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Coping mechanism of flood vulnerable households along Bitan-ag Creek, Cagayan de Oro city, Philippines

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Abstract. Flooding has been a problem worldwide that contributes negative impacts to environment and lives of many individuals. Flooding in Cagayan de Oro City is one of the major environmental dilemmas affecting properties and lives of local communities especially in areas along Bitan-ag Creek. The purpose of this study was to know the households' coping strategies in dealing with different stages of flood. This objective was attained through conduct of survey, analysis and identification of coping mechanisms. This study was conducted in Cagayan de Oro City at communities nearby Bitan-ag Creek. An inventory of households coping mechanisms can be used by the Local Government Unit in defining the policies for recommendations on flood management. Results showed that the households' behavior towards flood was influenced by the following factors: flood depth, flood duration and economic capacity of the household to cope with its impacts. The viable coping mechanisms employed by the households in the area are the economic and social coping mechanisms. The local knowledge of people should be included in the objectives of the existing disaster management plan of Cagayan de Oro City. This could provide more directives for disaster managers to plan measures and policies to improve the effectiveness of risk reduction activities. Raise awareness of the community on impact of flood, increase of public participation in flood management, and strict solid waste management should be implemented.
Key Words: flooding, flood coping mechanism, household behaviour.

Introduction. Flood disaster is a worldwide natural phenomenon that has adverse effects to any country of which it contributes risks in people's lives, destruction of environment and obstruction of economic development. Many countries across the world are affected by floods, which occur from time to time in all rivers and natural drainage systems and often leave devastating losses. Thus, flood is an inevitable natural phenomenon that damages lives, property, and environment, and causes great loss on economy and health (Sanders & Tabuchi 2000).

According to United Nation Development Program (2005), Asia is among the most affected continent in the world with more than half of the population are considered casualties with more than 90% of those are injured, homeless and needing assistance. Since the Philippines is geographically located in the path of an average of 20 turbulent typhoons per year (Bildan 2003), the country has been considered vulnerable to almost all types of natural disaster. Evidently, the flash flood in Ormoc City in November 1991 left massive damages of property and ended about 4,000 lives (Environmental Research Division Manila Observatory 1992). This clearly indicates the importance of measures that reduce the risks of becoming vulnerable to natural disasters. The Philippines pre-event coping capacity index is computed to be 3.0–3.7 in Asia-Pacific which is said to be in the middle rank, and for the post event, it is computed to be 2.2–2.5 (2nd from the lowest rank). As such, higher values indicate greater coping capacity (Norwegian Geotechnical Institute 2009).

However, greater action of responsibilities, with proper techniques, and enough knowledge brings forth safer environment. Although natural hazards cannot be managed, the characteristics of the built environment can be managed. Thus, effective flood responses are built from people's ability to deal with the floods, complementation of coping mechanisms, resources, and social capital (Alam 2008).

Flooding in Cagayan de Oro is one of the major environmental dilemmas affecting properties and lives of local communities. The heavy rainfalls decrease the capacity of the rivers and creeks to absorb water causing the water to overflow affecting business establishments and residents. This is due to high concentration of people, buildings, infrastructure and socio-economic activities in the city. There will be tremendous damage when severe flood strikes. According to UNESCO, people are vulnerable when the level of harm is high which can be expected under certain conditions of exposure, susceptibility, and resilience. Evidently, the sudden high rise of water can put people's lives at risk and damages to property. However, using various methods of assessment, vulnerability can be predicted and can be abated. Thus, the potential harm and possible measures to reduce risks are certainly the decisions of human population. The exploitation and lackadaisical actions direct them to either protecting or damaging the environment.

The role of community participation as well as people's general coping capacities is recognized as key elements in explaining disaster risk. Thus, capacity to cope applies to all levels of society and social organizations, and a broad range of physical, social, economic and ecological considerations (International Strategy for Disaster Reduction 2002).

