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Community Capacity and Needs Assessment on Flood Early Warning - A Case Study in Bangladesh

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Abstract

In Bangladesh, household and community response to extreme recurring events like flood is a factor of the extent of their vulnerability, the intensity of the hazard, and their level of capacity. If people are informed ahead in time of the flood, more actions they can take to prepare to reduce their risks and vulnerability. Flood early warning depends on the ability of relevant national, local and community institutions capacities to understand, interpretation, dissemination and response performance. Interruption in one single stage would fail the overall early warning system. Thus community capacity and need assessment is essential to design a robust and effective early warning system. This paper illustrates community capacity and need assessment on flood warning system through understanding people's perception on floods, existing warning and dissemination system, vulnerabilities, risk and coping mechanism. The methodology includes semi-structured questionnaires as well as workshops and Focused Group Discussions (FGDs). The survey findings substantiated that still households has lack of access to information, don't understand the flood nomenclature and majority of the population couldn't able to interpret and translate science information for local decision making even though information could be available.

Keywords: Community; Early warning; Flood risk; People's perception

Introduction

Early warning systems alone do not prevent hazards turning into disasters. Early action is essential in order to mitigate potential damage [1]. Early warning and early action together can save thousands of lives and livelihoods reduce vulnerability and strengthen resilience. Despite advances in forecasting, 'surprises' have resulted in great loss of lives as well as property in every severe hazard cases for any country (i.e. tsunami 2004, cyclone NARGIS, Pakistan Flood etc). The community impacts remain very high due to constraints in information flow; low capacity at local levels and lack of awareness of response options. In every single event it was observed that the early warning system fails. If root causes analyzed reasons for failure of warnings perhaps three major aspects [2]:

- Warning not understood: Messages was lack relevance and meaningful, some groups may largely exclude from most networks, hence unable to receive warning or informal personal network may undermine and deflect official communications.
- Warning understood, but ignored: Let's assume warning was understood but it may be ignored as other priorities interfere with immediate response to warning (e.g. looking for household members), seeking confirmation before acting or people make their own decisions based on experience, culture.
- Warning understood, not ignored, but not responded: Finally we assume that warning was understood, it was not ignored but it fails due to lack of physical facilities- safe shelters to move into or lack of evacuation modes.

The World Disaster Report communicated the importance that understanding early warning as a system rather than a technology highlights the need to address risk assessment, communication and dissemination, and preparedness to act with the same level of commitment provided to the technological aspects of early warning. A breakdown in any one of the pillars of early warning can cause warning messages to fail to reach and motivate their intended recipients. Significant challenges remain, especially as the nature of vulnerability continuously evolves and historical trends no longer provide reliable signals for future disaster occurrences due to climate change. There is no single solution, given the diversity of risks facing virtually every corner of the globe, but global cooperation has helped create systems to better prepare for and mitigate natural disasters. Early warning must lead to early action across all timescales, from providing a sufficient notice of an imminent event, to helping societies learn to adapt to climate change.

The Global Survey of Early Warning system by the UN [3] concluded that there are great capacities and strengths available upon which a truly effective globally comprehensive early warning capacity can be built. A network of interacting systems and components, drawing on the expertise and technical capacities of the different hazard fields and the knowledge and insight of the relevant associated social and economic fields. Moreover, what needs to be done to address the shortcomings is not a mystery, but has been already laid out in general terms in a succession of documents and meetings over the last decade. Implementing these changes does not have to be expensive, simple measures such as making public transport more reliable will allow even the poorest people in developing countries the opportunity to evacuate. Reducing deforestation around populated areas is another measure that can prevent heavy rain washing dangerous debris into the area [4].

