau (MGB). The hazard map shows the vulnerable areas for natural hazards in the country and Davao City has been identified as susceptible to flooding. In addition, a study on the Business Risk Assessment and Management of Climate Change Impacts of 16 cities from 2011 to 2013 conducted by the World-Wide Fund (WWF) shows that even though Davao City is located in a typhoon-free zone, it is susceptible to dangerous floods in areas adjacent to the city's rivers. There are several rivers that run through the city and drain into the Davao Gulf. The largest of these waterways are the Davao and Talomo Rivers where thousands of residents are most likely to be affected in case of flooding (Business World Online, 2015; Estacio, 2013; Sanchez & Sumaylo, 2015). Davao City is experiencing unprecedented development in recent years, and more so with the Duterte administration's "Build, Build, Build Policy" for infrastructure and development, urban sprawl is evident while sustained growth in central business district allows population to increase in magnified proportions. This puts consequent pressure on infrastructure, natural resources and ultimately contributing to the worsening global challenges on climate change, enhanced green-house gases emissions, lack of appropriate infrastructure i.e. flood control, traffic congestion, and lack of basic amenities

(electricity, water, and sanitation) in many localities, etc. As a consequent of this urbanization, flooding has been the most occurring natural event and the frequency of typhoons and storms that pass through the Philippines makes it more vulnerable to flooding (World Bank, 2012; Magalang, 2010; Estacio, 2013; Sanchez & Sumaylo, 2015). Davao City has 182 barangays and 68 are considered vulnerable to flooding. The Davao City Office of Planning and Development (DCOPD) and Disaster Risk Reduction and Management Office (DRRMO) records reveal that flooding and landslides are repeated occurrence in Davao City (2011). However, the flashflood of 2011 has created an impact that shows the need for a policy challenge on the disaster preparedness and response at the community level. Since flooding are common occurrence in different parts of Davao City, damage to properties and loss of lives are catastrophic in proportion particularly among the vulnerable groups and communities (Cayamanda & Lopez, 2018). Thus, focused flood risk communication messages should be studied and recommended (Villanueva, 2016). Communities need to build its resiliency to respond to flooding occurrences while policy makers and leaders need to regularly review and upgrade its existing policies to address gaps and promote effective community-based strategies.

In addition, some related studies on flooding as a disaster occurrence in the Philippines has revealed that not all incidents are due to natural causes. Magalang (2010) stressed that as the Philippines is part of the typhoon belt, the climate change phenomenon and rapid urbanization makes the country vulnerable to flooding. Therefore, there is a need to enhance the community-based approaches on flood preparedness through vulnerability identification, strengthening community resilience and examine the significant role of the communities to reduce their vulnerabilities.

THE CASE STUDY in DAVAO CITY

Communities need to build its resiliency to respond to flooding and mitigate its negative impacts since the country cannot avoid typhoons and its associated hazards and/or risks. Minimizing the cost and damage through preparation and coordination is a strategy, while policy makers and leaders need to consciously regularly review and update its existing policies to address gaps and promote effective risk communication as an integral element of risk reduction. Moreover, to encourage community-based approach through organized collaboration of individuals, communities and organizations, thus, this study focusses on risk communication management.

The purpose of this study was to examine the role of risk communication management in the reduction of risk among the flood vulnerable communities. It aimed to answer the following questions:

(1) What was the existing risk communication system in response to flooding of Davao City?

(2) What were the experiences and practices of the flood vulnerable communities in using risk communication protocols, strategies, tools, and messages to reduce their vulnerability to flooding?

(3) Are the flood vulnerable communities aware of the risk communication system of Davao city?

(4) How did flood vulnerable communities perceive and respond to the risk communication system of the disaster management council?

(5) What factors affected the perception of the respondents to the risk communication management of the local government units?

(6) What risk communication management would be appropriate for flood vulnerable communities?

Objectives of the Study

The main purpose of this mixed-method research was to analyze the role of the risk communication management in the

disaster risk reduction among the flood vulnerable communities. Specifically, it aimed to:

(1) Describe the current risk communication system of the local government units in terms of the actors and their roles in its implementation;

(2) Examine the respondents' experiences and practices in using risk communication protocols, strategies, tools, and messages to reduce their vulnerability from flooding;

(3) Assess the awareness and perception of the respondents on the risk communication system of the local government's disaster risk reduction council;

(4) Analyze the relationship between the respondents' socio-demographic factors and their risk related behavior; and,

(5) Develop a community-based flood-risk communication management framework for the flood vulnerable communities.

Scope and Limitation of the Study

Most of the literature on disaster studies emphasize the "top-down" approach which is also the existing management framework being used in the Philippines, following the NDRRMC plans and manuals. This study employed a mixed-methods approach aimed to come up with a risk communication management framework emphasizing a localized and participatory approach to address the needs and

context of the flood vulnerable communities of Davao City. The qualitative phase of the study primarily focused on the communication flow from the city government agencies towards the flood vulnerable communities to explain the transactional process involved in the dissemination of the risk messages cascaded from the national level. The analyses of the review of literature and the data from the key informant interviews (KII) served as inputs in the construction of the survey questionnaires. The responses to the focus group discussions (FGDs) were used to reinforce the findings of the study and provide specific examples but not disregarding the fact that other factors may have affected their participation and responses to the questions on their assessment of the risk reduction efforts. For the quantitative phase, the survey method conducted from November 2017 to April 2018 was used to describe and explain the awareness and assessment of the flood vulnerable communities on the risk communication system.

The analysis of the risk communication system is limited to the level of communication flow and would not provide conclusive analysis on the rationale and agenda setting components of message formulation from the major source which is the NDRRMC or the national level, rather, provide a descriptive analysis which would show the current risk

communication system and its transactional process being implemented.

Significance of the Study

The significance of this study is on risk communication management as another strategy to disaster risk management, with emphasis on a community-based approach that encourages local participation. This presents a novelty of approach as well as a valuable contribution to the literature on disaster studies in the context of development studies.

Further, the findings of this study specifically in documenting the experiences, responses and perception of the community can be used by the local government units and agencies involved in disaster risk and reduction as feedbacks to their efforts in their implementation of the risk communication for 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.

The inputs of this research may provide policy-relevant information useful for the CDDRM Council and member agencies, the barangay leaders, and the Sangguniang Bayan with regards to plans and strategies in reducing the flood risk towards community resilience.

Moreover, a recommendation for a risk communication management framework on flooding may be utilized by the Davao City council for possible policy recommendation that will highlight a community-based framework on risk communication management.

Methodology

Research Design

This study used a mixed method design, the Convergent Parallel Design. This approach utilized both the quantitative and qualitative data collection techniques, analyze separately and then merge for comparative or integrative discussion and interpretation (Creswell & Clark, 2011; Creswell & Creswell, 2018; Terrell, 2012).

The study is descriptive and formative in its approach, and applied both qualitative methods such as document reviews, content analysis, system analysis, Key Informant Interviews (KIIs) and Focus Group Discussions (FGDs) and further reinforced using a quantitative method which is a survey. The research matrix is summarized in Table 1.

Table 1

Matrix of objectives by source and type of data

Objectives	Sources Of Data	Type Of Data
1. Describe the current risk communication system on flooding of the local government units in terms of the actors and their roles in its implementation.	Key Informant Interviews (KIIs) Document reviews FGDs among agencies involved	Qualitative Policy Analysis Thematic and content analysis
2. Examine the respondents' experiences and practices in using risk communication protocols, strategies, tools and messages to reduce their vulnerability from flooding.	Survey FGDs among residents of flood-vulnerable communities	Quantitative Qualitative
3. Assess the awareness and perception of the respondents on the risk communication system of the local government's disaster risk reduction council.	Survey FGDs among residents of the flood vulnerable communities	Quantitative Qualitative
4. Analyze the relationship between the respondents' socio-demographic factors and risk related behavior	Survey FGDs among residents of the flood vulnerable communities	Quantitative Qualitative
5. Develop a community-based flood risk communication management (CBFRCM) framework for flood vulnerable communities	Inputs from objectives 1 to 4	Quantitative Qualitative

Conceptual Framework

The study investigated the flooding of Davao City guided by the social amplification of risk framework of Kasperson et al. (1988). Risk events were described utilizing the primary and secondary data reflecting the experiences and vulnerabilities of the communities to flooding. The information flow was investigated in terms of the current risk communication system

and its implementation utilizing the policies as well as the local government units as the agencies involved in terms of the actors and their roles in the implementation. Augmentation of the study of information flow included the examination of the strategies, communication tools and the messages used. In analyzing the communication systems involved in risk reduction this study would draw its analysis from the emerging field of complex adaptive systems (Comfort, 1999; Comfort, 2007; Comfort & Kapucu, 2006; Comfort et al., 2004; Comfort et al., 2004) with the underlying assumption that disaster management involving the areas of preparedness, mitigation and prevention would involve the interdependent collaboration of the different sectors involved: government agencies, private institutions, volunteer groups and the vulnerable communities as well. A study applying CAS in studying the dynamics of organizational structure and flow of communication amidst complexities and changes revealed that interdependence among elements involved would help plan and develop a more facilitative and systematic approach to communication processes (Dickens, 2012). In addition, the Communication Network Model (Lindell & Perry, 2004) was used to complement the objective to describe and discuss the communication systems. This approach is based on the communication models (Petersons & Khalimzoda, 2016) of Laswell in 1948 which takes into account the significant role of

the Sender-Message-Channel-Receiver-Effect (SMCRE) and it interdependent relationships that account for an effective communication process as well as Berlo's concept of duality in 1960 of the roles of the sender and receiver, taking into account the environmental, physical and social factors that affect message formation, perception and reception (Littlejohn, 2001; Littlejohn & Foss, 2008).

The analysis of the vulnerability characteristics was based on the socio-demographic factors of the respondents reflecting the actual years of stay in the community, the structure and ownership of their houses as well as their flooding experiences in terms of frequency of flooding, depth of water level in feet, perceived causes of flooding as well as the effects.

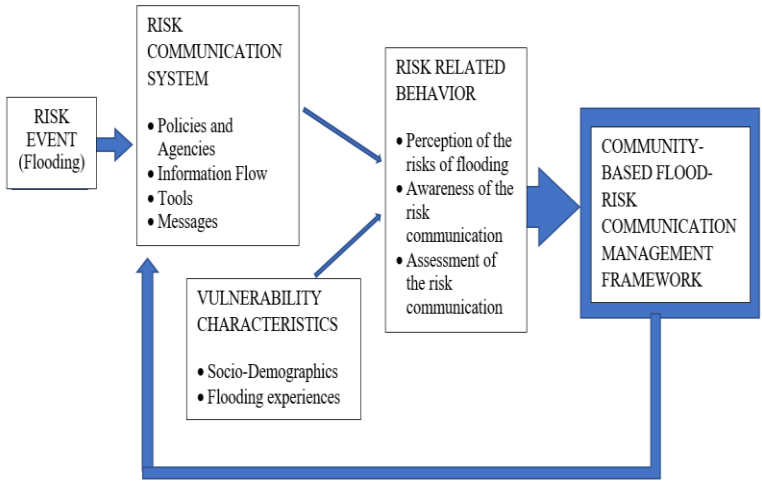
In terms of the *risk related behavior*, the study investigated the flood vulnerable communities' responses to flooding and their perception of risks. The *spread of impact* was investigated utilizing the respondents' awareness, perception and assessment of the current risk communication system.

The *type of impact* is reflected by utilizing the findings from the quantitative and qualitative findings and integrating these results to help develop a community-based flood risk communication management framework for the flood vulnerable communities in addressing a more inclusive risk reduction strategy. It can also provide useful information towards policy recommendations and possible appropriate

governance adjustment in the management of risk communication as well as provide suggestions for appropriate capacity building towards a localized and participatory approach on risk reduction.

Figure 5

The Conceptual Framework of the Study



The conceptual framework used for this study is an integrated model of the social amplification elements in the context of disaster risk management which highlights the following: (1) the analysis looks at the interactions, linkages and boundaries of the communication systems that recognize the roles of the policies involved as well as the multiple actors (agencies and communities); the information flow (strategies, mechanisms and inter-organizational processes; (2) SARF as a comprehensive theory of public experience of risk; and, (3)

integration of risk perception, experiences and feedback of the community will provide policy implication towards a more inclusive and community-based flood-risk communication management towards a localized risk reduction management plan.

Operational Definition of Terms

Flooding - is the specific risk event under investigation in this study, which refers to the rise of water level in the flood vulnerable communities. Flood vulnerable communities have been identified by the disaster risk reduction and management office and have been under close monitoring when there is a rainfall. It often results to inconvenience or possible harm to the communities.

Risk Communication system - the guidelines and flowcharts of the flow of communication being followed, the protocols and the appropriate inter-organizational coordination by the agencies involved in the disaster risk reduction management of Davao City. It is composed of the following elements:

Policies - the legal basis for the implementation of the program which include Republic Act, Local Government Code, City or barangay ordinances;

Agencies - the local government units involved in disaster-related concerns as specified by the RA 10121 in the

NDRRMP and the related policies at the municipal and barangay levels;

Information flow - the structure of the dissemination of messages; it can either be formal or informal; top-down or bottom-up; vertical or horizontal;

Tools - refers to the materials and resources used in the risk communication, categorized as mass, social or electronic media; written; visual; audio or interpersonal;

Messages - information that risk communication is trying to convey to the target audience, for instance, information on location of evacuation centers;

Vulnerability characteristics - refers to how the residents feel threatened about the degree of impact of flooding occurrences to their lives, livelihood and their assumption of the possible causes of flooding and their exposure to flooding;

Socio-demographic characteristics - refers to the combination of social and demographic factors that describe a group or individual i.e., age, gender, monthly gross income, level of education;

Age - categorized according to the NEDA age classification index as young (ages 21 and below); middle age (ages 22-45); senior citizen (above 60 years of age);

Highest level of education attained - the level of education that the respondents has achieved at the time the

survey was conducted. The categories include: no education, elementary, high school, college and vocational;

Monthly gross income - the earnings of the household bracketed using the BIR system for 2017 categorized as 10,000 and below; above 10,000-30,000; above 30,000-70,000 and above 70,000-140,000;

Years in residence - the actual number of years of stay in the community during the time the survey was conducted. It was categorized as: 0-10 years; above 10 -20 years; above 20 - 30 years; above 30 - 40 years; above 40 - 50 years and above 50 - 60 years;

Religious affiliation - categorized into three only: Roman Catholic, Islam, and Others which include Protestants, Baptists and Christians, among others;

Flooding experiences - the frequency and occurrences of flooding as well as depth and effects to the households and community. Frequency has been categorized into always, frequently, occasionally, rarely or no experience. Depth of flooding has been estimated using feet; while perceived causes associated with flooding was categorized into: when it rains, during rainy season, strong typhoons, among others. Similarly, respondents were asked to recall the effects of flooding to households and community in terms of damaged houses, damaged crops, drowned animals, disruption in work or school and dirty environment;

Risk related behavior - response and practices of the residents in preparation and during flooding occurrences in their area which include their responses to flooding categorized into the timeliness of preparation; reasons or motivators to prepare and reasons for evacuation;

Perception of risk - the idea or understanding of the flood vulnerable communities about the risks of flooding which they associate directly to causes of flooding and the impact of the overflowing of the river systems of Davao;

Awareness of risk communication - the respondents' knowledge or familiarity of the risk communication system being implemented by the Barangay Disaster Risk Reduction Management Office (BDRRMO) or City Disaster Risk Reduction Management Office (CDRRMO). Specifically, in terms of the risk reduction strategies categorized into: use of communication tools; trainings and seminars; drills; use of early warning devices like alarm, siren, house to house, use of megaphone and handheld radios and community assemblies. It also included identification of the most common sources of information on DRR strategies as barangay, city or national level. Moreover, the respondents' awareness of the communication tools as source of information on flooding;

Assessment of risk communication - the level of acceptance and evaluation of effectivity of the risk communication system. This was asked using statements

provided by the researcher and the risk communication efforts were rated using a Likert Scale with the following categories: - 1-Very Poor, 2-Poor, 3-Average/Fair, 4-Good and 5-Very Good;

Risk communication - the process of the risk reduction efforts involving the dissemination of information to the communities which involves strategies, tools and messages, both at the level of the national and local communities (barangay);

Community-based - the "localized" and participatory approach whereby communities are empowered to conceptualize, develop and utilize their own strategies and knowledge on flooding occurrences;

Flood-risk communication management - plans and strategies related to the communication of flooding and its associated risks.

Locale of the Study

This study was conducted in Davao City, considered as one of the largest cities in the world with an area of 244,000 hectares covering eight percent of the land area of the Southern Mindanao region (see Figure 6). The entire land area of the city primarily drains itself towards the Gulf Davao River and the Talomo River, the two rivers considered as the most important river basins in the city (Estacio, 2013). The Davao City River

is one of the seven catchments or river basins, which has the largest catchments area of about 1,647 square kilometers. Along with the Davao River Basin is its sub-basin, the Matina River Basin. Davao City is experiencing unprecedented development in recent years, and more so with the Duterte administration's "Build, Build, Build Policy" for infrastructure and development, urban sprawl is evident while sustained growth in central business district allows population to increase in magnified proportions. This puts consequent pressure on infrastructure, natural resources and ultimately contributing to the worsening global challenges on climate change, enhanced green-house gases emissions, lack of appropriate infrastructure i.e., flood control, traffic congestion, and lack of basic amenities (electricity, water, and sanitation) in many localities. Magalang in 2010 cited that the International Bank of Reconstruction and Development (IBRD) considered flooding as the most occurring natural event in the urban areas, thus, "poses a challenge to development and the lives of people, particularly among the residents of rapidly expanding towns and cities in developing countries". The frequency of typhoons and storms that pass through the Philippines makes it more vulnerable to flooding (Magalang, 2010).

Moreover, the United Nations Development Program (UNDP, 2013) has emphasized that Mindanao in the southern part of the Philippines is not traditionally prone to typhoons,

however, the onslaught of typhoon Washi in 2011 and typhoon Bopha in 2012, caused widespread damages and thousands of casualties as well as injuries. While climate projections for the years 2020 and 2050 indicate a generally drying trend in Mindanao, a closer look at regions 10 and 11reveal a positive increase in precipitation during the period of December to January. These experiences have proven that there is a growing trend of disaster vulnerabilities which requires prioritization for climate change adaptation and disaster risk management.

Figure 6

Locator map of Davao City, Philippines (DC-OCPD Manual)

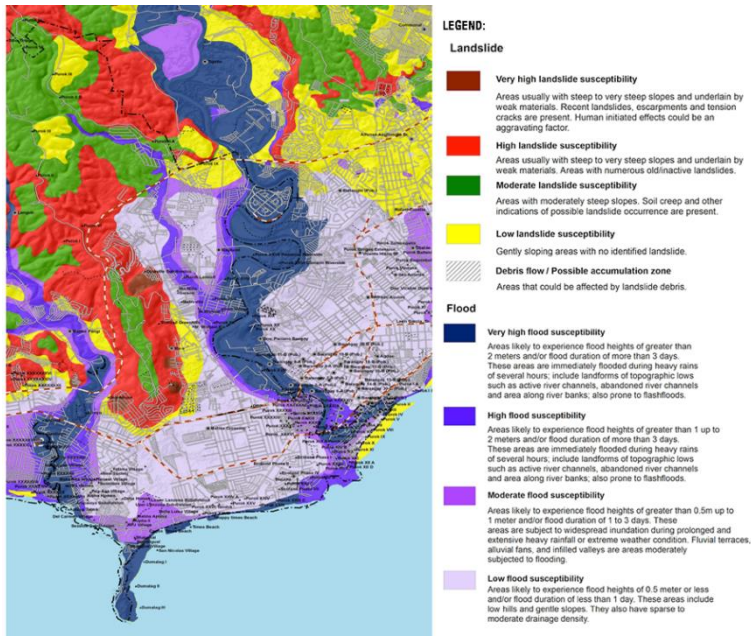
Having an area of 244,000 hectares, Davao City is among the largest city in the world in terms of area. It may be located in typhoon-free zone, but it is susceptible to dangerous floods in areas adjacent to the city's rivers. Largest waterways drain into the Davao Gulf, particularly Davao and Talomo Rivers are the most important river basins in the city and pass through heavily populated areas in the city. Consequently, thousands of residents are most likely to be affected in case of flooding (DC-OCPD Report, 2016; Business World Online, 2015; Magalang, 2010; WB, 2015). One case in point is the flashflood of June 28, 2011 that struck Matina, Davao City in Southern Philippines which has taken tolls on property and lost lives (DCDRRMO report, 2011).