Material and Method. The study was conducted on January 2011 prior to Typhoon Sendong along the communities of Bitan-ag Creek, Cagayan de Oro City, which is identified by the Department of Environment and Natural Resources-Mines and Geosciences Bureau Region 10 (DENR-MGB X) to be one of the flooded areas in the city. The communities that are commonly affected by the overflowing and flooding of the creek are some areas of Barangays 26, Camaman-an and Lapasan. A total of 366 samples in all 10 sitios along the Bitan-ag Creek were computed to constitute as the sample population and was distributed on the availability and willingness of the respondents.

This research study used data triangulation to comprehensively understand the local coping capacity of flooded households in the Bitan-ag Creek in Cagayan de Oro City. This was done by means of conducting survey (See Annex 1), observation and gathering of secondary data.

The data analysis of the study was done using descriptive statistics. Identifying of local knowledge on flood management and determining socio-demographic, household size, type of building structure, household income, and physical characteristic of flood was measured using descriptive statistics particularly the application of averages, percentages, and frequencies. Furthermore, there were consultations made with some community leaders and from related local authorities to collect information and data related with the local government unit disaster risk program and policies. The collected information and data regarding the local government unit disaster risk program were reviewed and matched with the local knowledge on flood management for recommendations of an effective disaster mitigation program.

Results and Discussion

Information of the respondents. The age of respondents is ranging from 14 to 81 years old. Majority of the respondents are from ages 26-39 with 36.3% when most at these ages are productive and physically well-built. Age is assumed to have a correlation with the respondents' attitude and perception to flood.

Based on the data from the interview, it shows that the female dominates the sampled population comprising 71% from the total 366 population, since the interviews were held at day time when males as head of the family are mostly working. Gender is assumed to have a correlation with the respondent's attitude and perception to flood.

Majority of the respondents graduated from high school (52%) and only 9% of the total 366 respondents graduated from college, and 1% remain in the elementary level. It is assumed that the educational level has a correlation with the way respondents assess their own risk perception. It is also assumed that well-educated people have better life and a higher income which influences the strategies applied in coping with the flood.

The household size ranges from 1 to 30 members. Majority of the households have 1-5 family members (58.50%). The information about the household's size is considered to be important to understand the economic status of the households.

Based on the interviewed respondents, majority has less than 2,000 pesos family income in a month. According to Family Income and Expenditure Survey of 2009, families with less than 5,200 pesos income per month are considered as poor families (NSO 2009).

Duration of stay of the respondents ranges from 1 to 14 years which constitute 37.4%, which is similar with 15 to 28 years which also constitute 37.4%. People that stayed longer are those vulnerable to flood since most of them are old.

Physical characteristics of respondent's houses. The result of this research shows that there are 11 types of combination of material structure of the houses. Table 1 describes the largest portion (26%) of the respondent construct their houses with reinforced materials such as combination of wood as wall material and wood as floor material. Furthermore, 18.6% of the respondents' houses are constructed with cement as floor material and hollow-blocks as wall material. The type of material used in constructing houses implies the socio-economic status of local people. Houses of respondents are also built in different number of floors which majority of the respondents have their house constructed in single-storey (71%) and 28% with two-storey houses.

Table 1

Cross tabulation between floor and wall material

Floor material (%)	*Wall material (in %)*					
	Ply wood	Wood	Bamboo	Hollow-block	Cement	Mix
Cement	1.9	13.1	0	18.6	0.8	12.3
Tile/Ceramic	0	0	0	0.3	0	0
Soil	0.8	9.3	0	0	0.3	0.3
Wood	2.7	26.0	1.1	0.3	0	4.1
Mix	0.5	2.5	0.3	0.8	0	4.1

Respondents' perception and flooding in their areas

Frequent flood depth. Bitan-ag Creek is one of the major creeks in Cagayan de Oro that is usually visited by floods (City Planning and Development Office 2008). Communities along the creek suffered from floods due to heavy rainfall and poor drainage systems. Table 2 shows the frequent flood depth experienced by the respondents. Based on the respondents' perception, the frequent flood depth ranges from 0.5 meter to 1 meter (49.7%). Moreover, 31.7% is experiencing flood depth greater than 1 meter.