The concept of flood risk is widely considered to be the product of three components: hazard, vulnerability, and exposure (value) [5]. In its simplest structure, risk is computed by multiplying these three

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components [6]. However, in practice, vulnerability and exposure (value) are usually combined into a single vulnerability factor and flood risk is computed using hazard and vulnerability components [7]. Flood risk is the measure of the seriousness of a flood hazard. It is the probability of an event multiplied by its consequences (like estimated damages) [8-11]. Flood risk is also defined as hazard multiplied by values and vulnerabilities in which "hazard" is the threatening natural event (including its probability of occurrence), while values (or values at risk) are items like buildings, or humans that reside at the location [12]. Vulnerability is the lack of resistance to damaging or destructive forces [13,14]. However, natural hazards usually do not manifest themselves in one single event with a given probability of occurrence, but in many different forms with an almost infinite number of variations [12].

In the disaster risk management perspective, vulnerability try to explain how the society, in its interaction with the changing physical world, constructs disaster risk by transforming physical events into hazards of different intensities or magnitudes. The assessment of vulnerability has become challenging in climate change research, due to its intense collaboration between scholars from many different research traditions. Pelling et al. [15] defines vulnerability as the exposure to risk and an inability to avoid or absorb potential harm. In this context, he defines physical vulnerability as the vulnerability of the physical environment; social vulnerability as experienced by people and their social, economic, and political systems; and human vulnerability as the combination of physical and social vulnerability.
To overcome this issue, [16] presents a conceptual framework and a terminology of vulnerability that enables a concise characterization of any vulnerability concept and of the main difference between different concepts; thereby bridging the gap amongst various tradition vulnerabilities. His work, describing the vulnerable situation and identifying vulnerability factors, shows four dimensions that are fundamental to describe a vulnerable situation: system, attribute of concern, hazard and temporal reference, the point in the time or period of interest. Using this dimension, a vulnerable situation can fully describe as "Vulnerability of a system's attributes of concern to a hazard in temporal reference".

There is conclusive research evidence about what it takes for people to shed their safety perceptions and then take early protective actions [17]. Here is what has been learned. Funding early warning systems are only as useful as the 'last mile' of successful evacuation and response. People do not immediately respond to early warnings because people worldwide first "search" for additional information to "confirm" that they are really at risk. This searching happens despite the technology used to give warnings. Searching is a social phenomenon. It involves talking things over with others and seeking to hear the same warning multiple times from different sources. Warned people turn to friends, relatives, and strangers to determine if they agree that risk is present and if protective actions are warranted. This process, constructing new perceptions of risk out of existing perceptions of safety adds time before protective actions are taken- it is fundamental to all human beings worldwide, and it is not going to change. Early public warnings work best when they are under mandate from a government that is trusted as they can facilitate the process and speed it along [4]. Ignoring this basic human warning element has and will continue to cost lives. Thus community need assessment and establishment of an early warning system based on community demands and needs are essential to reduce their vulnerabilities.

Methodology

The methodology has been designed to assess perception of the community people about disasters in general and flood in particular, people's knowledge about flood and flood warnings, existing practice of receipt and dissemination of flood warnings, different modes and channels for dissemination of flood warning, communication media for dissemination of flood warnings at grass roots level and change agents (social and community leaders) for dissemination of flood warnings and promotion of flood management.

The methodology includes administration of semi-structured questionnaires as well as workshops and Focused Group Discussions (FGDs). A set of semi-structured questionnaires was administered to 500 respondents in five villages under five unions (lowest Administrative unit) in five Upazilas (Sub-District). 100 samples were collected based for each union. Among five villages, two each were taken from high and medium floods and one village was taken from low flood areas. Persons who play a spontaneous role in acquiring knowledge on different aspects of life, both within the community and from outside, and also get opportunities in their daily engagement to share and disseminate information, were identified for the purpose of conducting in-depth interviews to learn about existing knowledge on flood information, and communication processes, levels, flows, etc., and local people's needs and priorities for flood information in helping them reduce risks. The interview also included views, ideas, suggestions on how different actors and institutions in the community could facilitate in managing a community based flood information system. The respondents parameters Vis a Vis the proposed parameters is presented in the Table 1.