In addition, the disaster vulnerability of some areas in Davao City reflects that majority of the barangays are vulnerable to flooding incidents (Figure 7). Since the Davao river is one of the seven catchments which has the largest catchments area of about 1,647 square kilometers, during heavy down pour, especially in the upland areas, the river overflows. Davao City has a total of 182 barangays, of which 63 have been identified as the flood-prone areas by the Davao City's Disaster Risk and Reduction Management Council (DCDRRMC). Records show that the repeated occurrence of floodings and landslides in Davao City from 2009-2013 caused a total of 77 cases of flooding and one flashflood that affected

a total of 8,656 families (DCOPD Report, 2016). The flashflood of 2011 in the areas of Matina, Davao City, that caused the biggest adverse impact to 3,604 number of families affected (DCDRRMO Report, 2011) showed the need for a policy challenge on the disaster preparedness and response at the community level.

Figure 7

Flooding and Landslide Vulnerability map of Davao City (DCDRRMO Manual)

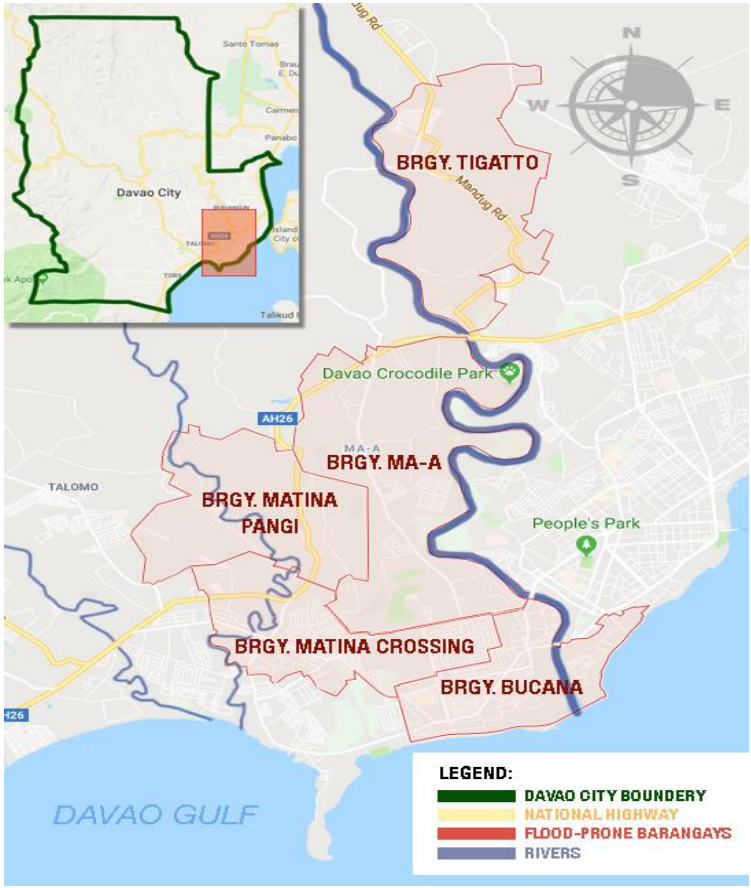


The locale of this study, therefore, was identified using a multi-level purposive sampling using the flood-vulnerability of the community as a major criterion. First, was the identification of the most vulnerable barangays to flooding based on the hazard map of the city and the affirmation by the Offices of

the City Planning and Development and the Public Safety and Security Command Center (PSSCC) as well as the City Disaster Risk Reduction and Management Office (CDDRMO). These include the communities living in Matina Crossing, Matina Pangi, Bucana, Tigatto and Ma-a. The areas are classified as the top 5 flood-prone areas and consisted of both minor and major commercial zones characterized by presence of small, medium and large commercial establishments. Further, the institutions like banks, schools, groceries and public markets are found in the area, which classified the areas as urban with a high-density residential zone and socialized housing zone (DCOPD Manual). However, it is also considered a flood risk area with flood mitigating zones were two major rivers run along the several barangays in Matina, namely: Pangi River (which cuts across Purok Sambag, San Isidro, Guadalupe, Mahayahay, Arroyo compound, Balusong, Lopez Village, Alzate compound, Concepcion compound and Doña Francisco) and Davao River which sets the boundary of the two puroks in Matina Gravahan. As recorded by the Barangay Office, the puroks enumerated above were inundated by the overbanking of the two rivers situated near them for the past years (CDRRMO Reports). Figure 8 shows the location map of the research locale.

Figure 8

Location map of the research locale (DC-DRRMO)



Sampling Design

A multi-stage sampling was employed in this study using the top 5 barangays identified by the DRRMC as the high-risk flood vulnerable areas in Davao City. Because of the possibility that in these flood vulnerable barangays, some puroks may not

be prone to flooding, the flood vulnerable puroks were also selected and a simple random sampling of households was done. The data from the CPDO as regards appropriate clustering of the flood vulnerable puroks were used as the basis for the determination of the total population. Based on the clustering, the puroks were determined to identify the sample population. From this data, a sampling frame was generated from the barangay offices as the basis for the simple random sampling to identify the specific households as the respondents of the survey. To give each household equal chance to be selected, random numbers were generated using the MS-Excel. Using the formula below, a sample size was determined with a 95% confidence level and .05 margin of error.

$$n = \frac{PQ}{d/2^2}$$

where:

P is the proportion of the target population that is based on prior information

Q is (1-P)

d= degree of error

Adjusting for the population of 6,177 in the flood prone puroks, the computed total sample was 376.

$$n = \frac{0.50 * 0.50}{(0.05)/2^2}$$

$$n = \frac{1111}{(1 + 1111/6177} = 376$$

Using proportional allocation, the number of samples by respondents is shown in Table 2. Among the five barangays, Barangay 76-1 Bucana Proper has the highest number of respondents with 135 because it has the higher number of population at risk of flooding. Meanwhile, Matina Pangi with the lowest population at risk has the lowest number of samples with 45.

Table 2

Distribution of survey respondents by barangay and purok.

Flood-Prone *Barangays*	High-Risk *Puroks*	Household Population	Respondents
Tigatto	1. Jade Valley	642	39
	2. Sitio Lourdes	98	6
	3. Uyanguren	210	13
	4. San Isidro	75	5
	5. Sta. Marina	135	8
	Sub-total	**1160**	**71**

Flood-Prone *Barangays*	High-Risk *Puroks*	Household Population	Respondents
76-A Bucana Proper	1. DAPSA	297	17
	2. St. John	283	18
	3. Pasil	1086	66
	4.Agro Compound	252	15
	5. Kasilak	302	19
	Sub-total	**2221**	**135**
Matina Pangi	1. Purok 1-A	105	6
	2. Purok 1-B	84	5
	3. Purok 3-A	197	12
	4. Purok 4-A	126	8
	5. Purok 7-A	230	14
	Sub-total	**742**	**45**
Matina Crossing 74A	1. Arroyo Lower	282	17
	2. Balusong 1	81	5
	3. Golden Valley	260	16
	4. Gravahan 1	269	16
	5. Guadalupe 1	201	12
	Sub-total	**1093**	**66**
MA-A	1. Gravahan Purok3	34	2
	2. Gravahan Purok4	160	10
	3. Purok 20	460	28
	4. Riverside	26	2
	Sub-total	**961**	**59**
	TOTAL	**6177**	**376**

Data Collection Instruments

The qualitative method was specifically employed to describe the communication system on flooding of Davao City. The policy analysis was used to examine the provisions of Republic Act 10121 to identify the protocols that are expected from the implementers of the policy, findings of which were utilized to develop the guide questions used for the key informant interviews to find out how the national policy was adapted by

the city and transmitted to the barangay and purok levels. The data collected from the KIIs were processed through thematic and content analysis to find out areas of concern that should be considered in the development of the questionnaire as an instrument for the survey among the flood vulnerable communities. The findings and results from the quantitative approach, however, were reinforced with the qualitative approach using the focus group discussions (FGDs) conducted after the survey. A total of ten (10) FGDs were conducted in two (2) sets per barangay, comprised of barangay captain, purok leaders and BDRRMC personnel for the Set A representing the implementors, the schedule reflected on Annex Table 1. Meanwhile, the FGDs among the residents of the flood-vulnerable communities as Set B were conducted on different schedule as reflected on Annex Table 3. Focus Group Discussions were likewise conducted for clarification or verification on awareness and perception of the communication system from the implementors at the barangay level and the community as well.

On the other hand, the quantitative method utilized the data from the survey among the flood vulnerable communities to explain their experiences and practices in reducing their vulnerability to flooding. The survey questionnaire was divided into four sections. The first part included questions on the perceptions, awareness, experiences and responses to flooding

occurrences. Specifically, this part included questions to find out the respondents' perception and awareness of risk, knowledge and experiences on flooding, flood-risk acceptance and responses on flooding. Moreover, socio-demographic and economic characteristics were also included in this section.

To determine the respondents' knowledge on the communication protocols and efforts on disaster-related information, the second section includes items that describe the type of information, efforts and activities as well as the sources of information.

The next section of the instrument seeks to find out the awareness and examine the perception of the respondents on the communication tools and the respondents' assessment of the efforts on risk communication based on their attitudes, behavior and responses on the barangay efforts and messages as well as their assessment of these tools and efforts.

The findings of the survey were reinforced through the use of the focus group discussions. The FGDs provided in-depth information to the items included in the survey instrument. Moreover, it provided the participants the opportunity to discuss further some items related to assessment of vulnerabilities, perception and experiences through their narratives. It also provided further discussions on their assessment of the communication strategies as well as their reception of these messages and efforts.

Data Gathering Procedure

The research involved several data collection techniques including secondary data, survey, key informant interviews (KIIs), and focus group discussions (FGDs). The documents consisted of the National Disaster Risk and Reduction Management Plan (NDRRMP), Executive Orders of the Davao City government on the City Disaster Risk and Reduction Management Office (CDRRMO), and barangay local ordinances on disaster plans. These documents were instrumental in describing the existing systems of communication on disaster and risk concerns on flooding from the city government level to the flood vulnerable communities.

Key informant interviews were done in the months of August and September 2017. Representatives from the agencies responsible for the disaster-related incidents such as the: (1) Public Safety and Security Command Center (PSSCC); (2) City Disaster Risk and Reduction Management Office (CDRRMO); and (3) LIGA-Association of Barangay Captains (Liga-ABC) served as the key informants of the study. They were interviewed on the communication system currently being implemented by the city as regards to disasters, particularly, flooding.

Meanwhile, the survey questionnaire was crafted utilizing the literature review, previous studies and some themes from the KIIs. The questions covered in the survey questionnaire

included the socio-demographic and economic characteristics of the respondents and their households, respondents' perception on the risks of flooding, their experiences with flooding, and their awareness and assessment of the barangay efforts in the risk awareness, disaster preparedness, risk reduction and mitigation of flooding. The alpha coefficient for the questions on attitude and perceptions was .904 as indicative of acceptable reliability. George and Mallery (2003 as cited in Gliem and Gliem 2003) provide the following rules of thumb: "_ > .9 – *Excellent*, _ > .8 – *Good*, _ > .7 – *Acceptable*, _ > .6 – *Questionable*, _ > .5 – *Poor*, and _ < .5 – *Unacceptable*" (p. 231).

The draft questionnaire was initially pre-tested to 20 respondents from the Matina Aplaya area on a self-administered approach on September 22, 2017. However, after the pre-test, the researcher found it more appropriate to administer the survey through an enumerator who can converse in the dialect and can expound on some questions that requires elaboration from the respondents. Thus, an enumerator was sought to allow respondents to be clarified on their concerns about the questionnaire in the local dialect. The survey questionnaire was revised according to the results of the self-administered pre-test. The questionnaire was prepared in English but with a translation in the local dialect that the enumerator used during the survey proper. The survey was conducted from November 2017 to March 2018 among 376

respondents in the priority puroks of the top five barangays. It should be noted that 23 survey questionnaires were not retrieved from the respondents due to their inability to complete the entire questionnaires, hence the total number of respondents was reduced to 353. The computed response rate of 94% is higher than the unwritten standards of 86.8% among published journal articles (Carley-Baxter et al., 2008). According to Carley-Baxter et al. (2008) while journal editors overwhelmingly (approximately 90 percent) say that response rate is at least somewhat important in publication decision-making, it would appear that such a feeling or perception is loosely interpreted; that is, there are not written standards or conventions for either reporting response rate information or deciding minimum thresholds.

The focus group discussions were conducted in the five barangays composed of two sets of participants each: SET A categorized as the implementers was composed of the barangay captains, purok leaders and members of the barangay disaster risk and reduction management group; and, SET B categorized as barangay residents was composed of the selected residents from the flood-prone communities. This was done to give the researcher the opportunity to validate the responses and the information from the key informant interviews and further elaboration on the survey questionnaire's open-ended questions. The survey enumerator

also served as the facilitator/moderator of the FGDs to understand the queries from the participants and at the same time capture the elaboration even if the participants spoke Bisaya. Engaging the services of a person who knows the local dialect was found to be useful as participants were able to expound on their ideas in their native dialect with ease and comfortability. Thus, enabled us to solicit a more comprehensive discussion with them.

A transcriber cum documenter was engaged to cover the photo documentation of the process of the data collection. He was also requested to translate into English the transcriptions of the FGD recordings since the researcher is not a native speaker of the dialect.

Furthermore, for ethical considerations, both the survey and the FGDs were conducted with an Informed Consent Form, giving the respondents and participants the objectives of the study and how the data will be processed and utilized for the study.

Data Analysis

Qualitative data were analyzed using themes while quantitative data obtained from the survey of residents of the flood vulnerable communities were analyzed using the Microsoft Excel for descriptive analysis. On the other hand, R software was used for inferential statistics. Descriptive statistics

included frequency distribution, graphs, and computation of mean, whenever applicable. Meanwhile inferential statistics using Spearman's Rank Correlation was used in determining the relationship between the respondents' socio-demographic characteristics and their risk-related behavior. The analytical framework is presented in Figure 9, while the summary of data and methods of analysis is presented in Table 3.

Figure 9

Analytical framework of the study using the Convergent Parallel Design

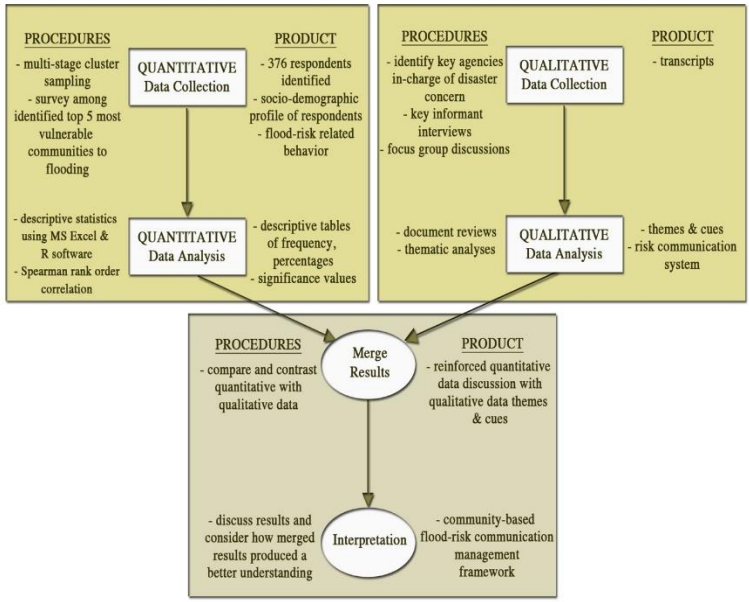


Table 3

Summary of data collected by method of analysis

Data Collected	Method of Data Analysis
SET A - Implementers	
Messages and Strategies for risk communication	Analyses of Transcripts from KII
Existing Policies and Programs	Document review
Information and Communication Flow	Document review
SET B - Residents of flood vulnerable communities	
Socio-demographics	Frequency, percentage, graphing
Residential profile affecting flood vulnerability	Frequency, percentage
Residents' knowledge, attitudes and perception on flooding and risk communication	Frequency, percentage, graphing
Residents' experience and behavior on flooding	Frequency, percentage
Relationship between assessment and socio- demographics	Spearman Rho
Residents' awareness and attitude on barangay efforts and tools	Frequency, percentage
Residents' awareness and sources of information on flooding	Frequency, percentage
Other factors affecting message reception	Thematic Analysis
Integration of the qualitative and quantitative data	Development of the community-based risk communication framework

Results and Discussion

The Current Risk Communication System of Davao City

Risk communication plays a central role in risk management. Several studies have provided different forms, ways, and strategies for transmission of risk messages on the classic linear message transmissions of sender-message-channel-receiver-effect models of Berlo and Laswell (Petersons & Khalimzoda, 2016). Kasperson et al. (1988) viewed that perceptions of risk are influenced by a network of socially mediated communication channels that can be either formal, such as the media, public relations campaigns, and community meetings or informal such as word-of-mouth and interaction within social networks. The process of sending and receiving risk signals involve filtering and decoding, information processing, attaching social value to the information and as an impact, specific mental perceptions and behaviors are expected. This linear communication flow emphasizes the role of source credibility as a significant factor that affects message reception. Lundgren and Mcmakin (2013) however, defined risk communication as a two-way communication which involves the authorities communicating the risk and that of the audience receiving these messages. In reality, there is no one generic guideline of risk communication transmission because of the

dynamics and variations of context among audiences, backgrounds, and environments.

Comfort et al. (1999) emphasized that as risk communication on disaster research has shifted its advocacy towards vulnerability identification, risk perception and community resilience lead to a growing literature on risk communication studies using the complex adaptive systems as the more relevant and integrative communication systems in disaster risk and mitigation. Further, she added that it involves three major components: 1) institutions which provide the technical structure needed to support communication and management; 2) intergovernmental management which refers to the organizational policies and procedures as well as the protocols involved therein and 3) auto-adaptation which provides collective learnings toward openness and willingness to adapt to the context of the disaster situation (Comfort, 2007; Comfort et al., 2004; Comfort & Kapucu, 2006). In addition, Lindell and Perry (2004) emphasized that risk communication should be a process by which stakeholders share information about hazards affecting the community. This is in consonance with the Sendai framework (United Nations, 2015) of establishing the role of governance and policy vis-à-vis community empowerment with awareness of risk. Risk communication approach should cover the practice of identifying, anticipating and responding to risk situations to

reduce to more acceptable levels the probability of their occurrence or the magnitude and duration of its impacts (Lindell & Perry, 2004).

Tselios and Tompkins (2017) viewed that although the central government may be better placed to respond to disaster-related concerns due to greater access to resources, the role of decentralization affects disaster outcomes. Hence, locally based governments or mechanisms may be better placed geographically and physically to respond to local needs. Moreover, relationship between disaster outcomes and political strategies is affected by the local representation in the institutional framework. Thus, it is critical to understand the role of the institutional framework, its policies and mandate and roles in the risk communication system since they serve as the filtering stations for amplification or attenuation (Kasperson et al., 1988).

The Policies and the Agencies involved in DRRM

The NDRRMP Manual states that the Disaster Risk Reduction and Management Act of 2010 which replaced Civil Defense Act of 1954, provides the legal and institutional basis for its framework. It gives the mandate of a top to bottom structure from the national to the local units or barangay. The National Disaster Risk Reduction and Management Council (NDRRMC) is empowered with the policy-making,

coordination, integration, supervision, monitoring and evaluation functions. Although it is headed by the Secretary of the Department of National Defense, it adopts a multi-sectoral representation comprising of sector ministries, civil society organizations and the private sector. The NDRRMC is replicated at the sub-national levels at provincial being the Local Disaster Risk Reduction and Management Office (LDRRMO), city and municipal levels as the City Disaster Risk Reduction and Management Council (CDRRMC) and at the barangay levels with the Barangay Disaster Risk Reduction and Management Committee (BDRRMC). The LDRRMO provides the technical support to the CDDRMC and BDRRMC (NDRRMP Manual).