Table 1

Distribution of respondents based on their perception on flood severity

Frequent flood depth	*Number of respondents*	*Percentage*
Less than 0.5 meter	68	18.6
0.5-1m	182	49.7
Greater than 1 meter	116	31.7
TOTAL	366	100.00

Flood water duration. The flood water duration is based on the usual length of time the respondents experienced. It is observed that the flood water duration in the study area is

ranging from < 1 day as the shortest and 5-6 days as the longest. Less than 1 day has the highest percentage of water duration with 60.70% (Table 3).

Table 2

Distribution of respondents based on their perception on flood duration

Flood water duration	*Number of respondents*	*Percentage*
Less than 1 day	222	60.70
1–2 days	127	34.7
3–4 days	14	3.8
5–6 days	3	0.8
TOTAL	366	100.00

A cross tabulation of respondents' perception on flood duration and frequent flood depth is shown in Table 4. It can be shown that the combination of 0.5–1 meter and < 1 day is the significant percentage of flood magnitude in the study area (30%).

Table 3

Cross tabulation of respondent perception on flood depth and flood duration

Frequent flood depth	*Flood duration (%)*				*Total*
	< 1 day	1-2 days	3-4 days	5–6 days	
< 0.5 meter	14.8	3.0	0.5	0.2	18.5
0.5-1 meter	30.0	18.3	2.5	0	50.8
> 1 meter	16.4	13.0	0.8	0.5	30.7
Total	61.2	34.3	3.8	0.7	100

Perception on flood severity. Flooding in the area has been affecting the local people perception on the severity it caused. Table 5 shows the distribution of respondents' perception about flood severity. It can be observed from the interview that 70.20% of the respondents perceived flood in their areas as nuisance which means annoying, unpleasant, creates injures and threatens properties. On the other hand, catastrophe is referring to disaster's negative impact directly threatens life. Others include sicknesses that were caused by flooding in the area.

Table 4

Distribution of respondents based on perception of flood severity

Flood severity	*Number of respondents*	*Percentage*
Nuisance	257	70.20
Catastrophe	80	21.90
Others	29	7.90
TOTAL	366	100.00

Reconstruction period. Majority of the respondents reconstruct houses in less than a week (62.8%) since most of the respondents do not have other places to stay.

Information on reasons to stay. There are three main reasons for staying in the area: no choice which means respondents are mostly informal settlers, the claimed for ancestral properties to the land and access to business. Most of the respondents depend on the nearby commercial centers of Cagayan de Oro City.

Local people coping mechanism. In the year 2009, hundreds of thousands of slum dwellers remained living in flood-prone areas of the Philippine capital despite pledges to move them after a barrage of deadly storms (Morella 2010). These slum areas are commonly at risk of flash flood since they lack support especially on building the necessary infrastructures that would keep their communities in a safer condition. These affected communities possess different coping capacities that struggle for a chance of living after an incident.

Type of coping mechanism. Historically, people have always made investments to obtain, and then to protect, those resources that hold the greatest value for them (International Strategy for Disaster Reduction 2002). Twigg (2004) categorized the coping mechanism into three categories that was used in this research:

a) Economic – economic diversification, such as having more than one source of income; having large family since it gives household additional labour; and saving and credit schemes are often an important component of economic coping strategies.

b) Structural/technological – the way that housing is adapted to repeated floods. Common adaptations include building houses on stilts so that floodwater can pass underneath, building them on plinths or platforms of mud or concrete so that they remain above flood levels, and building escape areas under or on top of roofs.

c) Social/organizational – the family is a fundamental social mechanism for reducing risk. Extended kin relations are networks for exchange, mutual assistance and social contact.

Table 5

Classification of coping mechanism employed by the respondents at different stages of flood