The fundamental approach to conduct the survey was to ensure the attitude, behaviour and practice that the survey team demonstrated in practice. The survey process was managed with a view to encouraging spontaneous participation of communities and all stakeholder groups to reveal accurate information in relation to flood preparedness, reducing vulnerability and risks. The following tools and techniques were used to implement the survey.

Focused Group Discussion (FGD)

During the survey, three FGDs with local stakeholders and participants from the community took place. The FGDs concentrated on a number of issues dealing with how flood related information

Criteria	Proposed Parameters	Respondent Parameters
Age	60% above 40 years of age having long experience of facing flood disaster	65% above 40 years of age having long experience of facing flood disaster
Gender	At least 50% female, who have to take the brunt of disasters	About 44% respondent household heads were women
Economic Condition	Approximately 80% marginal farmers and daily wage earners who are exposed to threats of flood disasters	76% were marginal farmers and daily wage laborers
Educational Level	Minimum 80% below SSC level whose awareness and capacities require development	93% below SSC level whose awareness and capacities require development

Table 1: Criterion for Baseline Survey, Desired and Respondent Parameters

could help the community and households to prepare better and enable reducing risks. Participants included both men and women. Marginal farmers, share-croppers, wage laborers, poor women were in majority. There were prospective and actual change agents who participated including mosque imams, teachers, traditional birth attendants, folk artists, NGO and social workers, etc. Due to resources constrained five FDGs were not conducted in five villages, we invited some major stakeholders from other village to join in the FGDs.

Study area

The study area has been selected based on riverine flood prone area, climate\hydrological data availability, accessibility. Availability of flood forecasts information has been considered as biophysical criteria. Demand from the user, per capita food grain production, literacy, population exposed to the flood hazard has been considered as social criteria. As mentioned earlier, five villages under five unions (lowest Administrative unit) in five Upazilas (Sub-District) are Rajpur union of Lalmonirhat district, Uria union of Gaibandha district, Kaijuri union of Sirajganj district, Bekra Atgram union of Tangail district and Gazirtek union of Faridpur district. Of the five villages, two each were taken from high (Kaijuri and Uria) and medium floods (Bekra Atgram and Rajpur) and one village were taken from low flood (Gazirtek). The study areas are shown in the Figure 1.

Major livelihood groups in the pilot unions are classified into eight classes, such as Farmer/Share cropper, Agriculture Labour, Non-Agriculture Labour, Fisherman, Service holder, Business, Loom, Cottage industry, Transport and Others. These classes were defined according to definition of Bangladesh Bureau of Statistics. According to people's perception in the community workshops, major livelihood groups in the pilot unions are Farmer/ Share cropper, Agriculture labour and Non-agriculture labour. About 50 % households are mainly dependent on agriculture in all pilot unions.

Road/ communication, educational, health and social infrastructures are important in a community. Information on these infrastructures of each union is taken from Union Parishad and Upazila Parishad, which are presented in the Table 2.

There are different types of flood shelter exist in the pilot unions, such as permanent flood shelter, institutions, embankments, etc. Beside these, people stay at the roof of their own houses or at relative's houses or on boat during flood. Participants at the community workshops expressed their views about their preference, acceptability and woman facility of the flood shelters.

At Kaijuri, Uria and Gazirtek unions, there is no permanent flood shelter. Most of people prefer to stay at their own houses or at their relative's house or stay on the embankment. There is small number of educational institutes and they are not in good condition to serve the flood victims during flood. Only Rajput has a permanent flood shelter with capacity of 100 households. Most of the flood victims stay on the embankment. Although the permanent flood shelter and education institutes have low capacity than the embankment, they got higher preference to the people. However, in all type of shelter, there is no extra toilet facility for women, except houses. People suggested increasing number, capacity and facilities of flood shelter.