Presidential decree No. 1566 enacted in 1978, entitled "Strengthening the Philippine Disaster Control and Capability and Establishing the National Program on Community Disaster Preparedness is one of the National Policies that addresses this concern (Saño, 2010). Consequently, Republic Act 10121 or the National Disaster Risk Reduction and Management Act together with the NDRRMP Plan of 2010 provides the legal basis for policies, plans and programs to deal with disasters (Bustillo, 2017; Boquiren, 2017). By law, the Office of the Civil defense formulates and implements the NDRRMP and ensures that the physical framework, social, economic, and environmental plans of the communities, cities,

municipalities, and provinces are consistent with such plan (NDRRMP Manual). The framework envisions a country of "safer, adaptive, and disaster-resilient Filipino communities toward sustainable development", with the coverage of four thematic areas, namely: (1) Disaster Prevention and Mitigation, (2) Disaster Preparedness, (3) Disaster Response and (4) Disaster Rehabilitation and Recovery. The National Disaster Risk Reduction and Management Committee (NDRRMC)'s assessment and identification of the flood risk areas are based on the hazard maps developed by different agencies such as the United Nations, and the Meteorological and Geosciences Bureau (MGB) which shows the vulnerable areas for natural hazards in the Philippines. Other sources include: PAG-ASA and Project NOAH (Nationwide Operational Assessment of Hazards) of DOST that constantly monitor the rain levels and weather patterns in the country's area of responsibility. This allows for the identification of coming typhoons. In the past years, the Philippines had experienced some destructive typhoons which includes Pablo, Pepeng, Santi, Sendong, Ondoy, Yolanda --- which resulted to damage of properties, loss of lives, loss of livelihood.

At present times, the NDRRMP serves as a guide how to carry out: (1) Disaster Prevention and Mitigation; (2) Disaster Preparedness; (3) Disaster Response; and (4) Disaster Rehabilitation and Recovery. It was developed to achieve

"disaster-resilient and safe Filipino communities" (DILG, 2011; ReliefWeb. Int. 2012; WHO, 2011). The NDRRMP base their risk assessments and decisions that determine the Philippines' vulnerability to natural disasters through multi-hazard maps and constant communication with key agencies. In addition, barangay-based efforts in the Philippines have also been developed in compliance to the NDRRMP mandate through the creation of the Barangay Disaster Risk Reduction and Management Plans (BDRRMP) with the major function of "protecting public and private organizations from any forms of disasters, hazards and other risks".

Furthermore, the BDRRMCs have been created with organizational structures with stipulated functions at the community levels. Its plans and projects are implemented by the barangay officials or through partnerships with the private sectors, the NGOs, businesses, local and international organizations. As such, pre-disaster activities at the community levels include information, education and communication (IECs) on areas of detecting, communicating, and preparing for disasters (Villanueva, 2016).

Resource mobilization for disaster risk reduction based on the DRRMP Act of 2010 shifted from response-focused into mainstreaming DRR into development policies, planning and programming as well as in climate change adaptation. It also provides a formula for budgetary allocation and

expenditure of the NDRRMC and LNDRRMC funds which states that "not less than five percent of the estimated revenues from regular sources shall be set aside as the Local Disaster Risk Reduction and Management Fund to support disaster risk management activities such as, but not limited to, pre-disaster preparedness programs including trainings, purchasing life-saving rescue equipment supplies and medicines for post-disaster activities and for the payment of premiums on calamity insurance" (NDRRMP Manual).

In compliance to the national law as regards disaster risk and reduction management, the Davao City Disaster Risk Reduction and Management Council is primarily guided by the Philippine Disaster Risk Reduction and Management Act and Plan of 2010 which was developed to address recurring problems related to disasters. It is a fact that several typhoons occur in the Philippines annually and often results to landslides, flooding that destructs property and causes loss of lives. Thus, it is important that environmental, risk and crisis intervention efforts are applied in the best way possible in natural disaster to minimize physical, social and environmental damage.

The Davao City Risk Reduction and Management Council (DC-DRRMC) Units

The Davao City Disaster Risk Reduction and Management Council (DC-DRRMC) was created as provided for in the Philippine Disaster Risk Reduction and Management Act of 2010. RA 10121 laid the basis for a paradigm shift from just disaster preparedness and response to disaster risk reduction and management (DRRM). There are three major agencies involved in disaster-related concerns of the city. These are the Public Safety and Security Command Center (PSSCC); the City Disaster Risk and Reduction Management Office (CDDRMO) and the LIGA-Association of Barangay Captains (LIGA-ABC) of Davao City (refer to Table 4).

The Davao City Public Safety and Security Command Center (PSSCC), used to be the Public Security Command Center (PSC Center) which was in charge of all peace and order concerns in Davao City. After the devastating flashflood of 2011, it was renamed to PSSCC to cover all concerns related to the safety and security of the city including all forms of hazards, disasters and any form of threat. PSSCC is under the supervision of the City Mayor (EO No. 18 2012). It is mandated to provide framework for collaboration, coordination and inter-operability of all offices, agencies and units involved in the safety, security and crime prevention as well as manage the information exchange and dissemination

across its clusters, namely: Davao City Police Office (DCPO); 1003rd Infantry Brigade, Philippine Army (PA); Task Force Davao; National Intelligence Coordinating Agency of Region XI. Parts of these clusters are the sub-clusters which include the Central 911, the Disaster Risk and Reduction Management Office and the Liga-ABC. Specifically, for disaster risk reduction management, the Core Emergency Cluster includes the: 1) Disaster Risk Reduction and Management Office for disaster concerns, involving risk mitigation, preparedness and adaptation; 2) Central 911 for emergency response; 3) City Traffic and Transportation Management Office (CTTMO) for traffic control and transportation; 4) Task Force Davao (TFD) for security measures; and 5) Davao City Police Office (DCPO) for public safety and mobilization concerns. According to a key informant, there is no protocol on how these agencies collaborate with the other agencies on matters related to disaster risk reduction management guided by the comprehensive and central communications system of the PSSCC but at the same time follow their own protocols in the pursuit of their own unit's specific mandate. Despite the lack of an overall protocol, the key informant added that what is important is that each agency knows their respective roles and tasks and effectively communicates with the other agencies under the supervision of one coordinating office.

Table 4

Matrix of the agencies, legal basis and its functions in disaster operations

Agency	Legal Basis	Tasks/Functions
PSSCC	Office of the Mayor Executive Order #18 Series of 2012	· Serve as the command, control and coordinating area during daily operations, crisis situations and combined security operations. · Develop, create and operate an alternate command and control unit as the need arises. · Maintain a constant and up-to-date city risk assessment on criminality, terrorism and emergencies.
CDRRMO	RA 10121	· Design, program and coordinate disaster risk reduction and management activities consistent with the national council's standards and guidelines. · Facilitate and support risk assessments and contingency planning activities at the local level. · Consolidate local disaster risk information which includes natural hazards, vulnerabilities and climate change risks and maintain local risk map. · Organize and conduct trainings, orientation and knowledge management activities on DRRM at local levels. · Operate a multi hazard early warning system linked to DRR to provide accurate and timely advise to national or local emergency response organizations and to the general public through a diverse communication approach. · Identify, assess and manage hazards, vulnerabilities and risks that may occur in their locality. · Disseminate information and raise public awareness about those hazards, vulnerabilities and risks, their nature, effects, early warning signs and counter-measures. · Establish linkage/network with other LGUs for DRR and emergency response purposes. · Establish a Barangay DRRMO with similar functions and tasks at the community levels.
LIGA-ABC	Sec 491 Local Governme nt Code of 1991	· Give priority to programs designed for the total development of the barangays and in consonance with the policies, programs and projects of the national government. · Assist in the education of barangay residents for people's participation in local government administration in order to promote united and concerted action to achieve country-wide development goals. · Serve as a forum of the barangays in order to forge linkages with government and non-government organizations thereby promote the social, economic and political well-being of the barangays. · Exercise such other duties and functions which will bring about stronger ties between barangays and promote the welfare of the barangay inhabitants.

The Davao City Disaster Risk Reduction Management Office (DC-DRRMO) is another agency crucial to the delivery of risk reduction and management concerns at the municipal level. It was established in compliance to the Republic Act 10121 or the "Philippine Disaster Risk Reduction and Management Act of 2010" which is responsible for setting the direction, development, implementation and coordination of disaster risk reduction and management programs within their territorial jurisdiction. The office is guided by the City Disaster Risk and Reduction Management Plan (CDRRMP) crafted by the City Disaster Risk and Reduction Management Council (CDRRMC) where the head of CDRRMO sits as a member. The specific tasks and functions of the DRRMO serve as the implementing guidelines of the national policy in the context of Davao City. It covers the areas of mitigation, preparedness, response, and recovery stages in any disaster which are specifically defined under the National Disaster Risk Reduction Management Plan (NDRRMP) of the Philippines. However, according to the key informants, the CDRRMP of Davao City does not reflect a particular focus on flooding, rather, include all the disaster risks such as earthquake, tsunami, landslides, fire and terrorism attacks. Moreover, the communication strategies do not focus on particular contexts of each disaster, rather, include general considerations for communication inclusive for all types of disasters, both natural

and man-made (Bustillo, 2017; Boquiren, 2017; De Leon, 2017). Based on the documents provided by the CDRRMO, however, the organizational structure reflects five sections such as administration, training, planning and research, operations and warning, and Central 911 response units headed by different persons.

The third agency considered significant in disaster-related concerns is the Liga-Association of Barangay Captains of the Philippines (Liga-ABC). Although the Association of Barangay Captains or Liga as formulated under Sec 491of the Local Government Code of 1991 under Republic Act 7160 (Arellano Law Foundation, 1991) was originally for the monitoring, implementation and empowerment of the barangay governance, Davao City's Disaster Risk Reduction and Management Council (DRRMC) considered the communities as integral part of the system that handle emergency and disaster cases at the level of their accountability. Thus, under the Executive Order #18, s2012, the Liga-ABC has been considered as one of the sub-clusters for the direct coordination at the level of the communities.

This unit is tasked in awareness raising, monitoring and assistance in line with the disaster and disaster-related concerns which specifically affects the barangays. The president of the Liga sits as a member of the DRRMC of the city. According to the disaster and emergency in-charge (Umpig, 2017), Liga is in-

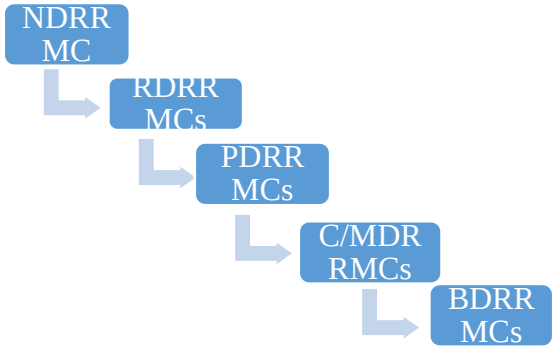
charge of coordinating among the barangay captains of Davao City the concerns that are relayed through their office including projects, plans, and issuances from the Department of Interior and Local Government (DILG). As member, the president is tasked to cover disaster and disaster-related concerns at the barangay level. For instance, Liga facilitated the systematic and organized conduct of this study through a memo sent to the barangay captains of the selected study sites.

The Flow of Communication

Information on disaster risk reduction and mitigation follows a "top-down" approach. Figure 10 shows the organizational set-up of the Philippine DRRM as regards the concerned agencies in compliance to the stipulations as mandated by the RA 10121. Similarly, the bureaucratic flow of communication follows the downward communication flow (Figure 10).

Figure 10

Philippine's DRRM organizational framework (NDRRMP Manual)



In the case of the barangay level DRRM, the trained community response team is expected to transfer the information to their respective communities. The members of the Community Emergency and Response Team (CERT) in every barangay who are expected to cascade the information to all the members of the community are required to undergo trainings. However, one key informant shared the lack of mechanism that would allow the CDRRMO to monitor how far is the extent of the reach of the transfer of information at the household levels. This is mainly because CERT members are under the supervision of the barangay captains and the purok (zone) leaders. During the FGD, the participants shared that some barangays like Bucana have initiated the participatory approach in warning people about the flooding incidences.

This current structure in the flow of communication was affirmed by the participants in the focus group discussion conducted among the barangay, purok leaders and disaster response personnel. However, it was further learned that the members of the CERT do not transfer the information, but it is the barangay captains who disseminate the messages from trainings or drills through the purok leaders who in turn relay the information to the residents. Generally, the transfer of messages is implemented through the issuance of a memorandum or via oral message using the handheld radios.

The barangay officials and selected residents who attended the FGDs reported that they ensure that during rainy days at the upland flood vulnerable areas, weather updates are closely monitored on the lookout for possible flooding that can affect low-lying communities. They added that barangay efforts to deliver trainings, seminars, and drills for awareness and preparedness are dependent on the availability of resource persons and LGU funds for such purpose. They also rely on the sponsorship of volunteer organizations like schools or non-government organizations to deliver these activities for them.

Majority of the FGD participants also agree that the barangays rely on the information coming from the agencies that serve as the filtering stations. As such, the role of the LGUs, CDRRMO, Philippine Red Cross, some non-government organizations (NGOs) and educational institutions, weather bureau, mass media, the church and the City Information Office play significant roles. All the implementors also confirm that most of the communication flow is top-down whereby all messages originate from the higher agencies and cascaded to the communities.

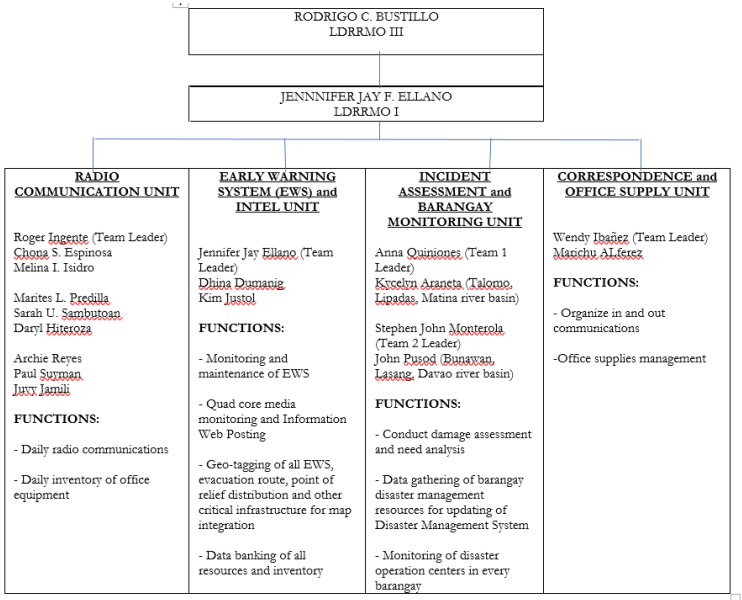
This current one-way flow of information, however, has shortcomings. O'Sullivan et al. (2012) stressed that as long as the communication flow is only a top-down mechanism, change is not likely to happen because it does not give room

for possible engagements. Moreover, some problems caused by political and social dynamics within the government, key agencies and authorities, and the public may also affect efficiency of implementation (Terpstra et al., 2009). Thus, there is a need to examine the role of the agencies and determine if the communication flow is managed according to the protocols specified in the institutional framework. Operationalizing Kasperson's amplification of information is dependent on how the agencies as "filtering stations" use the information, specifically the risk messages involved. An inter-organizational communication system depends on the access to information and the range and quality of information available to operating personnel.

The organizational set up shows that there are four (4) different units under the Operations and Warning Section (OWS) of the DRMMO (Figure 11). These are the Radio Communication Unit, System and Intel Unit, Assessment and Barangay Monitoring Unit, and Correspondence and Office Supply Unit. Each unit is headed by a Team Leader and has specific functions. The interview with the head of the Operations and Warning Section of the DRRMO suggests the interoperability of the different sections to achieve the efficient and effective implementation of their operation. The radio communication unit is in charge of transmitting the daily messages through the radio.

Figure 11

Tasks & Functions of the Operations and Warning Section, DRRMO



The in-charge of the unit ensures that everyone is informed and alerted. For instance, in case of weather disturbance, upon receipt of the information, it is widely disseminated through radio broadcast to all barangays, private institutions, hospital and academe tied up to the base can receive the information on pre- and during disaster eventualities. This is reinforced by the monitoring and maintenance of early warning system, quad core media monitoring and information, and web posting functions of the System and Intel Unit. The third and fourth units are concerned with assessing the needs, monitoring and assessing the damages, and monitoring of disaster operation

center while the fourth unit is in charge of logistics like office supplies management and record keeping.

Generally, the OWS relies on radio communication which links CDRRMO with key barangay officials like barangay captains and the Barangay Disaster Risk Reduction and Management Committees (BDRRMC). The key informant also emphasized that crucial to any barangay level disaster team is the presence of a radio communication system.

Hence, the high-risk areas to flooding are required to set-up a radio communication command unit for faster dispatch of information and efficient management of response actions. The key informant stressed that

"… *we already established different protocols especially for communication. We ensure that during disaster one of the vital requirements for disaster management is through communication. So now, one of our protocols is to ensure that all barangay or at least the high risk or hazard prone areas must have their own disaster operation center equipped with radio, cellular phone, and computer*."

Communication Strategies

The challenge in any communication to be effective is the identification of the crucial role of its interdependent elements of source-message-channel-receiver to achieve a successful outcome. In the case of risk communication, the greater challenge is the identification of the target audience as a major

consideration prior to the designing and planning the appropriate methods and channels to relay the risk messages. It is also necessary to identify the relevant information in the different stages of the disaster cycle.

Figure 12 shows the DRRM framework of Davao City with the specific tasks according to the disaster management cycle. The plans and strategies vary based on the different outcomes expected of the agencies. In the case of the risk communication, it is targeted among the most vulnerable communities. Specifically, for flooding concerns, the results of the key informant interviews and focus group discussions reveal that the focus or priority is to address the information campaign among the top five (5) flood vulnerable communities of Matina Pangi; Matina Crossing; Ma-a; Tigatto and Bucana as reflected in the Davao city hazard map.

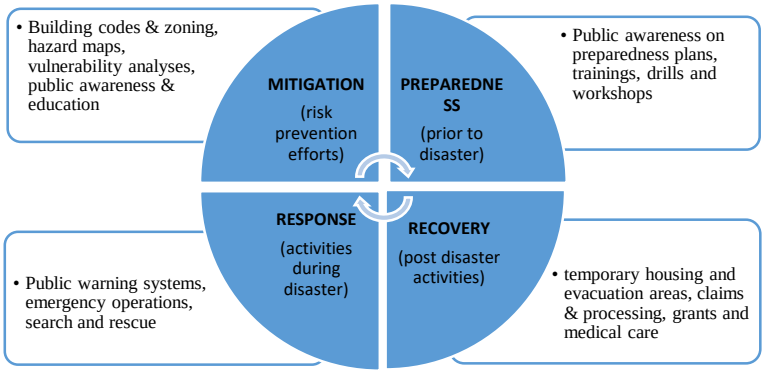
Interoperability of the Agencies

Comfort and Kapucu (2006) emphasized the need for integration as the number of organizations engaged in disaster related concerns. Achieving coordinated action among disparate group of actors depends fundamentally on their access to timely, valid information and their capacity for information search, exchange, absorption, and adaptation. Moreover, Carcellar et al. (2011) stressed the significant role of the interplay of institutional partnerships and inter-

governmental network system that encourages collaboration in the disaster management and risk reduction strategies.

Figure 12

DRRM Framework of Davao City



The PSSCC serves as the center for coordination on matters of public safety with linkages to the following government agencies: (1) Davao City Police Office (DCPO) - on crime prevention, suppression, and investigation; (2) City Traffic and Transportation Management Office (CTTMO) - on traffic management and enforcement; (3) City Health Office (CHO) and City Social Services and Development Offices (CSSDO) - on actual and emerging health emergencies and management of victims and emergency shelters; (4) Central 911, Bureau of Fire Protection, Red Cross and volunteer organizations - on all types of rescue services, including fire prevention and suppression, and hazardous materials response; (5) Davao City Disaster Coordinating

Council, Office of the Civil Defense, and Regional Disasters Coordinating Council - on planning and responding during calamities, disasters, and other special events.