	Economic aspect
Before flooding	Construct the house with reinforced materials
	Preparing storage at higher place
	Storing basic food and medicine, and fuel
	Building canals
	Constructing canals
During flooding	Evacuating important things to safer place
	Purchasing food
	Continue working
	Continue attending school class
	Saving money
	Cleaning the house by draining
	Constructing canals
After flooding	Purchasing food
	Purchasing construction materials for the damage
	Putting things back in its original places
	Cleaning the house
	Structural aspect
Before flooding	Constructing canals
	Building floodwalls
	Building escape areas under or top of roofs
	Elevating the house
During flooding	Closing the door and windows properly to avoid water
	Securing house entrance
	Cleaning the house by draining
After flooding	Repairing minor damage of the appliance
	Repairing important damage to the house
	Social aspect
Before flooding	Ronda (patrol area neighbourhood)
	Preparing temporary place at friend's or relative's place
	Cleaning the canals
	Asking local officials for the possible evacuation center
During flooding	Asking local officials for the possible evacuation center
	Evacuating the family to safer place
	Evacuating important things to safer place
	Searching relief materials
	Guarding the house to ensure safety belongings
After flooding	Cleaning the house and surroundings
	Looking for alternative place to move
	Continue patrolling the neighbourhood
	Helping other's community member in doing work
	Staying longer in the evacuated area
	Asking for local government assistance

*The examples of Table 6 are mostly derived from Dewi (2007)

The coping mechanisms employed by the local people were divided into three different stages according to Blaikie et al (1994) as follows: before, during and after flooding. Table 6 shows the classification of coping mechanisms employed by the respondents at different stages of flood.

Coping mechanism in relation with number of family members. Household size is considered to be important in understanding the economic status of the households. Based from Table 7, it is observed that all households from smaller to bigger family size apply economic coping mechanism more before flooding than social coping and structural coping mechanisms. There were 366 interviewed households; 215 respondents have 1-5 number of households, 130 of them have 6–10 members, 18 households with 11–15 members, and 3 with 16–20 members. Based from table 9, households with 1-5 family members have the highest percentage in employing economic coping mechanism (36.61%) before flooding followed by the household with 6-10 family members (25.96%). Among the economic coping mechanisms employed by the households before flooding are constructing of canals and reinforced materials of the house, storing basic needs (food, water, medicine, and fuel) and preparing storage at a higher place. It shows that the before flooding, respondents used more economic (66.12%) and structural coping mechanism (53.01%) and less on social coping mechanism (41.80%).

Table 6

Cross tabulation of people perception about number of family members and type of coping mechanism before, during and after flooding

Stages of coping mechanism	*Number of household members*	*Economic aspect (%)*		*Social aspect (%)*		*Structural aspect (%)*	
		Yes	No	Yes	No	Yes	No
Before flooding	1-5	36.61	22.13	25.96	32.79	31.69	27.05
	6–10	25.96	9.56	13.93	21.58	18.58	16.94
	11-15	3.01	1.91	1.91	3.01	2.46	2.46
	16-20	0.55	0.27	0.00	0.82	0.27	0.55
During flooding	1-5	66.12	33.88	41.80	58.20	53.01	46.99
	6–10	53.55	5.19	51.91	6.83	50.27	8.47
	11-15	33.06	2.46	31.69	3.83	32.79	2.73
	16-20	4.64	0.27	4.64	0.27	4.10	0.82
After flooding	1-5	0.82	0.00	0.55	0.27	0.82	0.00
	6–10	92.08	7.92	88.80	11.20	87.98	12.02
	11-15	57.92	0.82	58.20	0.55	43.99	14.75
	16-20	35.25	0.27	35.52	0.00	25.96	9.56

During flooding, households with 1-5 members of the family have the highest percentages that tend to employ all types of coping mechanism, economic (53.55%), social (51.91%) and structural coping mechanism (50.27%).However, all households from smaller to bigger family size, used all types of coping mechanisms during flooding.

The most common types of strategy employed by the respondents after flooding are economic (98.91%) and social coping mechanisms (99.45%).

According to Blaikie et al (1994), the economic diversification such as having large family can be seen as part of economic coping strategy since it gives household additional labour. In this case, there is no evidence that the higher the household size, the higher the coping mechanism before, during and after flooding, either economic, structural and social coping mechanisms.

Coping mechanism in relation with family income. Income is also an important factor that influences the selection of coping mechanism before, during and after flooding. In this research, there were 189 households that have < 2000 pesos income per month, 155 households have 2,001–9,000 pesos monthly income, and 22 households have an income of more than 9,001 pesos monthly. It is observed that before flooding in Bitan-ag Creek,

all households with P2,001 - 9000 income has the highest percentage of employing two types of coping mechanism, the economic coping mechanism with 33.88% and structural coping mechanism with 25.68%. Household with lower income (<2,000) also tend to use all types of strategies, however, households focused more on economic and structural coping mechanism (Table 8).