Existing flood forecasting system

For a flood prone country like Bangladesh, flood forecast technology plays an extremely crucial role in saving lives and properties. Flood Forecasting and Warning Centre (FFWC) of Bangladesh Water Development Board (BWDB) is responsible for flood forecasting and its dissemination within Bangladesh. There are several flood models used by FFWC to generate different scale flood information. Currently they provide 1-5 days deterministic forecasts using MIKE 11, one-dimensional modeling software. They also provide medium range (1-10 days) probabilistic discharge forecasts for Brahmaputra, Ganges and Megna at 18 locations and recently introduce the seasonal (25-30 days) forecasts using CCSM3 seasonal forecasts data. With support from the Department of Disaster Management (DDM), Cell Broadcasting (CB) has been started from July-2011 for flood warning message dissemination. Instant Voice Response (IVR) method is used; anyone call 10941 from Teletalk mobile can hear a recorded Bangla Voice Message regarding days flood situation.

In all pilot unions, people are getting early warning regarding

Infrastructures	Rajpur Union	Kaijuri Union	Uria Union	Gazirtek Union	Bhekra Union
Kancha road (km)	50	10.44	26	52	20
Paved road (km)	4	7.32	3	10	3
Rail road (km)	-	-	-	-	-
Embankment (km)	8		7	7	-
Flood shelter (no.)	3	-	-	-	-
Flood Control structure (Spur)	3	-	-	-	-
Primary school (no.)	11	24	4	13	5
High school (no.)	3	4	1	4	1
College (no.)	-	2	-	-	1
Modrasa (no.)	2	19	3	2	1
Mosque (no.)	37	22	5	25	17
Temple/ Girja (no.)	9	6	-	-	2
Club (no.)	-	-	1	4	10
Market (Hat/Bazar) (no.)	2	6	3	3	2
Hospital (no.)	-	-	1	-	-
Non-govt. Health clinic (no.)	-	4	-	1	-
Govt. health clinic (no.)	1	-	-	-	-
Bridge/ culvert (no.)	19	5	10	26	6
Fire service (no.)	-	-	-	-	-
Post Office	-	3	-	-	-

Table 2: Infrastructures in pilot unions

rainfall and flood through radio and television, which is delivered by FFWC and Bangladesh Meteorological Department (BMD) but the acceptability, is very low. People cannot rely on the early warning. However, people are dependent on their own experience about rainfall and flood in some areas. For instance, people at Kaijuri union can assume the near future rainfall and flooding condition in the area by observing the wind direction and clouds. The Bekra union was in pilot study area- Nagarpur thana, Tangail of EMIN project of CEGIS, where community based flood forecasting system was applied. The flood forecasting system includes mobile phone technology and flag signals for future flood condition. The people were trained about the message of flag and preparedness activities. The project was successful and highly accepted by the community. In general, as people do not rely on the early warning message got through TV, Radio, they do not take preparedness actions sincerely. So they cannot avoid damage of their property.

Respondent features

The disasters like floods have many direct and indirect impacts on the wealth and well-being of people and these are distributed disproportionately across the social categories. The poor, farmers, women and rich face different degrees of flood impacts and risks and they set various copying strategies according to their understanding of the problems as well as household and community capacity and try to reduce their vulnerability to floods. Figure 2 shows the percentage of age of household head. There were more male household heads in the sample households (500) (Figure 3) and two-third of respondent households had a single earning member. Almost a fourth had two earning members. A little over a tenth of the households surveyed had three or more earning members.

Three-fourth of respondent households had agriculture as their primary occupation. This includes households who were owner-cum-operators as well as sharecroppers and agriculture wage laborers. A little over 7 percent of respondent households relied exclusively on wage labor outside agriculture (Figure 4). Again, almost seventy five percent households relied on agriculture as their source of income.