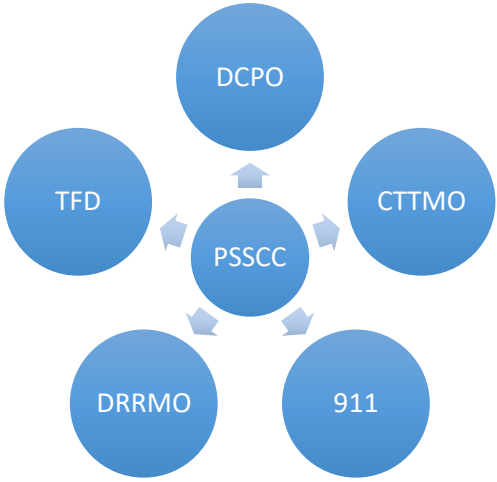
Davao City is known and prides itself for having a Central 911 for its emergency and response concerns since 2002. However, the presence of this center was not sufficient to address the concerns of the Davao City flashflood which struck the Matina area on 2011 that resulted to casualties and damage to properties and disrupted economic activities of the affected areas. This disaster posed a challenge to the current set-up of the City as regards safety and security of its constituents (Cayamanda & Lopez, 2016). Thus, establishing the intertwined role of the 911 vis-à-vis the Disaster Risk and Reduction Management Office under one office is compliant with the US standard for emergency response (Boquiren, 2017).

To perform inter-organizational integration, organizations and systems must be able to interoperate (Kalatzis et al., 2019). Interoperability was first defined by the United States Department of Defense in a 1977 North American Treaty Organization document as "the ability of systems, units or forces to provide services to and accept services from other systems, units or forces and to use the services so exchanged to enable them to operate effectively together" (Kubicek et al., 2011).

Highlighting the value of interoperability in each responder towards any eventuality being handled by the entire network of agencies, Mr. Boquiren visualized the coordination among agencies using a diagram (Figure 13) and highlighted the significant role of the City Mayor, the head of the PSSCC in overseeing and managing the entire operation. The Center has the mandate to maintain and sustain the inter-operability of the different agencies for a better management of communication and related concerns in addressing security and safety of the public.

Figure 13

Interoperability framework of the PSSCC (Boquiren, 2017)



The coordination that takes place in Davao City demonstrates the significant role of interoperability of the agencies working towards the safety and security of the people

from the flood vulnerable communities. As far as the CDRRMO is concerned, the City is prepared and has addressed the problem of communication management at the City level. The City has the necessary equipment, evacuation centers are in place, and the agencies like the City Social Services Department Office and City Health Office know their roles and responsibilities when disasters occur. Despite the preparedness, availability of sophisticated equipment, and plan for worst case scenario, the key informant believed that the best solution is to evacuate the residents of flood vulnerable areas.

The discussion highlights the significant role of the agencies in communicating risk and make people aware and be alert during impending eventualities. It was also mentioned that aggressive campaigns are being done despite the observed lack of manpower and at times funding to implement the strategies to increase the level of preparedness and awareness. Moreover, they have not been able to develop communication tools inasmuch as they could. They have plans of developing localized posters, brochures, and pamphlets, but unable to do so because of limited resources. Thus, the CDRRMO concentrates more on other channels of communication. Significantly, radio communication becomes a major channel, followed by social media and cellular phones to communicate with the key persons at the community levels. Moreover,

CDRRMO relies more "disaster response" through coordination with other agencies like the City Engineer's Office to access needed heavy equipment and additional assistance from the City Police Department during evacuation.

The CDRRMO, through the key informant, has expressed their appreciation on the role of the academe and other institutions which transform the technical materials into simple messages that can be readily transferred to the communities. He cited the University of the Philippines' (UP) Project Noah which have popularized the technical information. However, there are missing information that reflect the real situation in the communities. That is where, they rely on the experiential knowledge from the community itself. Direct interaction with the community makes them understand the real-time situations which can help them develop more approaches appropriate to the situation of the flood vulnerable communities. Moreover, there is a need to transform the reactive approach to a proactive approach in terms of disaster and related concerns.

Moreover, the key informant believed that there are still areas for improvement in responding to flooding and other disasters. Specifically mentioned was the need to intensify the information and education communication (IEC) as well as the development of communication protocols to address the transmission of information at the community levels.

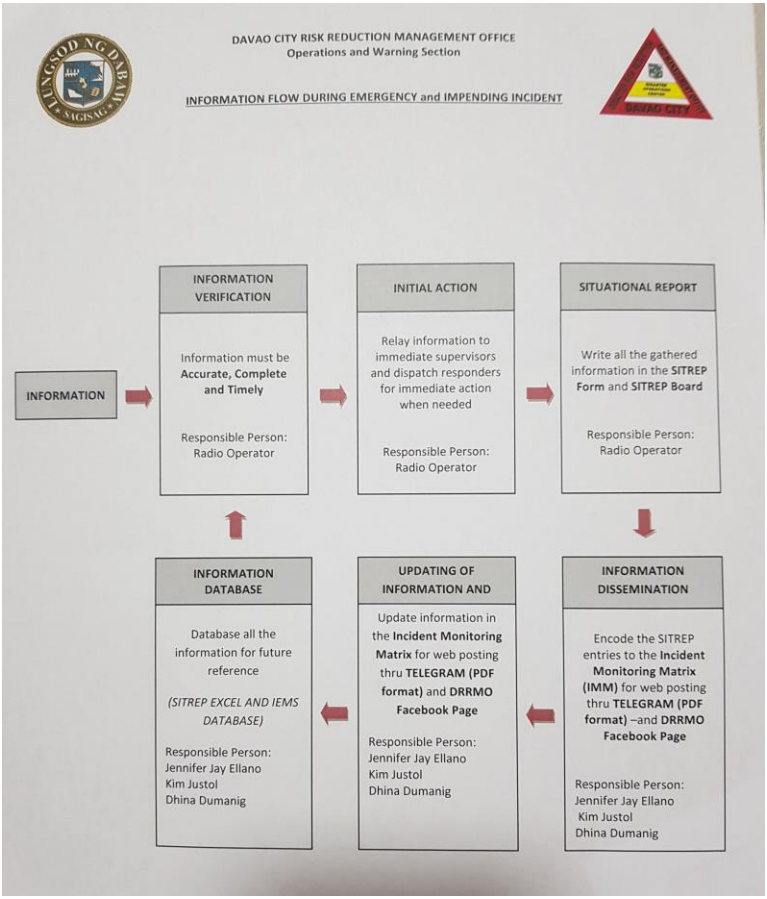
Moreover, these risk messages should be converted from generic messages into localized messages applicable to their context and experiences for better appreciation of the residents. This is where the CDRRMO needs assistance in translating the technical and scientific information for the residents to understand and appreciate. As a result, many IEC materials from the national agencies are wasted. The key informant also shared that national government agencies should "*give us directly what is happening. So kung tumataas ang tubig (if the water level rises, give us the height na... di na kailangan pa na ianalyze pa namin yan (no need for us to analyze the technical outputs) because we have no time to do it*". The key informant is referring to the automatic weather station and radar from the Department of Science and Technology (DOST).

A critical part of the OWS task is to ensure that credible information is disseminated (Figure 14). Critical to any disaster response is the validity of the information to help the concerned agencies prepare and respond to the emergency or impending incident and not create panic reaction from the public. Hence, the diagram shows the step-by-step procedure to observe and to follow for which the section in-charge is trained. The key informant stated that "*because if you have wrong information it will cause panic*." The protocol, thus, is considered very important to ensure appropriate and credible

amplification of messages are cascaded to the community where accurate information is most needed.

Figure 14

Protocols for information flow during emergency and impending incident (DC-DRRMO)



Moreover, the communication strategy also involved the identification of the ***priority target***, specifically, those areas that experience recurring flooding incidences like those located

near the riverbanks (Figure 15). The results of the recent vulnerability assessment of the DRRMO in collaboration with UP Mindanao revealed that the experts verified that among the disasters and hazards, Davao City is most vulnerable to flooding.

Figure 15

Flood vulnerable communities near the riverbanks, Davao City

Another strategy used is the use of ***fear*** to amplify the risks of flooding. A key informant reported to have used fear as a strategy to compel people to be responsible and be prepared to any disaster. Some residents can be stubborn and would not evacuate for fear of losing their material possession at the expense of their safety. This is when the key informant tried to amplify the risk with threat and by being aggressive to send the message across. He also mentioned the name of the

Mayor for the residents to accept the responsibility by being vigilant and alert at all times. In addition, citing the law and the importance of compliance to the law as citizens, he stressed that proactive approach can better prepare the communities than the usual reactive stance. Thus, part of his advocacy is to change the mindset of the residents and make them realize the significance of preparedness than emergency response towards any disaster eventuality.

Another strategy is the use of ***inter-governmental management***, the theme of amplification of information emerged reflecting that majority of the barangay-initiated seminars, lectures, and trainings were conducted in collaboration with external organizations such as schools and universities, the Philippine Red Cross and NGOs. However, it was expressed that since the activities were dependent on external funding, these initiatives were not regularly conducted which affects the continuity of the awareness and preparedness at the level of the communities. There was also the observed regularity of weather updates during rainfall to give the communities the necessary information for preparation and possible action on flooding incidences.

Communication Tools

Risk communication is a component of risk governance towards disaster mitigation, preparedness, response, and

recovery. Thus, risk communication is usually aimed for making people aware of the risks; improve their knowledge on possible disasters and be prepared; change their attitude towards preparation and changing eventually their behavior. Lindell and Perry (2012) emphasized that the transmission of risk messages is usually based on the classic model of source-channel-message-receiver (SMCR) and that the selection from a variety of tools requires the examination of the target audience for appropriateness and effectivity.

It also follows that when multiple tools are being used for a particular message, consistency and uniformity should be observed to avoid confusion.

Adopting the DRRM communication tool matrix of Georgia, the different tools listed below are categorized according to its usage in the stages of early warning and awareness (CENN, ND). Among the communication tools specified below, the postal or direct mailing is not utilized in Davao city due to the cost that it would entail for the agencies. The discussion of these tools would be further categorized into mass, social and electronic media, visual tools, written tools and interpersonal tools.

Tools	Messages	
	Early Warning	Awareness
Mass Media (TV, Radio, Newspaper)	X	X
Electronic media (WWW, SMS, MMS)	X	X

Tools	Messages	
	Early Warning	Awareness
Audio-visual (video, audio, multi-media, animation, photographs, model, map, slide show, artwork, graphs)	X	X
Postal (direct mailing)		
Stand-alone print (billboard, poster, banner, warning sign, flood water level)		X
Distributor print (leaflet, pamphlet, brochure, booklet, guideline, case study, newsletter, journal, research paper, report)		X
Face-to-face (meeting, seminar, workshop, conference, march, exhibition, demonstration, training, exchange visit, planning)		X
Folk media (story, drama, dance, song, puppet, music, street entertainment)		X
People (community leader, volunteer, project worker, head of sectoral groups, i.e. tribe, women, youth)	X	X

Mass, social, and electronic media

The use of mass, social or electronic media is possible and can be used at all phases of the disaster management cycle as long as communication facilities are not destroyed. It can provide information for preparedness as early warning as well as situational updates during the onset of the disaster (Clerveaux et al., 2009).

In the Philippines, oftentimes, mass media has been the major avenue for the information dissemination at the national level. Hence, majority, if not all, has the access to television,

radio or newspapers. In the recent typhoons and storms, it was observed that text messages are also utilized by both the NDRRMC and CDRRMO to give weather updates and warnings for possible typhoons and flooding outcomes.

At the level of the city, the CDRRMO also utilizes electronic media, particularly, the social media like Facebook through the Davao City official FB account or the Information and Inquiry Page of Davao City (Figure 16) to post signage and warnings on flooding to reach wider audience, particularly the youth, in order to update the community on the weather condition and also warn them if there will be flooding.

The key informant, Mr. Bustillo (2017), emphasized the significant role of social media and other forms of electronic communication to relay the information to make people aware and upgrade preparedness level. In all these activities, a strategic approach is to collaborate with other agencies. Not all areas can be covered by the CDRRMO alone and they admitted that the communication efforts should be a collaborative action from different agencies. The text messages of the NDRRMC on weather disturbances and warnings for any flooding and other disasters helped them implement their task of influencing the people of the barangay to prepare and evacuate if needed.

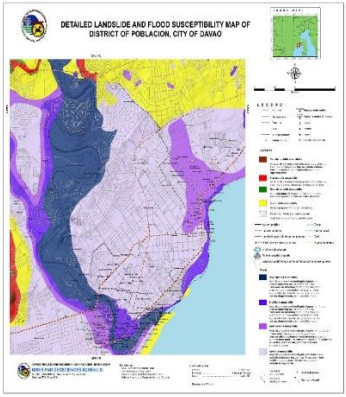
Figures 16

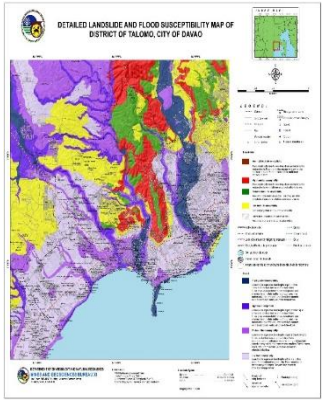
Sample postings on social media

Among the audio-visual tools, the most commonly used are the maps, specifically, the Geographic Information System (GIS) to identify the most vulnerable communities. The GIS outputs are hazard maps which vividly capture the level of risk of flood prone areas (Figures 17). Similarly, a hazard map from the DOST which captures the 100-year rain return flood hazard map for the visualization of the possible flooding and flashflood incidences.

Figures 17

Sample hazard maps utilized by the CDRRMO





Visual tools

Among the stand-alone prints, results of the KIIs and FGDs revealed that all the tools under this category are being used as billboards, posters, banners, warning signs and flow water level. Specifically, the DRRMO uses the communication tools provided by the national agencies such as Philippine Atmospheric, Geophysical and Astronomical Services (PAGASA); Department of Interior and Local Government (DILG), and NDRRMC. Examples of these are attractive color-coded rainfall warning (Figure 18) and storm warning system posters (Figure 19). At the barangay levels, signage are also used to give vital information and warnings (Figure 20).

Figure 18

Rainfall warning (DRRMO)

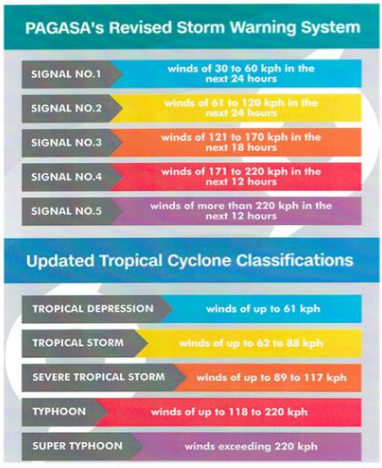


Figure 19

Storm warning system (PAG-ASA)

Figure 20

Signage in the barangay

The key informant expressed that the shortage of personnel in-charge delimits the creation of more local communication tools. The DRRMO relies more on the reproduction of materials from the national agencies for dissemination to the communities and warn them to prepare for any eventuality posed by flooding in the areas. Incidentally, brochures or flyers are also being distributed among the barangays as they receive them from the national agencies. However, due to limited number of copies, the CDRRMO prioritized the flood vulnerable communities. Some barangays with sufficient budget allocation may reproduce these materials to augment the copies coming from the CDRRMO.

Written Tools

For distributor prints, it was found that the most commonly used are brochures (Figure 21), flyers, leaflets and posters (Figure 22). Although there have been studies conducted about flooding and disasters in the area, case study, research report and other academic papers are mostly utilized only by the implementers for review, when necessary.

These materials from the national agencies are usually converted into billboards or signage for distribution to offices, schools and areas for the entire community to see.

Figure 21

Sample brochure (DENR)

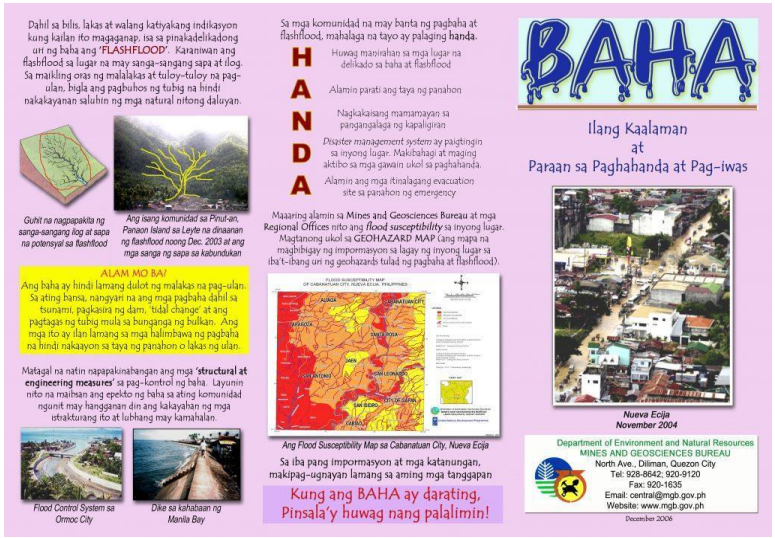
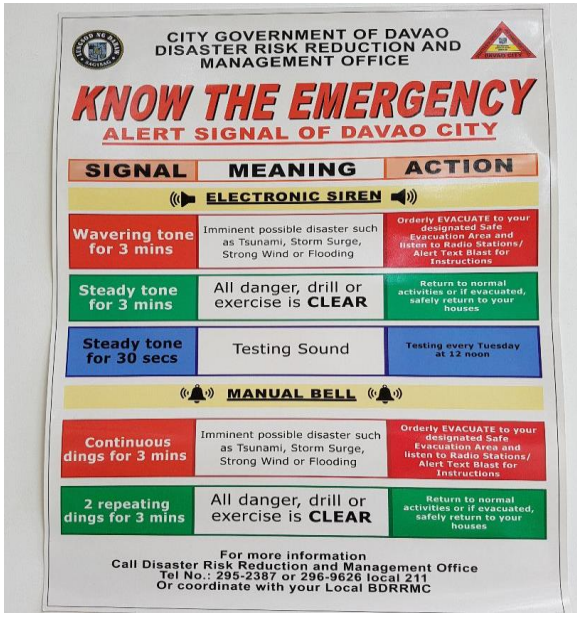


Figure 22

Sample poster (DC-DRRMO)



Other materials for dissemination to raise public awareness on the risks of flooding and other natural disasters include posters and brochures. However, due to limited number of copies, the CDRRMO prioritized the flood vulnerable communities. Some barangays with sufficient budget allocation may reproduce these materials to augment the copies coming from the CDRRMO. Other signage or markings are placed in structures like the pillar of the bridge to reflect real time water level. The FGD participants validated the distribution of the communication tools from the NDRRMC and CDRRMO, however, majority of them explained that they cannot develop nor reproduce communication tools due to limited manpower and budget. Surprisingly, the same FGD participants have plans to improve their DRRM communication strategies by: 1) developing communication tools and intervention strategies for persons with disabilities (PWDs), senior citizens; 2) collaborate with volunteer groups and sponsors for a disaster-resilient community in terms of infrastructure and community-based disaster response protocols; 3) activate purok disaster teams (PDaTs) and Community Response Teams (CRTs); and 4) develop more aggressive awareness campaigns and not rely only on "experiences" to respond to disaster situations like flooding.

Interpersonal Tools

A key feature of the interpersonal communication approach is the use of oral communication which allows the immediate response and feedback mechanism.

The CDRRMO utilizes the face-to-face interactions during seminars, trainings and workshops to help the communities recognize the gravity of the impact of flooding and other disasters. The planning and research staff transform the technical information into simple communication materials using layman's terms for ease of understanding of the people. Moreover, the modules for capacity building include the results of the needs assessment conducted by the research staff as well as the experiences of the people. The key informant finds the face-to-face interaction to be more effective than any other means of communication because people appreciate being asked of their situation that somehow ensures positive reaction to be prepared and cooperate for the follow-up activities through constant radio communication. Other forms of interpersonal communication include word-of-mouth, house-to-house visits and community assemblies which encourages transactional approach and encourages the immediate response or action to the messages. Results of this study show that at the onset of flooding, the use of word of mouth among the residents as regards warning and emergency messages becomes the basis for evacuation response.