Table 8

Cross tabulation of people perception about family income and type of coping mechanism before, during and after flooding

Stages of coping mechanism	*Family income*	*Economic aspect (%)*		*Social aspect (%)*		*Structural aspect (%)*	
		Yes	No	Yes	No	Yes	No
Before flooding	< 2,000	27.05	24.59	21.31	30.33	23.50	28.14
	2,001 - 9,000	33.88	8.47	18.31	24.04	25.68	16.67
	9,001-16,000 above	5.19	0.82	2.19	3.83	3.83	2.19
	Total	66.12	33.88	41.80	58.20	53.01	46.99
During flooding	< 2,000	44.81	6.83	42.62	0.82	45.08	6.56
	2,001-9,000	41.26	1.09	40.16	2.19	37.16	5.19
	9,001-16,000 above	6.01	0.00	6.01	0.00	5.74	0.27
	Total	92.08	7.92	88.80	3.01	87.98	12.02
After flooding	< 2,000	50.55	1.09	51.09	0.55	40.16	11.48
	2,001 - 9,000	42.35	0.00	42.35	0.00	29.78	12.57
	9,001-16,000 above	6.01	0.00	6.01	0.00	5.19	0.82
	Total	98.91	1.09	99.45	0.55	75.14	24.86

As illustrated in Table 8, the family income of the respondents in the studied area varies. It shows that during flooding, household with less than P2,000 income has the highest percentage of employing all types of coping mechanisms. Cleaning the house by draining, evacuating important things to safer place, securing the house entrance, and asking local officials for possible evacuation centers are among the activities employed by the households as part of the coping mechanism during flooding.

After flooding, all of the respondents mostly employed economic and social coping mechanism rather than structural strategies. Social coping mechanism employed by the household after flooding include cleaning the house, helping other community member in doing work, staying longer in the evacuated area, and asking l ocal government assistance.

In relation with family income, there is no evidence that the households with higher income can provide more economic, structural and social measures.

Coping mechanism in relation with frequent flood depth. People usually deal with the magnitude of the flood and have learnt to find ways in coping with its impacts. Magnitude of the flood consists of flood depth, flood duration and flood velocity. Flood velocity is not considered in this research since there is a lack of data about flood velocity. In this research, the frequent flood depth is defined as the usual measurement of flood in the respondents' house. This research shows that there are 68 households that experienced flood depth in less than 0.5 meter. Based from Table 2, the usual height of flood in respondents' house is from 0.5 to 1 meter where there are about 182 of them are affected. There were 116 households that have inundated depth of more than 1 meter.

It can be observed in Table 9 that the common coping mechanism employed by the households before flooding is the economic coping mechanism with 66.12% and less with social coping mechanism with 41.80%. Thus, from 0.5 to 1 meter depth of flood, households tend to use economic strategies in coping with the severity of flood 37.16%.

Table 9

Cross tabulation of people perception about frequent flood depth and type of coping mechanism before, during and after flooding

Stages of coping mechanism	*Frequent flood depth*	*Economic aspect (%)*		*Social aspect (%)*		*Structural aspect (%)*	
		Yes	No	Yes	No	Yes	No
Before flooding	< 0.5 m	12.30	6.28	6.28	12.30	8.47	10.11
	0.5–1 m	37.16	12.57	22.95	26.78	29.78	19.95
	>1 m	16.67	15.03	12.57	19.13	14.75	16.94
	Total	66.12	33.88	41.80	58.20	53.01	46.99
During flooding	< 0.5 m	15.85	2.73	14.21	4.37	15.03	3.55
	0.5–1 m	46.72	3.01	45.08	4.64	45.36	4.37
	>1 m	29.51	2.19	29.51	2.19	27.60	4.10
	Total	92.08	7.92	88.80	11.20	87.98	12.02
After flooding	< 0.5 m	17.76	0.82	18.03	0.55	10.66	7.92
	0.5–1 m	49.73	0.00	49.73	0.00	39.34	10.38
	>1 m	31.42	0.27	31.69	0.00	24.32	7.38
	Total	98.91	1.09	99.45	0.55	74.32	25.68

Relatively, during flooding households that usually experienced 0.5–1 m and >1 m depth of flood used the three types of coping mechanism. Thus, households with less than 0.5 m depth of flood, employed less coping mechanism.