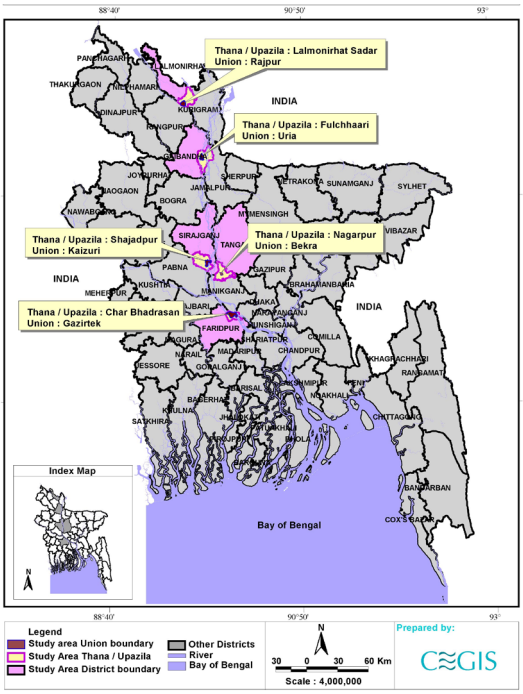

Figure 1: Study areas in Bangladesh.

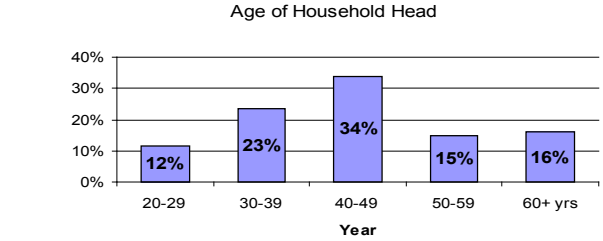

Figure 2: Age of Household head.

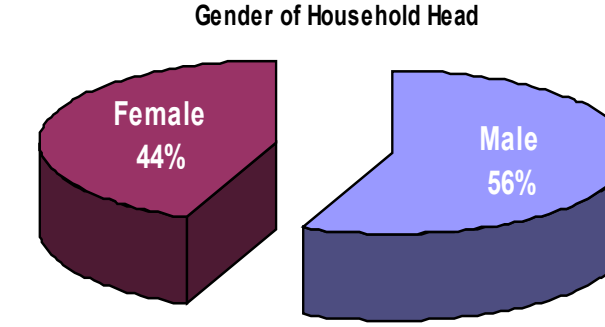

Figure 3: Gender of Household.

People's perception of flood and flood warning

All the pilot study areas are disaster prone area. Major natural hazards prevailing in the study areas are identified and ranked as per people's perception. Since the study areas are containing similar topography (flood plain of Jamuna river), major hazards occurring in the areas are also similar. In most cases, river erosion has got the first priority among all hazards and then flood. Storm/ tornado, hail storm and drought got third priority in Kaijuri, Uria, Rajpur and Gazirtek union respectively. Although river erosion got the priority than flood, both hazards are related to water level and movement in rivers. So forecasting on water level in river would be useful for preparedness / mitigation measures for both flood and river erosion. The household survey reveals that 80 percent respondents considered flood as a natural disaster only when they threat people, livestock, homes, crops and other natural and built-up landscape (Table 3). Sixty percent respondents understood flood to be when houses, roads, and crops are damaged, communication and livelihood disrupted, day-to-day living is affected (Table 4). Out of 500 respondents, only 241 considered floods to be a risk to human lives. Out of these, almost half seriously believed flood impacts could cause losses in human lives. 74 respondents believed floods to have moderate risks for human lives, while 55 respondents believed floods to be of less risk in terms of human lives. An overwhelming 387 out of 481 respondents regarded flood impacts damaging house and homestead as a high risk, while 437 out of 477 respondents believed damage to crops as a high flood impact risk. Figure 5 shows the perception of flood impact by the community. The causes of flood vary with the land type, topography, and hydrology and drainage system of the area. Two main causes of flood were discussed:

flood due to river water and flood due to heavy rain. Flood affected villages of each union and seasonality of flood were identified through discussions. The affected areas are classified into high, medium and low based on the different thresholds. For an example, in agriculture sector if the flood inundates the low lying agriculture land is defines as "low", if the flood water reach to the local roads defines as "medium' and if it's reaches to the house called "high". There were overwhelming responses of flood having high-risk impact on fisheries, livestock management, employment, health, and sanitation. A significant finding was that 348 out of 467 respondents considered female-specific problems to be at high risk on incidence of flood.