For the FGD participants, utilizing all forms of communication from formal media such as TV, radio, signage, posters, brochures, pamphlets to informal channels like word-of-mouth, and social media should be explored. In terms of the timeliness of the warning signals during the onset of flooding, they reported that house-to-house and roving of in-charge using megaphones is a reliable and important tool.

Based on the above discussions, operationalizing the "ripple effect" can be observed through the transactional process and communication channels involved in the DRRM of Davao City. Finally, the key informant added that communicating risk and preparedness should be a continuous effort to sustain the community's motivation to be alert and prepared at all times.

According to one key informant (Bustillo, 2017), communication is critical in managing disasters. At the onset of the flooding incidents, radio communication plays a role to disseminate information and warnings to the communities that may be affected. During flooding, the cellular phones and megaphones become alternative channels to disseminate warning and to inform concerned agencies of the real-time situation at the community levels. It was, however, emphasized that communities should be capacitated to respond to flooding. Since there are situations that require quick response

and it would be an advantage if communities are better prepared. He stressed that:

"*communication is a vital tool in disaster management. One cannot communicate if you don't know how to reach out to these people. We have to identify team leaders and volunteers to coordinate as responders at the community levels. Not all the time the Central 911 can respond immediately since sometimes there are cases of simultaneous emergency and disaster incidents. Communities must be organized to respond to their own situation and not rely solely on 911 responders.*"

This particular emphasis on community preparedness and communication management puts priority on the community's capacity to strategize and develop its own initiatives to consider the importance of social networks and collaboration among individuals in the community.

Audio tools

In terms of the audio tools which serve as critical to disaster preparedness and response, the interviewee reiterated the significance of radio communication as the priority channel and part of the disaster funds of each barangay is for the purchase and set-up of a radio communication center. It does not only serve its purpose during disaster and emergency response rather, it also become a vital tool for faster and wider scope of information dissemination across the communities, the concerned agencies and among the volunteer organizations

that respond to any disaster or emergency. Furthermore, it is more sustainable at the community level due to its low maintenance and easy to operate compared to cellular phones. Moreover, there is also the common usage of loudspeakers, specifically during early warning signals among the communities. Since communication is critical during emergency situations, the most commonly used are the audio materials like radio communication, loudspeakers, siren or alarm, and ring tunes.

Communication Messages

Messages for awareness

The study revealed that trainings and seminars involved topics that helped them become aware of the risks and hazards of disasters like flooding, earthquake, fire, tsunami and even climate change. In most cases, discussion of disasters does not specifically focus on flooding, rather, it is discussed in the context of natural disasters which encompasses all the other disasters. Hence, there is the lack of emphasis on flooding concerns which the flood vulnerable communities need. Drills, on the other hand, are geared towards capacity building among participants on what to do to prevent, mitigate, act upon and rehabilitate after a disaster. Moreover, awareness of the early warning system being implemented within the community such as the alarm signals, flood water monitoring and typhoon

warning signals. Other topics include the guidelines for evacuation when necessary and the parameters for emergency response. It was, however, emphasized by the residents that some trainings and seminars focus more on utilizing visual aids and materials that are using technical terms and sometimes resource persons at the barangay level cannot simplify it and thus become irrelevant to them due to confusion and lack of appropriate understanding of the message. Moreover, the seminar speakers rely on the materials from the national agencies in terms of typhoon warnings, hazard identification and evacuation guidelines. Some items were not directly targeted to their specific context. One instance cited by one of the residents of Matina Pangi, an area vulnerable to both flooding and landslide, is the difficulty of identifying which is more dangerous and riskier, landslide or flooding. Since seminars discuss landslide and flooding separately.

Messages for preparedness and warning

The implementers have identified preparedness intervention such as drills for emergency response and alert level parameters, rescue and recovery mechanisms and first aid information. The implementers and residents agree that aggressive campaign should be done to disseminate information on preparedness and warning as part of the pre-disaster stage so as to capacitate the communities for early

detection of danger signs and voluntarily respond accordingly without waiting for instructions from the concerned agencies. However, the nature of the messages being given through the tools for this purpose, does not reflect the specific guidelines for any disaster or eventuality. In most cases, drills and trainings focus on first aid, basic life saving techniques and medical response. Basic preparedness and warning that the households can use for emergency situations are information about safety and timeliness of response to any disasters. Some residents highlighted that at the onset of flooding occurrences, they rely more on their previous experiences and information by word of mouth in terms of validity of emergency information. In most cases, information about directions where the evacuation centers are located becomes the highlight of the messages addressing preparedness and warning. Although they are familiar with the usage of siren/alarm and loudspeakers to alert them when flooding occurs.

Barriers and Challenges

However, in terms of the residents' reception of the CDRRMO efforts, the key informant emphasized that it cannot be avoided that despite the efforts to have an inclusive training and preparedness enhancement, some residents would be resistant to the idea, capitalizing on the fact that their experience and length of stay in the area have given them

sufficient knowledge and can help them prepare for any eventuality. To this, he specified that at times, there is a need to amplify the risk to change their mindset to listen and heed to warnings of the PSSCC. For instance, the key informant capitalized on the casualties and damage to properties of the 2011 flash flood in Matina to emphasize the risk and the gravity of disasters, which exemplifies Kasperson's idea of risk amplification. Through giving vivid examples with negative outcomes, the source of the message, CDRRMO, attempts to change the mindset from complacency to a proactive stance to make the people more receptive to the risk messages and be mindful of the possible negative impacts of the disaster that they thought as a regular occurrence. One interviewee also emphasized the lack of sufficient personnel and limited resources to help them perform this task for a wider reach of their messages. Hence, they rely on cascading the knowledge and information from the barangay officers to the households through the trained purok leaders and provision of posters. This practice also shows the possible problems when the trained officials who are expected to transmit the messages do not deliver and cascade the information to the communities. It also creates problems when the residents themselves prefer not to participate for whatever reason as reported by a member of CERT. Sometimes, this non-participation is translated to non-reaction to evacuation orders during flooding.

Admittedly, the key informant aired the problem with illegal residents in danger prone areas who are stubborn but cannot be ignored during flooding. He added that as a disaster manager, he is recommending to totally relocate the households living within the waterways and the mangrove areas that are easily affected during monsoon. Simply put, some problems of these flood vulnerable communities are brought about by the conditions as consequence of poverty. Contributory factors to the vulnerability of these communities are their decision to stay in the areas despite the awareness of the risks and dangers associated with their settlement in these areas. In this case, the only proactive strategy is to upgrade early warning devices and enhance awareness and preparedness of the residents to minimize the impact of disaster.

The key informant also reiterated that everything about disaster and related concerns would be efficiently managed with the cooperation and systematic coordination among the agencies involved, volunteers, and the community at large. The Local Government Units (LGU) may be at the forefront but it needs the assistance and cooperation from other agencies and the community as well to be able to deliver efficient services and have positive outcomes. The implementers also expressed that there were constraints encountered by the barangays that affect the implementation of the risk communication at the

community levels. It was observed that the limited personnel to assist the BDRRMCs prohibits the continuity of the programs. Majority of the participants agreed that there is still the need to further enhance the planning and development of the strategies and utilization of the tools. Some barangays also need a more defined warning system and additional equipment and facilities like hand held radios, siren, or alarm. It was also mentioned that structural interventions in the bureaucracy affect the urgent dissemination of messages. Thus, there was the suggestion of a more defined policy or barangay ordinance on this matter. Other suggestions from the implementers at the barangay level include: more aggressive awareness and preparedness programs, involve the youth and women in the planning and implementing strategies, as well as develop communication strategies for the persons with disabilities (PWDs) and senior citizens by documenting the experiences and practices and share among the flood vulnerable communities. For specific DRRM strategies, there is a need to review the existing policies or guidelines and develop a more defined and policy-oriented risk communication at the community level. Lastly, majority also stated that there is a need to develop a ready reference master list to prioritize the vulnerable groups and re-activate the purok disaster assistance teams (PDATs) and community response teams (CRTs). However, on the long-term plan, most of the implementers

agreed that there is a need to review the land use plan of the city as well as relocate the residents of the highly vulnerable areas to flooding, specifically, those on the riverbanks.

In describing the communication system, two major themes have been observed among the participants of Set B comprised of the residents of the flood vulnerable communities, as follows: (1) communication efforts reflecting the current activities and programs being implemented at the community level, and (2) protocols observed in the structural flow of communication. With regard to the communication messages, sources and channels of communication, there were six themes identified as: (1) topics and messages of lectures and trainings, (2) types of messages relayed to the communities, (3) sources of the information, (4) media used to communicate information about flooding, (5) timeliness and appropriateness of the communication; and (6) target audience of the messages. All the barangay implementers revealed that disaster risk trainings and seminars involved topics about risks of disasters like earthquake, fire, tsunami, and flooding and how to prepare on these eventualities. It also covers emergency response and alert level parameters, information about warning signals which include alarm systems and color coding on water level signage, preparation for disasters, including guidelines for evacuation and first aid. The communication tools enumerated include signage, posters, water level coding, seminars, lectures,

and drills during pre-disaster situations. The use of mobile phones, hand held radios, megaphones, use of siren and even house-to-house information campaign during disaster situations and incident reports and documentation of post disaster meetings for post disaster situations. However, it was also mentioned that word-of-mouth and social media were being used for message dissemination at different stages of the disaster cycle.

The participants from Set B (residents of flood vulnerable communities) agreed that although there are programs and efforts for the awareness and preparedness of the flood vulnerable communities; majority of them expressed that the following areas can still be enhanced and strengthened.

a. Management of risk communication. There is a need to encourage participatory and inclusive approach to address the concern on gaps in message dissemination, the relay of messages must reach all the affected households and not only those that have members who are active in disaster concerns. In terms of limited distribution of materials, it was suggested that if majority of the residents can attend assemblies and participate and, in the planning, and conceptualization stage, information can lead to wider dissemination of information. It was also stressed that programs and activities on risk reduction at the barangay level is not sustained due to lack of funds or personnel. This can be addressed if sectors like

the youth, the members of the household who stays at home and other volunteer groups can be tapped to help augment manpower shortage. Moreover, encourage that majority, if not all, of the residents should be involved in the awareness and preparedness activities. Similarly, to recommend a policy that will ensure funds and programs are geared toward this initiative since it was also reported that some barangay officials neglect or do not prioritize risk reduction management and efforts are not optimized. Some barangays have the interest to pursue risk reduction initiatives but lacks the appropriate knowledge and skills to do so, thus, collaborating with other agencies, institutions, academe and volunteer groups can be an alternative. Lastly, results of the study also revealed that there is no risk reduction program which particularly address the needs of the PWDs and Senior citizens, which are considered highly vulnerable to flooding.

b. Tools and messages. Results of the study revealed that efforts can still be maximized to ensure a more participatory approach. Trainings, seminars and drills should encourage more participants other than those assigned to monitor disaster eventualities. There is also a need to add more signage and posters for warning and evacuation information Another area is the insufficiency of equipment for warnings and alert messages, some FGD participants emphasized that the sirens, although placed in strategic locations, cannot reach

the entire community at risk. Thus, there is a need to add more siren, megaphones and hand-held radios for the barangay implementers. Some information materials are highly technical for the residents and to address key gaps in understanding the information on the materials being utilized, simplification of messages according to "layman's" context is necessary. Another strategy is for regular community meetings be done to discuss experiences and sharing of practices on flood responses as well as develop quick reference on what items to prepare in evacuation eventualities, what to do when flooding occurs and additional safety tips at the household levels that they can easily implement, and information about evacuation

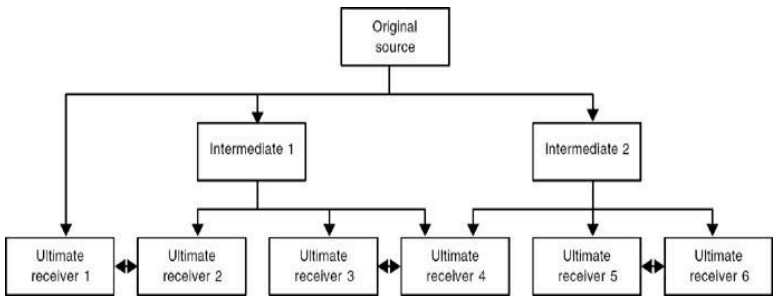
Summary

Lindell and Perry (2004) emphasized that risk communication should be a process by which stakeholders share information about hazards affecting the community. In consonance with the Sendai framework (UNDRR, 2019b) of establishing the role of governance and policy vis-à-vis community empowerment with awareness of risk, risk communication approach should cover the practice of identifying, anticipating and responding to risk situations to reduce to more acceptable levels the probability of their occurrence or the magnitude and duration of its impacts (Lindell & Perry, 2004). Consequently, risk communication must be represented by a network (Figure

23) where there are multiple sources linked to the ultimate receivers through intermediaries that receive the information and relay it to the ultimate receivers. The image below captures the existing communication system and protocols being observed by Davao City. NDRRMC or PAG-ASA being the original source, DILG being the intermediate 1 relays the information to LIGA-ABC, PIA and PSSCC; the Office of the City Mayor as the intermediate 2 relaying the information to PSSCC, OCD and RDCC while CDDRMO being the ultimate receiver 1 coordinates with PSSCC to ensure relay of information to response units like the 911 and CHO.

Figure 23

Communication Network Model (adopted from Lindell and Perry, 2004)



The examination of the communication systems and protocols of Davao City revealed that a "top-down" implementation is observed depending on the hierarchy of the agencies involved which validates findings of previous studies that examine risk communication from the perspective of the

implementers (Haer et al., 2016; Lazrus et al., 2015: Leelawat et al., 2015; Kubicek et al., 2011; Comfort & Kapucu, 2006; Comfort et al., 2004). In this particular case, disaster or risk messages or materials come from the NDRRMC, cascaded down to the concerned agencies the City level i.e. DILG, CDRRMO and City Mayor's Office then cascaded down to the barangays through the BDRRMC and barangay captains sent to the household levels through the purok leaders. It is, however, noted that lateral communication between agencies is involved. The inter-operability of the agencies at the City level made communication more efficient and reliable. In terms of information transfer, this is usually done through radio communication and is expected to have its "ripple effect" to other concerned agencies until it is cascaded to the communities. Moreover, it was found that despite the observation of the formal channels of bureaucracy, there is also the use of the social media, word-of-mouth and text messages in the dissemination of the information.

Results of this study put emphasis on building community resilience utilizing effective information dissemination and dynamic community-based preparedness that would lead to better disaster mitigation strategies. Communication protocols, coordination as well as control should be observed at these critical situations as pointed out by Comfort et al. (2004) and Comfort (2007). Similarly, it also

concurs with the findings of previous studies that highlight the need to build relationships, social ties and inter-organizational coordination to sustain the strong social capital among the concerned communities with the varied organizations (Comfort & Kapucu, 2006; Australian Red Cross Report, 2013; Oh et al., 2014). The interplay of roles of the varied organizations, including the NGOs and international volunteer organizations should be focused on implementation rather than conceptual levels (Christoplos et al., 2001; Comrie et al., 2019). Moreover, Reid (2015) argues that it is also best to explore the community-based adaptation measures that will have significant contribution 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' and disasters like flooding. Furthermore, it builds on human rights-based approaches to development that target the most vulnerable people and fully includes them in all levels of adaptation planning and implementation. Moreover, the Australian Red Cross (2013) reported that in recent years, CBA has shown that it can also operate at scale but with communities remaining central to planning and action, for example through mainstreaming into government processes. Furthermore, emphasis on areas to work on should be at the forefront of discussion and decision

among key players, i.e., LGU, development-oriented group, to encourage a strong community/participatory focus and long-term perspective must be central to any development initiatives.

B. Vulnerability Profile and Risk Related Behavior of the Communities

Past direct and indirect disaster experiences invoke preparedness intention and actual preparedness for flood hazards at individuals, communities and organizations levels (Ejeta, 2019). Ejeta (2018) also stated that even though the communities experienced the flood disasters in the past repeatedly, 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 (Grothmann & 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). Grothmann 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.

This section describes the vulnerability profile of the respondents, their awareness and perception on the risks of flooding, and their assessment of the risk communication system of Davao City. The data came from the survey of 353 respondents who were randomly selected using a multi-stage cluster sampling. The survey was conducted in the top five (5) flood vulnerable barangays identified by the Davao City Risk Reduction and Management Center with a total population of 6177. The total sample interviewed was 376, however, only 353 questionnaires were processed due to many incomplete entries. Results of the key informant interviews and focus group discussions were also integrated to provide an in-depth explanation of the patterns emerging from the survey.

Data were analyzed using frequency distribution, ranking, graphs, and correlational analyses using R statistical software and Microsoft Excel. Specifically, the Spearman's Rank Order Correlation was used to determine the relationship between the socio-demographic and economic factors and the respondents' awareness and perception on the risk communication system of Davao City.

Vulnerability Profile of Respondents

Socio-demographic and Economic Characteristics

Demographic, social, and economic characteristics are the most common characteristics to describe the respondents' vulnerability to flooding (Rufat et al., 2015). For this study, the collected demographic and social indicators included age, gender, and civil status and educational status of the respondents and their household members, and religious affiliation. On the other hand, economic factors included gross monthly income and number of household members engaged in economic activities. To further illustrate the vulnerability of the respondents to flooding; information on the number of years residing in the area and housing characteristics were collected.

Table 5 shows the profile of the survey respondents based on their socio-demographic data. The age of the respondents was categorized into four categories as young (ages 21 and below); middle age (ages 22-45) old (ages 46-60) and senior citizens (above 60 years old) based on the age classification index of the National Economic and Development Authority (NEDA, 2017). More than half of the respondents belong to the middle-aged group (53.5%); followed by the old group (39.9%). More than 80% of the respondents are females and majority have attended high school, are married, and are Roman Catholics.

Although not indicated in the Table 5, it is worth mentioning that 5.1% of the households have senior citizens and children below five years old. Wisner, Gaillard & Kelman (2012) noted that the underlying causes of vulnerability are economic, environmental, demographic and political processes which account for insecure conditions. Studies (e.g., CSSP, 2008; Mallon, et al., 2013; Stough, 2015; Wisner, et al., 2003 as cited in Howard, et al., 2017) have emphasized that it has been well established that vulnerable groups or "at risk" groups are likely to be prepared for a natural disaster, more susceptible during its occurrence.

Almost half of the respondents are engaged in contractual type of work followed by those who are self-employed (25.5%). The contractual workers are laborers, drivers, salesclerks, household helps, school janitors, and canteen servers. These less-secured types of work are characterized as seasonal, high turnover rates, and low paying (Sauter, Comen and Stebbins, 2017). Based on the income categories of the Bureau of Internal Revenue (BIR) (2017), more than half of the household of the respondents earn PhP10,000 or less followed by 43.6% who were earning PhP11,001-PhP30,000 per month. Only 5% of the respondents earned more than PhP30,000 or more per month.