After flooding, people in the surveyed area employed lesser structural coping mechanism (74.32%) than economic (98.91%) and social coping mechanism (99.45%). However, households who experienced flood depth that ranges from 0.5 to 1 meter have the highest percentages in using economic and social coping mechanism. The strong network and relationship among households is an important asset to cope against flood threat. It is observed that the economic, social and structural type of coping mechanism have association with the flood depth.

Local government flood management. Flooding in Cagayan de Oro City severely affected the city and claimed significant number of damages to properties, infrastructure, lifelines and sometimes death. There are two types of flood occurrences in Cagayan de Oro City, namely: riverine/urban floods and coastal floods. Riverine/urban flooding is caused by intense rainfall, overcharging the existing drainage system, overflowing of water along riverbanks and flood plains. Bitan-ag Creek segment is provided most with dikes of about 1.5 meter height and box-culvert along road junctions (Uncad 2008).

There are proposed projects nationwide that will help in mitigating the flood's negative impacts. According to the Regional Development Plan of Region 10 (Philippine Information Agency 2012), Cagayan de Oro City is included in the Part III of the Master Plan and Feasibility Study of Flood Control and Drainage Projects of Selected River Basin Nationwide. Among the included measures are the structural and non-structural measures. Proposed structural measures include increasing flow capacity by constructing a dike/river wall and deepening and widening the channel. Another is regarding the basin by constructing a dam for flood water storage, lowering the flood discharge, constructing a revetment and spur dike to protect the river against scouring, erosion and bank collapse. Non-structural measures include inundation map, plan of community-based flood warning system and recommendation for a watershed management and flood plain management system and zoning (Philippine Information Agency 2012).

There are also actions taken by the Department of Environment and National Resources (DENR), which are the following: (1) institutionalized the CDORBMC (Cagayan de Oro Riverbasin Management Council) in coordination with the Archdiocese of Cagayan de Oro City (November 2010); (2) implementation of upland development program (2009-2010); (3) National Greening Program on 2011; (4) Linis_Estero from 2005-2009; (5) Adopt_an_Estero Program (2011); (6) Supported the passage of the environment related congressional bills filed by Congressman Rodriguez; (7) Characterized and

assessed the Bubunawan Watershed to flooding and landslide; (8) Provision of Geo-Hazard Assessment Reports and Maps to all LGUs (2010); and (9) Development of Integrated Coastal Management Plan of Cagayan de Oro City (2011).

Through the Department of Science and Technology (DOST) Disaster Risk and Exposure Assessment for Mitigation (DREAM) project, Cagayan de Oro City already has 3D and hazard map together with Iligan, Iponan and Mandulog River. Important tools in flood early warning system were also installed in the city, such as Automated Rain Gauges and Water Level Sensors.

There are mostly three types of flood warning levels in the Philippines. Figure 1 shows the preconditions for warning levels. This warning system is form the Binahaan Watershed LFEWS (Local Flood Warning System) that uses three colors to communicate warning and alert levels. The LFEWS flood alert signals and symbols are already adopted in Leyte Island (Deutsche Gesellschaft fur Internationale Zusammenarbeit 2012).