Almost 70 percent of the respondents knew that radios provide flood warnings, while a little over 60 percent also knew televisions provide flood information and warning. Very little responses were obtained on other sources of flood information and warning (Figure 6). Out of 500 respondents of the household survey, 490 (98%) said there was no effective process and system for flood information collection and dissemination at community level. What little information they received as flood warning on rise and fall of water levels of major rivers is from radio (74%). A little over 30 percent of respondents received information on the damages on crops from their community members, while a quarter of the respondents received information on the flood intensity and areas affected form television. It was interesting to note that a number of respondents (28%) took the marking of water gauges as an indicator of warning (Figure 7). Household survey responses indicate there is little involvement of local institutions and change agents/actors in relation to flood information dissemination at the village level. Figure 8 shows that only 2% involvement is from local government and 10% from NGO's. Before flood communication media for flood information dissemination at grassroots found that 75

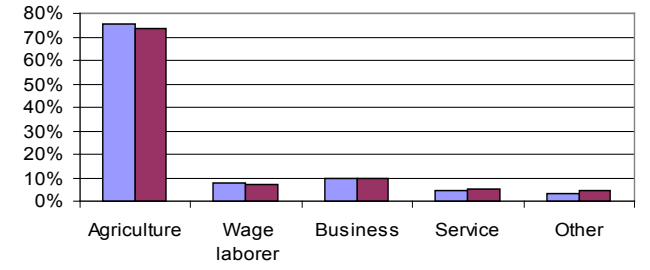

Figure 4: Occupation and sources of household income.

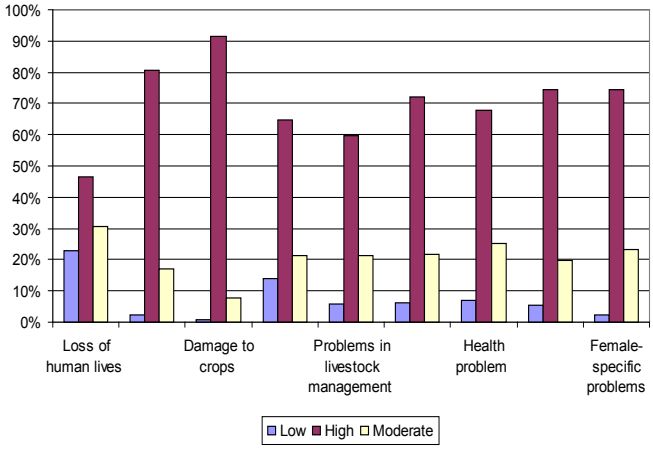

Figure 5: Perception of Flood Impact.

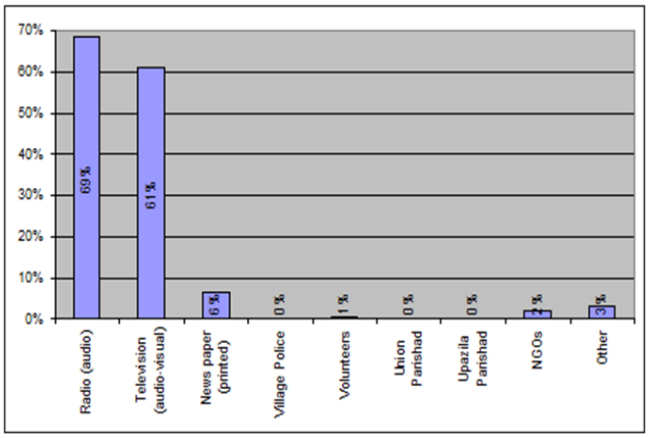

Figure 6: Different Flood Warning Sources.