Table 5

Distribution of respondents by vulnerability characteristics

Characteristics	F	%
Age Group		
Young	5	1.4
Middle-aged	189	53.5
Old	141	39.9
Senior Citizen	18	5.1
Sex		
Female	285	80.7
Male	68	19.3
Educational attainment		
No Education	3	0.8
Elementary	67	19
High School	187	53
College	81	22.9
Vocational	15	4.2
Civil Status		
Single	27	7.6
Married	223	63.2
Live-in	55	15.6
Widower	37	10.5
Separated	11	3.1
Religion		
Roman Catholic	239	67.7
Islam	32	9.1
Others*	82	23.2
Occupation		
Contractual employee	175	49.6
Self-employed	90	25.5
Private employee	18	5.1
Government employee	12	3.4
Not employed	58	16.4
Gross Household Monthly Income		
10,000 and below	185	52.4
Above 10,000 – 30,000	154	43.6
Above 30,000 – 70,000	8	2.3
Above 70,000 – 140,000	6	1.7
Total	**353**	**100**

*Note: Other religious affiliations include Protestants, Adventists, Baptist, Church of Christ, Iglesia ni Cristo

Number of years residing in the area

On the average, the respondents have been staying in the flood vulnerable communities for 13 years. More than a third of respondents have been exposed to flooding for 10 years or less while another 33% are living in the area for the past 20 years. Flooding has become a natural occurrence in Davao City after 1916. After the devastating flashflood on June 2011, flooding occurred every other two years, that is, 2013 (Figueroa, 2019), 2015 (Carillo, 2015), until 2017 (Figueroa, 2019); however, flooding happened again in 2018 (Revita, 2018). Figueroa (2019) reported that the effect of the flashflood in 2011 was in no comparison to the two destructive prewar floods that devastated Davao region a century earlier, one in 1912 and another in 1916. These were the most destructive ever to sink the town of Davao, destroying Davao Bridge, and leveling the roads and abaca plantations of Lapanday and Tigatto, which are situated close to the Davao River banks (Figueroa, 2019). Perez (2016) emphasized that the vulnerability to flooding of these communities was attributed mainly to the four watershed systems in the City of Davao, namely: 1) Davao River Basin; 2) Lasang Watershed; 3) Lipadas Watershed; 4) Talomo Watershed. In addition, Revita (2018) mentioned that the other causes of flooding were high concentration of informal settlers in the vicinity, some of whom have built structures that

block the drainage outlets leading to the rivers (Carillo, 2015) and mounting garbage (Revita, 2018).

Table 6 also shows that majority of the respondents owned (58.9%), improvised housing (63.2%) made of temporary mixed materials plywood, corrugated metal, sheets of plastic, and cardboard boxes (70.5%). Only 18% are made of concrete or permanent materials.

Table 6

Distribution of respondents by years of residence and housing characteristics

	F	%
Years of residence in the Area		
0-10 years	127	36
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
Mean Number of Years Residing in the Area	13	
Ownership		
Owned	208	58.9
Rent-free	94	26.6
Rented	51	14.4
House Type		
Improvised	223	63.2
Single One storey	69	19.5
Single Two-storey house	53	15
Attached row house/apartment	8	2.2
House material		
Mixed materials	249	70.5
Concrete	64	18.1
Wood	18	5.1
Light materials (amakan)	22	6.2
Total	**353**	**100**

Flooding experiences

This section presents the experience of the respondents. This covers the experience in terms of depth of flooding and its causes, effects of flooding, and their response on flooding.

Depth of flooding. Table 7 contains the recollection of the respondents of their experiences with flooding highlighting the frequency of incidents, the depth of flooding, and the damages brought by flooding. Majority (88%) of the respondents recalled that they have experienced flooding in their area of residence while 11.6% responded that they have not experienced flooding. The respondents who have not experienced flooding are those residents of the flood vulnerable communities for less than a year. Meanwhile, almost one-half of the respondents reported to have experienced occasional flooding. Only one percent of the respondents recounted to have always experienced flooding in their residence.

More than half of the respondents have experienced more than four feet deep floodwaters while 18.8% have recalled experiencing a 1-2 foot depth, 10% reported a 2-4 foot depth, and 4.5% of the respondents declared less than a foot depth. Revita (2018) reported that floodwater in the Panacan area reached waist-deep while in the lowest portion of the posh village of Belisario Heights the floodwater was at neck-level on May 29, 2018 after a heavy downpour.

More than 40% of the respondents associated flooding to rains. Only 6.60% reported that flooding was due typhoon. As noted earlier, Davao City is a typhoon-free area, hence it is not surprising the low number of respondents relating flooding to typhoons. This is supported by the recollection of some respondents that some occurrences of flooding are not usually experienced during heavy rainfall. The other reasons given for the flooding incidents were downpour in the upland areas which contributed to the overflowing of Davao River, high tide, and obstructions in the drainage system due to the piles of garbage in their areas. They also associated flooding as an effect of climate change and poor urban planning. These causes of flooding were also reported in several newspaper articles including Basa (2017), Carillo (2015), Revita (2018), and Figueroa (2019). The report of the Bank of the Philippine Island, Inc. and WWF (2013) highlighted the rapid increase in population of Davao City which has been ongoing for the past 20 years where more than 692,000 new residents were added to the city. Davao City registered 2.88% annual population growth rate which is twice higher than the population growth rate of the Philippines between 2000 and 2005. UCANEWS (2011) quoting a key respondent, however, had a very different explanation who said that "years of environmental plunder through logging, large-scale and open-pit mining, land use

conversion, to name a few, has brought us an environmental crisis."

Table 7

Distribution of respondents by frequency, depth and cause of flooding

Item	F	%
Frequency of Flooding		
Always	5	1
Frequently	61	17
Occasionally	172	49
Rarely	74	21
No experience	41	11.6
Depth of flood water		
More than 4 ft.	208	58.9
2-4 ft.	31	8.78
1-2 ft.	59	16.7
Less than 1 ft.	16	4.5
No experience	41	11.6
Perceived causes associated with flooding		
When it rains/rainy season	202	57.22
Overflowing of Davao rivers	128	36.26
Obstructions in drainage system	82	23.23
High Tide	48	13.6
Strong typhoons	34	9.63
Climate Change	10	2.83
Poor urban planning	8	2.67

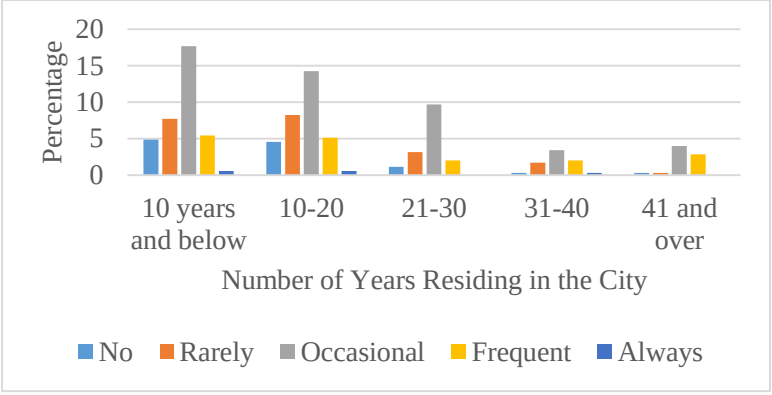
**Multiple response*

Figure 24 shows the distribution of respondents by years of residence and by flooding experience. The percentage of respondents who reported to have experienced flooding is higher for the respondents who resided in the area for the last 30 years. This is particularly true for those who reported to have experienced flooding occasionally and always. The

residents of city for more than 40 years have also indicated the occasional and frequent occurrence of flooding. Reports of flooding can be considered as occasional because flooding occurs only once every year and rarely twice a year as reported by Revita (2018).

Figure 24

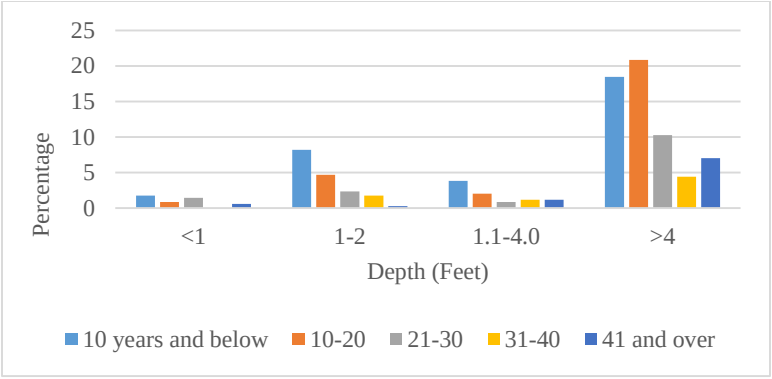
Percentage distribution of respondents by number of years residing in the area and occurrence of flooding



Flooding occurrences in Davao City as reported by majority of the respondents are occasional but heavy. Moreover, heavy flooding occurs in the last 20 years. Figure 25 shows that regardless of the number of years residing in the City, majority of them reported to have experienced flooding more than four feet deep. This is particularly true for those who have been residing in the area for 10 to 20 years.

Figure 25

Percentage distribution of respondents by depth of floodwater and number of years residing in the area



Effects of Flooding. The residents of the flood vulnerable areas reported that flooding heavily damaged both households and communities. Table 8 summarizes the effect of flooding to households and the community. Majority of the respondents consider disruption from work (23%), damaged the houses (23%), and disruptive schooling of their children (20%) as having the greatest impact among residents. For instance, some survey respondents mentioned that the most recent flooding of December 22, 2017 resulted to evacuation of residents and forced them to celebrate Christmas season at either the evacuation centers or houses of relatives or friends. Moreover, disruption of their work for at least two weeks meant no income for daily earners. Eighteen percent (18%) of the respondents have reported the other effects of flooding

which are emotional and psychological. The FGD participants shared to have been emotionally and psychologically affected brought about by panic and fear, dirty environment, muddy and inaccessible roads, and foul smell due to scattered garbage. There were also reported of damaged crops and dead livestock. The effect of flooding is further worsened by their low income as majority of the respondents have a monthly household income of Php10,000 and below.

Heavier damages were mentioned in several reports including UCANEWS (2011), Maxey et al. (2013), Carillo (2015), Revita (2018) and Figueroa (2019). For instance, the 2011 flashflood was worst where 25 people, including 14 children were killed and affected up to 12,700 families (International Federation of Red Cross and Red Crescent Societies, 2011).

Table 8

Distribution of respondents by effect of flooding to households and community

Effect	F	%
Disrupted work	217	23.4
Damaged houses	216	23.3
Disrupted school	188	20.3
Dirty environment	170	18.4
Damaged crops	64	6.9
Drowned animals	71	7.7

Note: Multiple response

Results of the survey showed that majority (81.7%) of the respondents in the flood-vulnerable communities were

amenable to relocate (Table 9). However, the results of the focus group discussion with selected households have differing opinions regarding relocation. They shared that they cannot move to other areas because it is expensive to build house, aside from the sentimental reasons attached to and familiarity with the area. They also considered that their current location is strategic in terms of their workplace and school for their children. These sentiments are similarly found in the findings of Mercado (2016) which revealed that residents of Baseco in Manila remain in their residences despite the knowledge of disaster risk and possible damages to property and loss of lives. It should be noted that there are also respondents living in the identified flood vulnerable barangays who do not considered their area as vulnerable to flooding and yet 45.3% of them were also willing to relocate. This contradictory finding of results from the quantitative and qualitative data emphasized Creswells's idea of divergence which requires further exploration in future studies to validate and identify underlying factors that may have affected the contradiction.

Table 9

Distribution of respondents by perception of area as flood vulnerable and willingness to relocate

Area of residence is flood vulnerable	Willingness to relocate			
	NO		YES	
	F	%	F	%
No	34	53.1	53	18.3
Yes	29	45.3	236	81.7
No Answer	1	1.6	0	0
Total	**64**	**100**	**289**	**100**

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These results affirm the significance of some initiatives from other parts of the Philippines on building disaster-resilient communities that aimed to reduce community vulnerabilities to disasters by incorporating DRR into their community development programs. As of 2010, the pilot projects have introduced early warning system, vulnerability reduction and social protection and participatory disaster-responsive governance. Some of the documented initial projects in the Philippines have shown that the more participatory the community and stakeholders are, the higher is the assurance of effectiveness (Dela Cruz et al., 2010).

Response of households to flooding. Nearly half of the respondents prepares for the possible effects of flooding once the rain falls (Table 10). Meanwhile, more than 30% of respondents only prepared when the floodwater is already high. These responses are very risky because as reported by the BPI and WWF (2013) flooding in Davao City is caused by the rains in the upland. By the time that the residents are ready to evacuate, floodwater could be very high making it more difficult to get out of the community. This has been observed during the 2011 flashflood in the Matina and nearby areas of Davao City, resulting to 29 deaths and destruction of properties (Cayamanda & Lopez, 2018).

The family and relatives of the respondents were the main reason (52.13%) for the respondents to prepare for the

floods. When probed further during the focus group discussion on what particular preparations they do when there is threat of flooding, answers vary from stocking of food in case they are stranded at the second floor of their house; packing necessities in the event of evacuation and transferring electronic appliances on top of table and higher part of the house to protect from flooding. Somehow the aggressive programs of the government have also motivated 38.36% of the respondents to prepare their family to safety when flooding occurs.

Meanwhile, the family's safety was the main reason why respondents evacuated as reported by 47.6% of the respondents. The other reason was their experience in the past. Lesser number of respondents mentioned the reasons for evacuation such as to secure important items, advise of barangay authorities, neighbors are evacuating and sufficient knowledge on flood risks.

Table 10

Distribution of respondents by response of the households on flooding

Response	F	%
Time to Prepare		
When rain falls	147	48.2
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	25.9
When authorities advise us to do so	31	10.16
When floodwater starts to enter the house	5	1.64
Total	**446**	

Response	F	%
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	1.7
Total	**464**	

**Multiple response*

Risk Perception of Flooding

The perception and acceptance of risks depends on the socio-cultural context, the characteristics of risk, the degree of exposure, the degree of control mechanisms and the effect of the risk on the individual or community. Thus, it also follows that resident of flood vulnerable communities' associate risk of flooding with the possible effect of flooding to their properties, livelihood and the inconvenience of evacuation rather than the threat of high-water levels (Baan & Klijn, 2004). Moreover, Bubeck et al. (2012) viewed that experience with hazards is

often considered to have a powerful impact on the recognition of a risk and seems to be an important factor that influences private mitigation behavior based on several studies. Kreiback, et al. (2011), on the other hand, viewed that experience in extreme flood event significantly increases the level of preparedness among both the private households and businesses.

This study revealed that the residents of the flood vulnerable communities associate flood risks with their perception of the possible causes of flooding. This is similar to the findings of Bubeck et al. (2012) that risk perception and experiences, in the context of flood risk communication and management reveal that people living in the flood-vulnerable communities often highlights their experiences as basis for their responses to flooding incidences and accepts the reality that their risk perception is directly a product of their experiences. On the other hand, Demeritt and Nobert (2014) noted that some studies revealed that social class and education are strongly correlated with higher levels of risk perception and responses to flooding as well as prior experiences on flooding as also often claimed to increase responses to risk communication messages, hence, there is a need to consider a risk instrument model (RIM) that would explicitly show risk communication as an instrument for changing attitudes and behavior among recipients; while O'Sullivan et al. (2012)

revealed that experiences on flooding motivates preparedness adaptations. Thus, emphasizing that risk perceptions are greatly affected by experiences.

Table 11 shows the risk perception on flooding among the respondents of flood-vulnerable communities. The respondents were asked if they Strongly Disagree, Disagree, Neither Agree nor Disagree, Agree, Strongly Agree and No Answer. These levels of perception were represented numerically using a scale of 1 to 5 with 5 as Strongly Agree.

The findings suggest that the respondents do not see their activities to be contributing to the risk of flooding but is caused by nature as evidenced by the high percentage of respondents who strongly agreed that flooding is due to climate change (93.77%), rain (63.53%), and the fact that some areas are really flood vulnerable (56.09%). Moreover, the respondents point out the other factors when they strongly agreed is a consequence of poor drainage system (75%) and poor urban planning (48.86%). It should be noted that 71.88% of the respondents strongly agreed on the statement "Our community is already 'immune' with flooding". This has ramification on how they initiate activities to mitigate the risks of flooding and on their awareness and acknowledgement, termed as reception throughout the study, on the efforts of the local government unit to address the risks before, during, and after flooding.

Risk perception and experiences in flooding towards reduction of vulnerability

Results of the focus group discussions reveal that many of the participants admitted being aware of the risks of flooding and accepted the fact that they live in the flood vulnerable areas are willing to relocate. However, the high cost of moving and losing their current livelihood deter them from moving out of their flood vulnerable community. According to them, they resorted to reducing their vulnerabilities by closely monitoring the weather in the uplands through radio or local updates from the television; placing sticks on the riverbeds to see the increase in the water level, and closely coordinating with the barangay officials. Thus, the need to strengthen promote participatory engagement to come up with localized strategies in disaster preparedness and management in flood vulnerable areas (Cayamanda & Lopez, 2018).

Table 11

Distribution of respondents by risk perception of flooding (n=353)

Statements	SD	D	NDA	A	SA
It is a normal effect of rain.	5.7	13.96	13.96	2.85	63.53
Flooding is an effect of climate change.	0.28	1.42	3.12	1.42	93.77
There are areas that are really flood- prone.	9.07	5.38	26.63	2.83	56.09
Our community is already "immune" with flooding.	5.4	9.66	11.65	1.42	71.88
Flooding is a result of poor urban planning.	15.91	7.67	24.72	2.84	48.86
Flooding is a consequence of poor drainage system	8.52	5.97	8.52	1.99	75

Legend: Strongly Disagree (SD); Disagree (D); Neither Disagree Nor Agree (NDA); Agree (A); Strongly Agree (SA)

The responses during the FGD reveal that experiences in flooding in Davao City started as early as 1966 and participants have recollection of high tide experience in 2002, significant flooding incidences such as the Matina flashflood in 2011, Maa flooding in 2013, and the recent 2017 flooding in Bucana and Tigatto. This information confirms the survey results that the respondents have been exposed to the risks and impact of flooding, thus, highlighting convergence between the quantitative and qualitative data. Although as the survey revealed that majority of the respondents consider rainfall as the major contributory factor for flooding, through the years, it has already worsened. One particular significant response was the 2017 flooding incident in Tigatto which occurred even without the presence of any rainfall. The participants also mentioned that their response to flooding incidences can be considered as self-imposed monitoring (i.e., staying awake and alert; monitoring water levels; and voluntary evacuating PWDs, children and senior citizen of the household to higher or safer grounds) while the males took charge in staying to watch over their property and belongings; barangay initiated such as purok leaders house to house warning and advise and reliance on the dissemination of information by word of mouth within the community.

Flood vulnerable communities' perception, attitude and behavior on flooding revealed that significant factors such as

experience in flooding, its occurrences and depth as well as years in residence influence the respondents' behavior towards flooding incidences. This affirms that experiences also reinforces risk perception which is contrary to Martin's (2003) and Martin et al.'s (2009) argument that actual experiences did not have significant impact on risk perception.

Results of this study on perception and assessment of the risk communication affirms previous studies that: (1) different people, having different beliefs and perceptions can be bound together by experiences, in particular, flooding (Wamil, 2010); (2) there exists a link between risk perception and actual behaviors (Raude et al., 2005); (3) individual belief in risk reduction behaviors, effective and strongly-led people to actually engage in risk reduction behaviors (Martin et al., 2009; Parker, 2017; Mulilis & Duval, 2006).

C. Davaoeños' Awareness, Perception, and Assessment of the Risk Communication System

Questions referring to information channels, sources of the communication tools, and messages came from secondary and primary sources. Secondary data were sourced from CDRRMO reports while the primary data came from survey and key informant interviews. Specifically, survey respondents and key informants were asked of the barriers to the reception

of the messages and the communication tools and their perceived effectiveness.

Awareness of the Risk Communication System

Results of the study show that majority of the respondents are aware of the disaster risk reduction strategies to disseminate information about flooding. Table 12 summarizes the respondents' awareness of the barangay strategies to inform the residents about flooding. There were four major strategies identified by the respondents such as trainings and seminars, drills, early warning devices and use of communication tools. The use of communication tools refers to the exposure of the respondents on the tools utilized for disaster risk reduction strategies. It may be a previous or current existing communication tools such as posters, flyers, signage, among others.

Majority of the respondents are aware of the communication strategies on the communication system of Davao. More than 90% of the respondents were of the trainings and seminars followed by drills at 88.67% and use of communication tools at 80.45%. Among the early warning devices, alarm or siren was the most popular followed by use of megaphone. The house-to-house visit was also mentioned by 62.61%. Albeit still high, the respondents were least aware

of community assemblies as a risk reduction strategy with 55.81%.