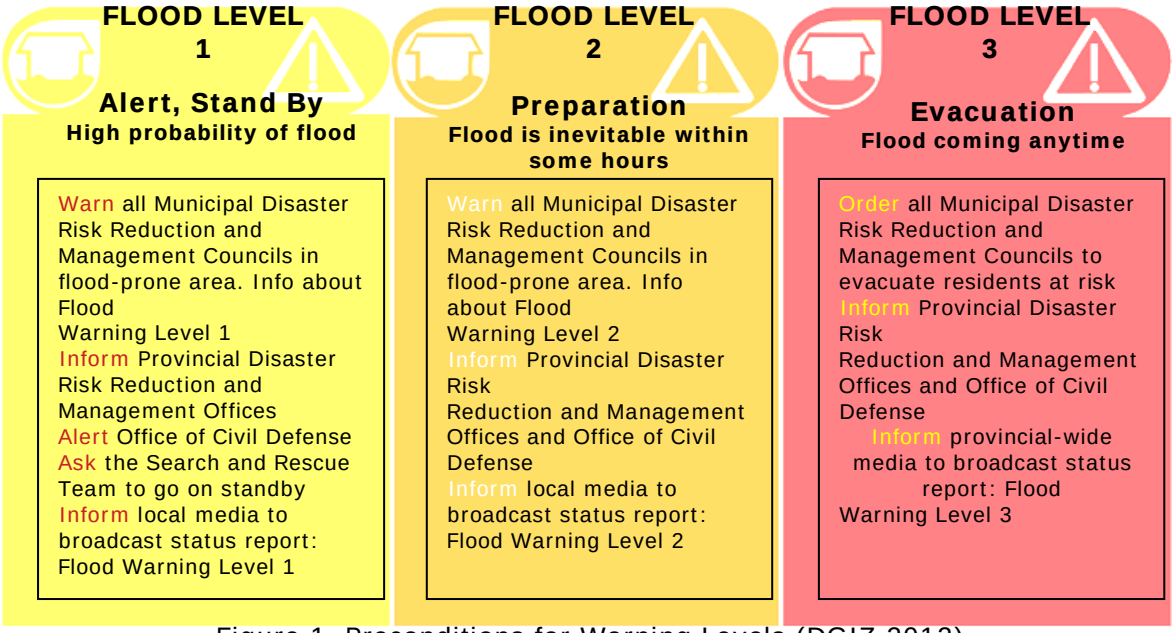

Figure 1. Preconditions for Warning Levels (DGIZ 2012).

Conclusions. Flooding has been associated with the Bitan-ag Creek in Cagayan de Oro City. The capacity of the households in coping with flood depends on how households use their existing resources to achieve various beneficial ends.

The results of this research revealed that the types of coping mechanism employed by the households are influenced most by magnitude of flood and the capacity of households to deal with it. Attitude and behaviour of affected households to cope with flood impacts are influenced on how they perceived flood magnitude in their area. They set up ways of coping to minimize the negative impacts of flood. The capacity of the households in this research is largely dependent on the socioeconomic status of the households. It can be concluded that the higher the households' capacity the lesser vulnerable they are against flood threat.

Many efforts have been made by Local Government of Cagayan de Oro City in order to deal and minimize the negative impact of flooding, consisting of structural and non-structural measures. It is believed that joint use of non-structural and structural measures is the best alternative of coping with flood. Unfortunately, these efforts have not been sufficient enough to overcome problems caused by floods in the city. The community is still and will continue to be suffering from frequent flood especially areas nearby Bitan-ag Creek.

A combination of structural and non-structural measures is found to be the best alternatives in coping with flood. Nevertheless, these efforts have not been able to sufficiently overcome the problems, and the community is continually suffering from the floods. The coping capacity of households that constitutes the coping mechanisms

employed by them should be included in the objectives of the existing disaster management plan of Cagayan de Oro City. However, there is a little evidence that the local government of Cagayan de Oro city has included the local knowledge of the people into their implementation. This could provide more directives for disaster managers to plan measures and policies to improve the effectiveness of risk reduction activities. Raise awareness of the community on impact of flood, increase of public participation in flood management, and strict solid waste management should be implemented; integration of Climate Change Adaptation in Disaster Management, and a comparative study before and after Typhoon Sendong should be studied.

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Annex 1

COPING MECHANISM OF FLOOD VULNERABLE HOUSEHOLDS ALONG BITAN-AG CREEK, CAGAYAN DE ORO CITY: AN ASSESSMENT

(This information will only be used for scientific research purpose)

Questionnaire no.: ____ Date: _____ Time: _____
Researcher: Kabingue, Vida Fe C.
Contact: vidafekabingue@gmail.com
Environmental Science student, MSU-Iligan Institute of Technology, Iligan City

_____

Instruction: Please fill up the following questions below. And put check on the corresponding choice(s) in each number.