Table 12

Distribution of respondents by awareness of the disaster risk reduction strategies (n=353)

Indicators	Awareness			
	Yes		No	
	F	%	F	%
Disaster Risk Reduction Strategies				
Trainings & Seminars	328	92.92	25	7.08
Drills	313	88.67	40	11.33
Use of Communication Tools	284	80.45	69	19.55
Early Warning Devices				
Alarm/Siren	296	83.85	57	16.15
Use of Megaphone	284	80.45	69	19.55
House to House	221	62.61	132	37.39
Use of Handheld Radios	183	51.84	170	48.16
Community Assemblies	197	55.81	156	44.19

In terms of the sources of information of risk messages on flooding, results show that respondents consider the BDRRMO as their major source of information on flooding, specifically, through trainings and seminars (25.5%), as well as distribution of communication tools (32.9%). Almost half of the respondents considered the use of siren or alarm (44.20%) as the major tool being used as early warning device. For the communication tools, they are mostly familiar with tools like posters, signage, brochures, radio communication and community meetings. Some are also aware of the following sources of information on flooding considered are word-of-

mouth and house-to-house information campaign by the zonal (purok) leaders (Table 13).

In addition, the respondents' familiarity on the communication tools as sources of information on flooding revealed that communication tools were also assessed, and majority said that they are aware of the distribution of the communication tools that relay information about the risks of flooding, how to prepare during disasters, the reminders for preparation and evacuation and location of evacuation centers in their areas.

Table 13

Sources of information on disaster risk reduction strategy

Indicators	Source of Information					
	Barangay DRRMO		City DRRMO		National/ NDRRMC	
	F	%	F	%	F	%
Disaster Risk Reduction Strategy						
Trainings & Seminars	120	36.59	152	46.34	56	17.07
Drills	265	84.66	48	15.44	0	0
Use of Communication Tools	97	34.18	88	30.99	99	34.86
Early Warning Devices						
Alarm/Siren	256	86.49	40	13.51	*	
Use of Megaphone	260	91.55	24	8.45	*	
House to House	215	97.29	6	2.71	*	
Use of Handheld Radios	163	89.07	20	10.93	*	
Community Assemblies	145	73.6	52	26.4	*	

Notes: Only the respondents who said yes in Table 12 as included in this table, hence the total of respondents per strategy varies.

**Not Applicable*

Table 14 summarizes the awareness of the communication tools. Ninety-five percent (95%) of the respondents reported to be familiar with the television or radio as the source of information on flooding followed by social media like text messages, Facebook (FB) or Twitter at 87.6%. Meanwhile, 83% were familiar with the brochures at the BDRRMC while 81% were aware with flyers or leaflets being distributed to the community as well as the posters that they see within the community (78.1%). Some are also familiar with the other sources of information on flooding such as word-of-mouth and house-to-house information campaign by the zonal (purok) leaders.

Table 14

Distribution of respondents by awareness of the communication tools as source of information on flooding

Tools	Awareness			
	Yes		No	
	F	%	F	%
Television or Radio	338	95.7	15	4.3
Social Media (Facebook, Twitter)	310	87.8	43	12.1
Brochures (with folds)	293	83	60	16.9
Flyers/leaflets	289	81.6	64	18.1
Posters	276	78.1	77	21.8
Billboards/Road signage	225	63.7	128	36.2
Seminars/Drills	177	50.1	176	49.8
Community meetings/Assemblies	155	43.9	198	56
Text messages	124	35.1	229	64.8
Radio Communication	107	30.3	246	69.6
Word of mouth	41	11.6	10	2.8

**Multiple response*

Assessment of risk communication strategies

Respondents were asked to assess the risk communication by rating the statements about communication strategies, effectiveness of communication tools, messages and efforts of the barangay using a Likert Scale with the following scale: 1-*Very Poor*, 2-*Poor*, 3-*Average/Fair*, 4-*Good* and 5-*Very Good*. Table 15 shows the summary of their ratings and assessment. Majority of the respondents or 58.6% have rated the communication strategies as Very Good; 32.9% Good and 8.5% with Average or Fair rating. None of the respondents gave poor and very poor ratings. Results of the survey as well as the responses of the FGD participants revealed that majority of the respondents from the flood vulnerable areas considered the efforts of the barangay and the strategies to be acceptable and are appreciated. Moreover, the participants also admitted during the focus group discussions, that oftentimes, they missed attending the seminars, drills and trainings due to conflicts with their work schedule. Some mentioned that there are instances that the zonal (purok) leaders only informed and invited selected residents, especially in cases when there are only limited slots available. However, they have lamented that some efforts cannot be implemented due to some constraints at the barangay level i.e., lack of manpower and lack of funds.

Table 15

Distribution of respondents by assessment of communication strategies

Assessment Rating	F	%
Very Poor	0	0
Poor	0	0
Average/Fair	30	8.5
Good	116	32.9
Very Good	207	58.6
TOTAL	**353**	**100**

In terms of the content or type of risk messages that the communication strategies contain, majority of the respondents or 96.6% received guidelines for evacuation and information about the evacuation centers (93.8%). Only 43 or 12.2% observed information about disaster risks and 7.9% revealed information about disasters (Table 16).

Table 16

Distribution of respondents by the Types of Risk Messages

Risk Messages	F	%
Guidelines for Evacuation	341	96.6
Information about Evacuation centers	331	93.8
Information about disaster risks	43	12.2
Information about disasters	28	7.9

**multiple response*

Effectiveness of the communication tools. Majority of the respondents consider that almost all the communication tools being provided and distributed to the barangays are effective. This assessment is attributed to the elements of visual designs

or its appearance using colors, photos and figures for tools like posters, flyers, signage and billboards; while accessibility for text messages and online media and understandability, relevance and reliability for face-to-face communication, specifically, during community meetings and seminars. Furthermore, television, radio and other mass media are both understandable and available to every household (Table 17).

This study echoes the role of risk perception and communication as an effective mitigation and preparation for disasters (Martin et al., 2009; Martin, 2003; Comfort, 1999; Kasperson et al., 1988). Furthermore, Slovic (1987) emphasized that gaps in risk perception can be translated into deficiencies in disaster preparedness and adaptation strategies. Thus, this gap in communication can adversely affect local awareness of potential risk and the local response to a hazard like flooding. Similarly, it encourages a system-based (Reid, 2015) and multi-lateral approach (Okada & Matsuda, 2005) to empower the communities in developing their own risk communication strategies that will emphasize the multi-lateral knowledge and context-specific messages produced from the experiential learnings of the flooding incidents.

Table 17

Distribution of respondents by effectiveness of the communication tools (n=353)

Tools	Assessment						Top Reason For Being Effective
	Effective		Ineffective		No Response		
	F	%	F	%	F	%	
Flyers/leaflets	319	90.4	34	9.6			Visual Design
Posters	321	90.9	32	9.1			Visual Design
Brochures (with folds)	321	90.9	32	9.1			Visual Design
Billboards/ Road signage	325	90.9	28	7.9			Visual Design
Text messages	342	96.9	10	2.8	1	0.3	Accessibility
Social Media (FB, Twitter)	265	75.1	86	24.4	2	0.6	Accessibility
Videos	269	76.2	82	23.2	2	0.6	Accessibility
Community meetings or assemblies	347	98.3	5	1.4	1	0.3	Relevance & Relatability
Seminars/Drills	351	99.4	1	0.3	1	0.3	
Face-to-face communication	351	99.4	1	0.3	1	0.3	Understandability
Radio Communication	352	99.7	1	0.3			
TV or Radio	351	99.4	1	0.3	1	0.3	Understandability & Availability

The respondents have rated the communication tools as acceptable, however, some residents during the FGD expressed recommendations in terms of the management of the communication system as follows: (1) be more aggressive in giving trainings and seminars for all the residents and not to only selected participants; (2) uniformity and consistency in implementing barangay programs; (3) additional funds from the city or national agencies for disaster awareness and preparedness; (4) ensure that all areas, including in far-flung zones (puroks) are reached by the information campaigns and

materials; (5) ensure that all areas have siren/alarm; (6) all zonal (purok) leaders should be given hand held radios for faster and more coordinated communication especially during flooding incidences; (7) add more personnel so more residents will benefit from the barangay programs and projects on disaster concerns; (8) provide clear and well-defined guidelines on communication.

Use of communication messages and tools. In terms of the usage of the communication tools, Table 18 highlights the statements given to collect the respondents' assessment regarding the use of the communication tools and how they, as the receivers of the communication messages, perceive the contribution of these tools to their awareness and preparedness on flooding. The respondents highly regard that the risk of flooding is understandable for them and that they strongly agreed to the statements which reflect that the materials are understandable, communication transfer are clear especially during flooding incidences, the tools are context-specific in terms of awareness of the risk and other flood-related information. Moreover, they also agreed that the evacuation and rescue drills are imparted to them which reinforces their preparedness for flooding, specifically, the early warning devices alerted them during flooding and that it is timely disseminated so they can still prepare during flooding incidents. Similarly, respondents also acknowledged that the communication tools contain various

information as well as helped them understand the risks of flooding.

Table 18

Percentage distribution of respondents by assessment of the messages and tools (n=353)

Statements	SD	D	NDA	A	SA
There is various information that help me understand the risks of flooding	3.12	23.23	30.88	9.07	33.71
The risks of flooding are understandable for us	0	1.13	1.7	0.57	96.6
Evacuation and rescue drills during flooding are imparted to us.	4.82	17.85	15.86	5.67	55.81
There is no confusion when messages are relayed during flooding incidences in our area	1.7	5.1	20.11	4.25	68.84
Materials distributed to us are understandable.	1.98	5.1	18.98	4.25	69.69
Materials distributed are translated into our community's context.	1.98	5.38	18.7	3.97	69.97
Clear instructions are given for evacuation and relocation, when necessary.	1.13	7.65	8.5	1.98	80.74
There is an early warning device or system that alerts us during flooding.	2.27	6.52	24.08	6.8	60.34
Early warning system/device gives us appropriate time to prepare for flooding.	1.42	2.83	17.85	7.08	70.82

Legend: Strongly Disagree (SD); Disagree (D); Neither Disagree Nor Agree (NDA); Agree (A); Strongly Agree (SA)

On the other hand, these results affirm that the communication system of Davao city utilizes various channels of communication in communicating risk messages. Broadcast channels through TV and radio; mobile communication using text messages and electronic transmission via the social media; visual communication channels through posters and signage and written channels using posted memos or letters. Face-to-face communication channel is evidently the most utilized at the community levels, be it through formal and structured messages like seminars, drills or trainings or informal by word-of-mouth or simple conversation among the residents about the matter. The convergence of quantitative and qualitative results reinforced the description of the current risk communication system of Davao City. However, there is also the divergence in terms of the concerns raised to further improve the system which can be addressed by a community-based approach to risk reduction and management.

Assessment of the communication system at the barangay level

Source of information, strategies, and messages. As indicated in Table 13 the barangay officials serve as "filtering stations" when relaying information to the communities. These channels of information from the national to the municipality level follows the protocols as stipulated in the institutional framework of

each agency involved. Nonetheless, interoperability still operates enabling the communication flow as linear. Hence, this section explores the assessment of the respondents to the communication system from the barangay. There were 26 statements representing the source of information, use of tools, messages, and the over-all efforts of the barangay for awareness, preparedness and risk reduction. These areas of concern were also the themes derived from the follow-up focus group discussion (FGDs) conducted among the residents of the five barangays covered in this study. Questions used in the FGD were the open-ended questions to probe the assessment statements from the survey to further clarify and expound on the issues raised during the survey. Specifically, the focus of the discussion during the FGD was guided by the set of questions that serve as the themes, specifically, covering their attitude, awareness and assessments on the efforts of the barangay level officials as regards the heightening of the risk awareness and preparation on flooding in their areas.

There are five statements assessing the usefulness of the sources of information for amplification at the barangay level. Among the information, the respondents strongly agreed that instructions on evaluation and relocation are clear (80.74%) followed by the statement that purok leaders are relaying the communication messages on risk and awareness (75.07%) (Table 19). Meanwhile, more than half of the respondents

strongly agreed on the statement that the barangay captain is active in encouraging disaster and risk awareness campaigns (54.67%) and that the efforts and campaigns on flooding by the authorities are useful for us (52.69%). These findings showed that the barangay as source of information play an important role in the awareness, preparedness and information transfer within the barangay. However, the percentage of respondents who strongly agreed that concerns on flood risks are addressed appropriately by the barangay/purok at 37.39% indicates that the sources of information are not enough. Moreover, one-third of the respondents neither agree or disagree on this statement.

Table 19

Percentage distribution of respondents by assessment of the information received from the barangay (n=353)

Statements	SD	D	NDA	A	SA
My concerns on flood risks are addressed appropriately by the barangay/purok	2.83	15.3	33.14	11.3	37.39
The efforts and campaigns on flooding by the authorities are useful for us.	2.27	11.05	28.05	5.95	52.69
Our barangay captain is active in encouraging disaster and risk awareness campaigns	3.68	19.55	17.85	4.25	54.67
The purok leaders are relaying the communication messages on risk and awareness.	0.57	5.95	7.65	10.8	75.07
Clear instructions are given for evacuation and relocation, when necessary.	1.13	7.65	8.5	1.98	80.74

Legend: Strongly Disagree (SD); Disagree (D); Neither Disagree Nor Agree (NDA); Agree (A); Strongly Agree (SA)

Overall efforts of the barangay. In terms of the barangay efforts, statements were also provided to find out how the community assess the barangay efforts as regards risk communication on flooding (Table 20). Results of the study revealed that two-third of the respondents strongly agreed that barangay efforts are helpful in their preparation for flooding. However, for the rest of the statements, the percentage of respondents who strongly agreed was lower indicating less appreciation of the efforts of the barangay to communicate them the risk of flooding. Less than half of the respondents have strongly agreed that they were encouraged to participate on risk reduction and management program offered by the authorities while one-fourth have strongly agreed that they are always informed of trainings, seminars, and lectures on risk and awareness on flooding. Moreover, less than one fifth strongly agreed that the barangay has clear programs for disaster awareness. This pattern suggests that the efforts of the barangay officials are perceived to be less than messages and communication tools informing the residents of the risk.

Table 20

Percentage distribution of respondents by assessment of the barangay efforts (n=353)

Statements	SD	D	NDA	A	SA
We are always informed of trainings, seminars and lectures on risk and awareness on flooding.	23.8	32.58	14.16	4.25	25.21
We are encouraged to participate on risk reduction and management programs offered by the authorities in our barangay.	3.69	15.34	26.42	5.11	49.43
The barangay has clear programs for disaster awareness.	10.3	35.04	30.48	5.7	18.52
The barangay has adequate programs for disaster mitigation.	9.39	33.7	33.98	7.18	15.75
Barangay efforts are helpful in our preparation for flooding.	1.7	6.8	24.36	4.82	62.32

While efforts are much appreciated, there are some barriers to communication which affected the reception of the efforts of the barangay. Table 21 shows that majority or 64% consider individual beliefs (i.e., flooding can be managed by themselves; confident of their safe location; hopeful that flooding will not affect them); while 32.7% considered experience with flooding and 27.8% considered personal knowledge about disasters are some factors that hinder reception of the risk messages. Some FGD participants claimed that their experience with flooding incidences provide

them with the best preparation for any eventuality. In addition, 44.8% considered stubbornness, lack of concern for safety, and belief that flooding is a common incidence as barriers to reception of communication efforts. The qualitative and quantitative results of the study converged, and this finding also conforms to the results of Cole and Fellows (2008) on the study of why some risk communication failed and consequently can translate into negative impacts of disaster to the households or communities.

Table 21

Distribution of respondents by perceived barriers to reception of the barangay efforts

Factors	F	%
Individual beliefs	226	64.02
Experience with flooding	114	32.29
Personal knowledge	98	27.76
Not interested	72	20.4
Poor dissemination	65	18.41
Low awareness	45	12.75
Unclear messages	13	3.68

**Multiple response*

Attitude of the respondents on the efforts of the barangay. Figures on Table 22 shows the attitude of the respondents towards the efforts of the barangay to communicate the risks of flooding. Despite their lower appreciation of the efforts of the BRRDMC as shown in Table 22, more than 90% of the participants have agreed that they are willing to join the future

activities on lectures and trainings on flooding and preparedness and drill exercises and are willing to evacuate if the authorities advise to do so.

Table 22

Percentage distribution of respondents by attitude toward the barangay efforts (n=353)

Statements	SD	D	NDA	A	SA
I am willing to join future lectures and trainings on flooding.	0.57	1.98	4.53	1.42	91.5
I will participate on preparedness and drill exercises.	0.28	1.42	3.98	1.42	92.9
I will be willing to evacuate if the authorities advise to do so.	0.28	1.42	2.27	1.42	94.62

Relationship of respondents' socio-demographics and risk related behavior

The experience of flood victims is only one aspect in proactive action in flood risk management (Higginbotham et al., 2014). Whitmarsh (2008) argued that experiences have to be paired with individual values and belief. Therefore, individual actions can also be associated with socio-economic status of individuals (Kreibich et al., 2011; Duží et al., 2014; Fuchs et al., 2017).

Table 23 shows that there is no significant difference between the socio-demographic characteristics and the awareness of residents toward the risk of flooding. This means that regardless of age, household monthly income, number of years living in the current address, number of children aged

five years and younger, number of household members working, and number of household members attending school, does not affect their perception on the risk of flooding. Fuchs et al. (2017) found that among the demographic variables including gender, age, educational attainment, and income, only income was found to has a significant impact on individual risk awareness; where people with a higher income are more likely aware of the flood risk. Moreover, this finding is contrary to the findings of Bubeck et al. (2012) that social class and education are strongly correlated with higher levels of awareness and of flood risk and knowledge of how to respond to it.

Table 23

Residents' awareness of the risk of flooding by socio-demographic characteristics

Sociodemographic	Value	df	Asymp. Sig. (2-sided)
Age	6.095	9	0.73
Gross Monthly Household Income	14.504	9	0.106
Number of Years Living in current address	21.185	15	0.131
Number of Children aged 5 years and younger	21.909	15	0.11
Number of Senior citizens in the household	12.28	12	0.423
Number of household members earning salary	13.517	18	0.76
Number of household members attending school	29.284	21	0.107

Table 24, on the other hand, presents the relationship between socio-demographic characteristics of the residents and the barriers to reception of barangay efforts. There was a negative correlation between gross monthly household income and barriers to communication, which was statistically significant, rs = -.127, p = .017. This indicates that as monthly household income increases, their level of perception to barriers decreases. Further, based on the results of the study, the number of household members attending school has negative correlation to barriers to communication and statistically significant, rs = -.124, p = .020. This means that as the number of household members attending school increases, the perception on barriers decreases.

Table 24

Correlation between socio-demographic characteristics and barrier to reception of barangay efforts

Spearman's rho	Age Group	Income	Years of Residence	Number of children below 5	SenCit_HH	HH Me_Salary	HH Me_Sch	RespBarrs_Ndx
Correlation Coefficient	0.088	-.127*	0.086	-0.096	0.033	-0.084	-.124*	1
Sig. (2-tailed)	0.099	0.017	0.106	0.071	0.535	0.116	0.02	
N	353	353	353	353	353	353	353	353

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Similarly, in terms of flood perception, results revealed that only the presence of children under five years of age in the household has significant negative correlation. Thus, suggests

that as the number of children under five in the household increases, the flood risk perception becomes weaker. This may be attributed to the fact that households with more number of children are prevented from joining activities that can enhance their perception of flood as a disaster and as a risk. They would rather attend to the needs of their children rather than spend time on activities outside the households. This idea was confirmed during the focus group discussions among mothers with children below five years of age. They would rather have their husbands or the barangay officials and just follow what instructions are given instead of themselves joining the activities on awareness and preparedness on flooding (Table 25).

Table 25

Correlation between socio-demographic characteristics and perception of flood risks

Spearman's rho	Age Group	Income	Years of Residence	Number of children below 5	SenCit_HH	HH Me_Salary	HH Me_Sch	Resp Barrs_Ndx
Correlation Coefficient	-.007	.102	-.019	-.138**	.034	.015	-.075	1.000
Sig. (2-tailed)	.903	.056	.717	.010	.527	.776	.165	
N	349	349	349	349	349	349	349	349

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Summary

Using the convergent parallel design method shows that majority of the quantitative results converged with the

qualitative findings except on the divergence in area of the triangulation between the respondents' awareness of their community as flood-prone and willingness to relocate. However, it conforms to Mercado's (2016) finding which accounts for the economic cost of relocation and thus the decision of the residents to remain in the flood vulnerable area despite the risks and hazards associated with it.

The findings are in consonance to the studies on risk communication that highlights awareness and preparedness (Lindell & Perry, 2004) and the critical role of decision-making on disaster eventualities (Lindell & Perry, 2012). Specifically, flood risk communication studies have been documented highlighting the role of social networks (Haer et al., 2016), different strategies to improve flood risk communication (Haer et al., 2016; Lazrus et al., 2016; De Boer et al., 2014) as well as looking at different perspectives to assess the flood risk communication systems towards upgrading awareness and preparedness (Maidl & Buchecker, 2015; Demeritt & Nobert, 2014; Rollason et al., 2018; Feldman et al., 2016).

The FGDs also revealed that although majority of the participants appreciate and welcome the barangay efforts on information dissemination and preparedness about flooding, they opined that other factors contribute to their plight i.e., poor drainage system; lack of vegetation in the areas to absorb water; poor planning on location of subdivisions and

residential areas. Some suggestions for the management of risk messages at the community level, specifically, a need to develop a communication management plan at the barangay levels i.e. point persons or in-charge should be clearly identified per purok for a better and more organized communication flow in the flood vulnerable communities. In so doing, there will be an opportunity for community and institutions to discuss and decide on the protocols of the inter-organization approach emphasizing the role of the institutional structures and provide the mechanisms for disaster mitigation and response that are context-specific to the communities (Tselios & Tompkins, 2017; Comfort & Kapucu, 2006; Comfort, 2007; Christoplos et al., 2001).

In terms of the barangay efforts on risk reduction and management of risk messages and preparedness, participants agree that community meetings, seminars, lectures, drills and trainings conducted by the concerned agencies are useful in making people aware and encouraged them to prepare for any eventuality. Topics of these strategies include: emergency response like first aid and alert level parameters used for sirens and color coding of water levels, orientation and information on warning signals, preparations and guidelines for evacuation. However, they observed that since it was not done on a regular basis, due to conflict in schedules or lack of funding for such. Moreover, they have observed that efforts are being done to

mitigate flooding such as tree planting activities in collaboration with other agencies, schools and volunteer groups. Visible also are the warning signals like bridge markings, signage and posters as well as the use of text messages and radio communication to disseminate information to the community. In terms of the understandability of risk messages, the participants agree that simple and clear language is being used, posters or signage with technical texts are accompanied by easy reference visuals. Some areas, however, admit that they are not reached by these efforts and they rely on word-of-mouth and voluntary sharing of information among themselves.

Similarly, there has been a wide range of media being used for information dissemination which includes: face-to-face communication, mobile phones, radio communication, television and radio announcements, use of social media like Facebook. However, it was noted that the informal channels i.e. word of mouth and house to house strategies contribute greatly to the timeliness of the dissemination of information addressing the urgency of the attention calling among the flood vulnerable communities. These efforts, as well as their acceptance of the limitations of the barangay and the vulnerability of their areas have made the communities more informed about the risks and higher level of preparedness is encouraged and practiced.

As previous studies have been documented on risk perceptions (Christoplos et al., 2001; Terpstra et al., 2009; Martin et al., 2009), different risk communication strategies (Haer et al., 2016; Lazrus et al., 2016; De Boer et al., 2014; Sanchez & Sumaylo, 2015; Sanchez, 2014), modelling of risk studies (Cadag & Gaillard, 2012; Bradley et al., 2014; Lazrus et al., 2016; Lindell & Perry, 2012; Kasperson et al., 1988; Wisner et al., 2012) and evaluation of risk communication (Comfort & Kapucu, 2006; Leelawat et al., 2015; Mercado, 2016; Skinner & Rampersad, 2014), this particular study may provide additional literature as regards the role of community-based flood risk communication systems, particularly, in addressing the "localized" and participatory approach which evidently is not yet observed by the current communication system of Davao City.

Summary, Conclusion and Recommendations

Summary

This study was conducted to address the gap in the literature that no studies have yet been found to specifically relate to risk communication management. Extensive literature and studies have been examined on the areas of risk communication and disaster risk management. While risk communication centers on the significance of communication to risk reduction and management at the different stages of the disaster cycle, and

disaster risk management focusses on the mitigation, response and recovery stages of the disaster cycle, no literature has been found to specifically reflect the integration of risk communication and disaster risk management. Thus, this study examined the role of risk communication in risk reduction and developed a community-based risk communication management framework relevant to the flood-prone communities.

Similarly, the research utilized Creswell's Convergent Parallel mixed method research, whereby the qualitative and quantitative approaches were utilized in the data collection and analysis guided by the integrated frameworks of the Social Amplification of Risk Framework (SARF) and the disaster risk management in the context of risk reduction and management using the case of Davao City's flood vulnerable communities.

Entry protocols were observed to gain the cooperation and participation of the involved agencies that were considered crucial in the key informant interviews, the survey and the focus group discussions. The KIIs were conducted from the heads of the PSSCC, the CDRRMO and the Liga-ABC --- the identified key agencies involved on disaster concerns within the months of August and September 2017. From these KIIs and from the review of secondary data through policy analysis and document reviews, the five barangays considered as the most vulnerable to flooding have been identified as: Matina

Pangi, Matina Crossing, Ma-a, Tigatto and Bucana. Similarly, the KIIs also provided the basic and necessary information necessary for the crafting of the survey questionnaire for the flood vulnerable communities. After the questionnaire was drafted, it was pre-tested to a flood vulnerable community for comprehensibility and appropriateness. The pre-test, however, revealed that some questions need refinement and that an enumerator-assisted survey is more appropriate to ensure that clarifications would be addressed immediately.

The questionnaire sought for the respondents' socio-demographic characteristics, experiences and practices to reduce vulnerabilities and their perception of the barangay's communication protocols and efforts, including their assessments of the communication system.

The survey was conducted among the 376 respondents, obtained from a multi-stage cluster sampling, from November 2017 to February 2018. However, only 353 were used in the data analysis due to incompleteness of many questions.

Focus group discussions (FGDs) were also conducted in two sets per barangay: Set A comprised of the implementers of the risk communication which included the barangay captains, purok leaders and members of the BDRRMCs to cover discussions on the management, strategies, tools and messages used for flood risk awareness and preparedness. Meanwhile, Set B included the residents of the flood vulnerable

communities to discuss the open-ended questions of the survey instrument for clarifications and gain additional insights as regards to their suggestions and expectations for a community-based risk communication management system.

Data were analyzed using frequency distribution, ranking, graphs, and correlational analyses using R statistical software and Microsoft Excel. Specifically, the Spearman's Rank Order Correlation was used in determining the factors related to the comprehensive implementation of the communication system as regards to the utilization of the communication channels, tools, and messages.

The premise of this study is that flood risk as a hazard to flood vulnerable communities interact with the psychological, social, institutional, and cultural processes in ways that may amplify or attenuate the community's responses to the risk or risk event. Amplification occurs at two stages: in the transfer of information about the risk, and in the response mechanisms of society. The amplified risk leads to behavioral responses, which, in turn, results to secondary impacts.

The results of the study derived from the qualitative and quantitative approaches revealed the following:

The risk communication system of Davao City is compliant to the institutional framework as provided for in the RA 10121 and utilized a structural flow of "top-down" approach from national level to the barangay level, priority

given among the identified 63 flood-prone communities, results show; however, that not all the barangays have well-defined information structure toward its residents. It was a downward communication flow at the level of the municipality, utilizing the city agencies as the lead implementers, namely, PSSCC, DRRMO/911 and ABC Liga. Results of this study also show that the risk communication system adopts a system approach and there is interoperability among agencies in implementing disaster management which follows the prescribed protocols and processes as stated in the NDRRMP. The risk communication utilizes various communication tools from written, visual, electronic, face-to-face communication to sophisticated maps and GIS to make people aware, prepare and respond to disasters for awareness, preparation and responses. However, respondents expressed that this set-up is not replicated at the level of the communities and some suggestions emanated from the communities include a more defined and structured management of risk communication and utilize extensive use of communication tools to reach all the affected households and work towards a more aggressive and comprehensive awareness and preparedness strategies to reduce the risks. Moreover, there is a need to encourage participation and involvement of the community to address specific concerns that may be disregarded by the top-down approach.

Flooding has been experienced for the past 20 years in the areas and the past direct and indirect experience have evoked preparedness among individuals and their households reflecting that the flood vulnerable communities are aware of the risks and its consequences. The vulnerability of these flood vulnerable communities is associated with their socio-demographic characteristics which are commonly referred to as social vulnerability indicators on disaster studies. The collected social, demographic and economic data included age, gender, civil status, education level occupation; religious affiliation of the respondents and household information which covered gross monthly income, number of household members engaged in economic activities and attending school. Other information collected included type of house occupied, nature of house ownership, and type of house materials. There were also questions referring to experiences and response to flooding as well as practices to reduce vulnerability. Sources of information about flooding and communication tools were asked during the focus group discussion which were participated by selected households and key informants and from secondary sources. Results of the study revealed that the respondents have confirmed that their experiences have significantly improved their risk perception and awareness level leading towards a more pro-active attitude and response toward flooding. The flood vulnerable communities'

perception of risks is directly associated with the perceived causes of flooding. Moreover, although aware of the risks, residents cannot relocate even if they are willing due to the expenses to be incurred to secure another residence elsewhere.

Moreover, the findings on the community's perception and assessment of the risk communication systems at the barangay level showed that responses to flooding practiced by the residents are working for their self-monitoring and preservation at times of flooding incidences, however, these are not integrated as part of the community's risk reduction practices. Moreover, having been subjected to the previous flooding experiences, they no longer see the need to rely on formal risk communication messages, rather, they resort to adaptive measures to respond to flooding occurrences that they seem to be appropriate. The respondents expressed that there is a need to improve the communication system and management specifically at the community level and suggested that participatory approaches be utilized in the awareness and preparedness.

In terms of the communication strategies, it was found that the there is a high rate of satisfaction in terms of the barangay efforts, however, they still look forward to being acknowledged as partners to accommodate their inputs and participation. Moreover, the FGDs revealed that some conflicts between barangay officials and purok leaders interfere

with the management of communication as well as the disaster response itself.

Results of the correlation analysis on the community's reception and assessment of the risk communication system revealed that there is no significant relationship between the transfer of risk communication signals and how communities assess the efforts of the concerned agencies, however, their experiences and perception of flood risks influence these assessments. There was, however, a negative correlation between the gross monthly household income and perception to barriers. This indicates that as monthly household income increases, their perception of barriers to barangay efforts decreases. Similarly, the number of household members attending school has negative correlation to perception of barriers to barangay efforts. This means as a greater number of household members attends school, their perception of barriers to barangay efforts decreases. On the relationship between socio-demographic factors and flood-risk perception, the study revealed that the presence of children below five years has been found to have significant relation with the risk perception. As number of children below five years increases in the household, the flood risk perception becomes weaker. This may be attributed to the idea that presence of children below five years hinders the household in active participation on awareness and preparedness activities. These findings have

been consistent with the results of the focus group discussions (FGDs) among the residents of the flood vulnerable communities. Similarly, one of the major suggestions for the management of risk messages at the community level was to develop a communication management plan at the level of the communities. They sought for a defined structure and process of communication within the community where identified key persons, aside from barangay captain and purok leaders, should be assigned per area for faster and easier sharing of communication messages.

The findings specified above are in consonance to the studies on risk communication that highlighted awareness and preparedness (Lindell & Perry, 2004) and the critical role of decision-making on disaster eventualities (Lindell & Perry, 2012). This also conforms to the flood risk communication studies which showed that other factors affect reception to risk communication efforts, specifically, role of social networks (Haer et al., 2016); various tools and strategies to improve flood risk communication (Haer et al., 2016; Lazrus et al., 2016; De Boer et al., 2014), as well as looking at different perspectives to assess the flood risk communication systems towards upgrading awareness and preparedness (Maidl & Buchecker, 2015; Demeritt & Nobert, 2014; Rollason et al., 2018 and Feldman et al., 2016).

Using the findings from the qualitative and quantitative data, a community-based flood risk communication management framework is proposed which could help integrate the significant contribution that the residents may provide based on their own experiences and adaptive strategies in flooding. Further, it could provide significant inputs to the policy recommendation for a localized and participatory approach on risk reduction strategies.

It is, however, noted that the results cannot be generalized because the study only covered the top five flood vulnerable communities from the identified 63 flood-prone communities in the Davao City hazard map. However, specific results in the context of the five barangays studied may be relevant to other flood vulnerable communities of similar context like low lying communities situated near the rivers. Similarly, since the study is aimed towards the risk communication management and systems involved, no full evaluation was done specifically to present a comprehensive communication audit of materials used for risk communication.

Conclusion

Theory and Knowledge Generation

The integration of the risk communication and disaster risk management which may be a first attempt in research

utilization has been useful in the conduct of this study. The elements of the theories of SARF and the disaster risk management cycle have reinforced the examination of the risk reduction strategies in the context of the flood vulnerable communities of Davao city. The study among the flood vulnerable communities using the social amplification risk framework and disaster risk management provided effective tools in examining the communities' assessment of communication systems. It also captured the underlying issues that affected vulnerability and resiliency towards flooding. It also described the current institutional dynamics as well as the capacities of the communities to address this disaster.

Methodology

In terms of the use of methodology, Creswell's Convergent Parallel mixed method design has proven to be effective in the reinforcement and complementation of the quantitative with the qualitative results. The merging of the analysis of the results using the quantitative and qualitative data revealed the convergence, showing the complementary and reinforcement. However, there was also the divergence between the quantitative and qualitative findings in relation to the awareness of the area as flood risk and the willingness to relocate. While the quantitative results show that there was a positive response on both areas during the survey, the results

of the FGD contradicted this idea when participants disclosed that relocation is not possible due to the high economic cost. This divergence could be attributed to the fact that the survey questionnaire only allowed a yes or no answer and did not allow further discussion. On the other hand, the FGD encouraged them to elaborate and discuss the issue further.

Locale of the Study. Davao City is naturally flood prone area manifested by its physical characteristics. This is further magnified by the high urban population density and human settlements found along the river banks or nearby river tributaries. Building community resilience utilizing effective information dissemination and dynamic community-based preparedness would lead to better disaster mitigation strategies. Communication protocols, coordination as well as control should be observed at these critical situations (Comfort et al., 2004; Comfort, 2007). In addition, there is a need to enhance relationships, social ties and inter-organizational coordination to sustain the strong social capital among the concerned communities with the varied organizations (Comfort & Kapucu, 2006; Australian Red Cross Report, 2013; Oh et al., 2014). Moreover, flood risk awareness and preparedness can be further improved through an integrated flood risk communication management approach (Thieken et. al., 2016) to emphasize on the following areas: (1) effective risk communication and management leads to appropriate

precautionary actions; (2) community participation and inputs of adaptive measures and precautionary ideas can help improve flood risk information campaign; (3) flood hazard information, precautionary measures and coping possibilities should be linked more effectively to provide context-specific approaches toward risk communication management.

The following conclusions can be derived from the results:

The amplification of the messages was not clearly seen in this study. The agencies as the "filtering stations" did not transform the messages for attenuation, rather, cascaded the information downward without any alteration or modification. FGDs also revealed that some problems in the communication system was due to the conflicts between and among the barangay officials and the purok leaders. There is a need to replicate the interoperability of key players at the level of the communities.

The flooding experiences of the flood vulnerable communities have provided the residents the adaptive measures to respond to flooding occurrences that they seem fit to be appropriate. Some of these strategies 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. 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.

A proposed community-based flood risk communication management framework may address the gaps and standardize localized approach to specific contexts of the flood vulnerable communities. It may 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.

Recommendations

The study of flooding in Davao City should not only be approached within the confines of Davao City geographical boundaries as it has a myriad of dynamics, factors in governances and cross boundary issues. In this light, it is recommended for stakeholders to harmonize efforts and initiatives and find areas to work together given their varying interests – be it political, economic and environmental. The interplay of roles of the varied organizations, including the NGOs and international volunteer organizations should be focused on implementation rather than conceptual levels (Christoplos et al., 2001). Moreover, it is also best to explore the ecosystem based and community-based adaptation measures may be explored to engage most vulnerable communities in activities that can mitigate the ill effects of flooding in the future such as "community-led drainage clean-up", "neighbors-policing-neighbors" for good practices like planting of bamboos along river banks to avoid further erosion, etc. Incentives for best practices may be designed to encourage further and model communities. Essentially,

community-based adaptation (CBA) that is a community-led process, based on communities' priorities, needs, knowledge and capacities on managing disaster such as flooding (Reid, 2015).

A CBA approach would empower them and instill the principle of shared growth and accountabilities in flood risk management, reduction/mitigation of flood risks, among others. This is another avenue to develop and further enhance social capital among stakeholders and the general community. But emphasis on areas to work on should be at the forefront of discussion and decision among key players, e.g., local government units, development-oriented groups, etc.

In terms of governance, consolidation of existing policies, regulations, and updating of these essential governance-related documents will always be relevant as communities, cities, and governance aspect is always evolving and transitioning to better respond to various needs of clients. This would include harmonization of efforts, plans, and programs targeted to address flood risks in the study area. It is critical that information, education campaign be upscale, and to pursue aggressively via flash flood specific materials to put emphasis on the risks anybody is exposed to, and how they can contribute to minimize if not avoid disruption in their daily lives for flooding occurrences in the future. However, long term perspective must be central to any development initiatives

as far planning and development interventions to mitigate if not avoid flooding in Davao City, particularly in the areas of this study.

Knowledge generation and Theoretical Implications

(1) Flood Risk Amplification Communication Theory 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.

(2) Since this study has the novelty to use risk communication management, which was considered gap in the examined literature, a similar approach can be done to add literature to this area of knowledge.

Practical

For the implementing agencies, the results of the study may be useful in crafting a well-defined risk communication plan for the flood-vulnerable communities capitalizing on the documented experiences, challenges, responses and self-

imposed strategies for preparedness. Specifically, the following can be done at the level of the barangays:

(3) Re-activate and create a clear organizational set-up of the DRRM that will give defined tasks and functions as well as identify target persons with emergency contact information for proper guidance of the residents.

(4) Craft an annual calendar of activities for awareness and preparedness on flooding.

(5) Develop a context-specific risk communication plan to target specific audiences with the most appropriate communication tools to relay the risk messages on flooding.

(6) Document all the DRRM plans, projects and strategies as well as monitoring and assessments of these activities to provide proper guidance on the achievement of goals and identification of the effective DRR strategies for the community. These materials should be open for public awareness for transparency.

(7) Initiate a multi-sectoral committee specifically on DRRM, consisting representatives from the different sectors such as youth, women, church, and other groups. Through this, dialogue and open communication can be encouraged to address all concerns from different sectors and more inputs can be generated to work towards a context-based risk communication system.

(8) Engage the community on trainings, seminars and lectures to encourage sharing of experiences and best practices on DRR strategies and preparedness on flooding.

(9) Conduct flood drills that would involve all the residents especially those on the highly vulnerable areas.

(10) Create or strengthen MOAs with various agencies like NGOs and private companies to address the barangay's limitations on funding and manpower in implementing DRRM initiatives and projects.

Policy

In terms of policy recommendation, an institutionalization of a "localized" risk communication management is proposed as follows:

(11) Integrate disaster communication protocols from the community level for integration with the plans of the different agencies involved, specifically, involve all the 63 high risk barangays of Davao City in creating their own DRRM adaptation strategies.

(12) Design a manual of protocols for guidance of appropriate responses and actions, including the IRR for developing community-based risk communication plan and strategies.

(13) Specify a period of implementation and corresponding evaluation after an appropriate timeframe,

including the monitoring of the conduct of trainings and seminars.

Future Studies

(14) Document experiences and further analyze the risk perception and awareness on disaster among the other flood vulnerable communities that may help build context-specific IRRs at barangay levels from the national level of the NDRRMP.

(15) Risk communication and management studies should be further explored at the community levels for a more comprehensive baseline data that can enrich and enhance DRR strategies and management policies.

(16) Risk perception studies can help provide a more specific and focused messages anchored on local context and culture that can help generate support on building resilience and adaptive capacity. Moreover, minimize fear and empower communities to act according to their specific needs and situation.

(17) Utilize the proposed Flood Risk Amplification Communication Theory to test the modification of SARF.