I. Personal Profile
Name (Optional): _____
Education: _____
Age: _____
Sex: _____

II. Socio-Demographic Profile
1. Number of Household Members: ____

2. Estimated Family Income/Month
( ) Below Php 2,000
( ) Php 2,001-9,000
( ) Php 9,001-15,000
( ) Php 15,001-21,000
( ) Php 21,001 above

III. Element at Risk
3. Building Material (please select)

Floor material	( ) Cement	( ) Tile/Ceramic	( ) Soil	( ) Wood	( ) Others
Wall material	( ) Ply wood	( ) Wood	( ) Bamboo	( ) Hollow-Block	
	( ) Press cement		( ) Mix		
Number of floors	( ) 1	( ) 2	( ) 3	( ) Above 3	

IV. Flood Characteristics
4. Flood Characteristic
4.1. What is the frequent depth of flood in your area?
( ) < 0.5m
( ) 0.5 – 1m
( ) > 1m

5. What is the common flood water duration?
( ) Less than 1d ay
( ) 1–2 days
( ) 2–3 days
( ) 3–4 days
( ) 4–7 days
( ) More than 7 days

V. Floods Coping Mechanism (Protection)
6. What keeps you staying in the area?
( ) Access to business
( ) Access to education
( ) Access to place of work
( ) Ancestral properties
( ) Cheap
( ) Compatible neighbourhood
( ) Others, please specify _____

7. Have you applied any local flood coping mechanism (protection)?

7.1. Economic Aspect		
Before	( ) Yes	( ) Construct the house with reinforced materials ( ) Preparing storage at higher place ( ) Storing basic food and medicine, and fuel ( ) Building canals ( ) Constructing canals ( ) Others, please specify _____
	( ) No	
During	( ) Yes	( ) Evacuating important things to safer place ( ) Purchasing food ( ) Continue working ( ) Continue attending school class ( ) Saving money ( ) Cleaning the house by draining ( ) Constructing canals ( ) Others, please specify _____
	( ) No	
After	( ) Yes	( ) Purchasing food ( ) Purchasing construction materials for the damage ( ) Putting things back in its original places ( ) Cleaning the house ( ) Others, please specify _____
	( ) No	
7.2. Physical/Structural Aspect		
Before	( ) Yes	( ) Constructing canals ( ) Building floodwalls ( ) Building escape areas under or top of roofs ( ) Elevating the house ( ) Others, please specify _____
	( ) No	
During	( ) Yes	( ) Closing the door and windows properly to avoid water ( ) Securing house entrance ( ) Cleaning the house by draining ( ) Others, please specify _____
	( ) No	
After	( ) Yes	( ) Repairing minor damage of the appliance ( ) Repairing important damage to the house ( ) Others, please specify _____
	( ) No	
7.3. Social Aspect		
Before	( ) Yes	( ) Ronda (patrol area neighbourhood) ( ) Preparing temporary place at friend's or relative's place ( ) Cleaning the canals ( ) Asking local officials for the possible evacuation center ( ) Others, please specify _____
	( ) No	
During	( ) Yes	( ) Asking local officials for the possible evacuation center ( ) Evacuating the family to safer place ( ) Evacuating important things to safer place ( ) Searching relief materials ( ) Guarding the house to ensure safety belongings ( ) Others, please specify _____
	( ) No	
After	( ) Yes	( ) Cleaning the house and surroundings ( ) Looking for alternative place to move ( ) Continue patrolling the neighbourhood ( ) Helping other's community member in doing work ( ) Staying longer in the evacuated area ( ) Asking for local government assistance ( ) Others, please specify _____
	( ) No	

8. How long does it take your family to reconstruct the damage?

( ) Less than a week
( ) Less than three weeks
( ) In a month
( ) Less than 6months
( ) In a year
( ) More than 1year
( ) No reconstruction happens

9. How do you perceive the flood in your area?

___ Nuisance (damage properties of the households)
___ Catastrophe (directly threaten life)
___ Others, please specify _____

END OF QUESTIONNAIRE

I thank you very much for your help and kind cooperation.