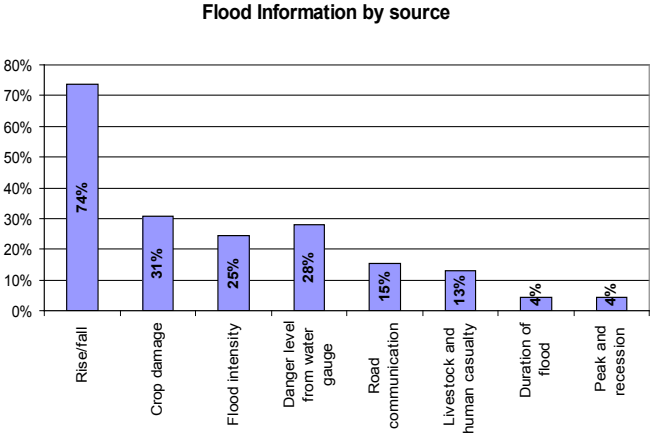

Figure 7: Types of Flood Information from Sources.

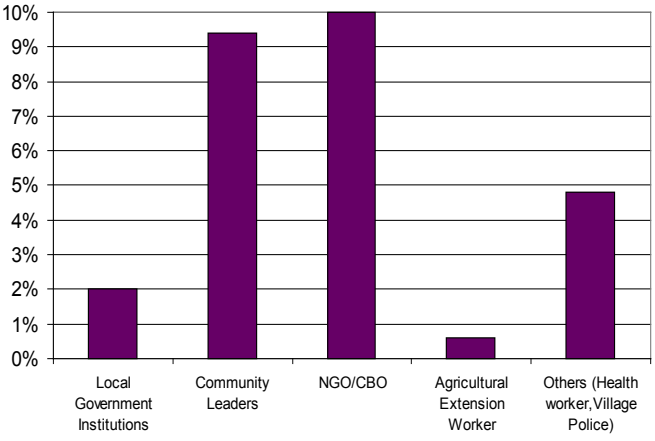

Figure 8: Different groups for receipt and dissemination of flood warnings.

percent received flood information prior to flood from interpersonal communication and during flood 86 percent respondent received their flood information from interpersonal communication (Figure 9).

The findings also reveal there is little practice in respondent households on alternative income generation prior to flood. Also, the households taking preparedness measures were few in number. The most common preparedness measure was making and storing separate clay stove and preserving cooking fuel. The most significant actions households carried out during flood was maintaining boats/rafts (34%) and moving household belonging to safety (33%) (Figure 10).

Respondents initiated crop and/or vegetable cultivation immediately following flood (41%), and also rebuild damaged facilities including homes, latrines and tube well (Figure 11).

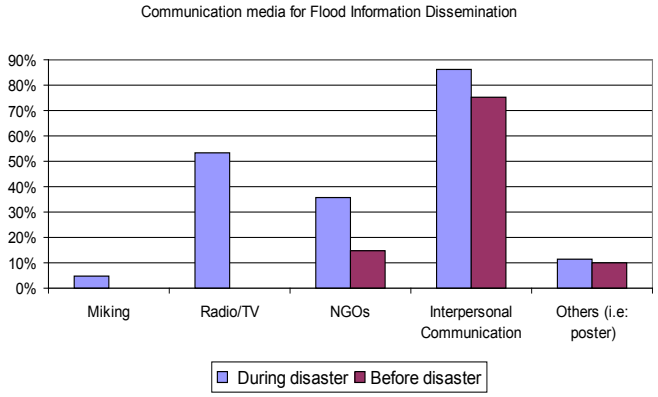

Figure 9: Communication media for Flood Information Dissemination.

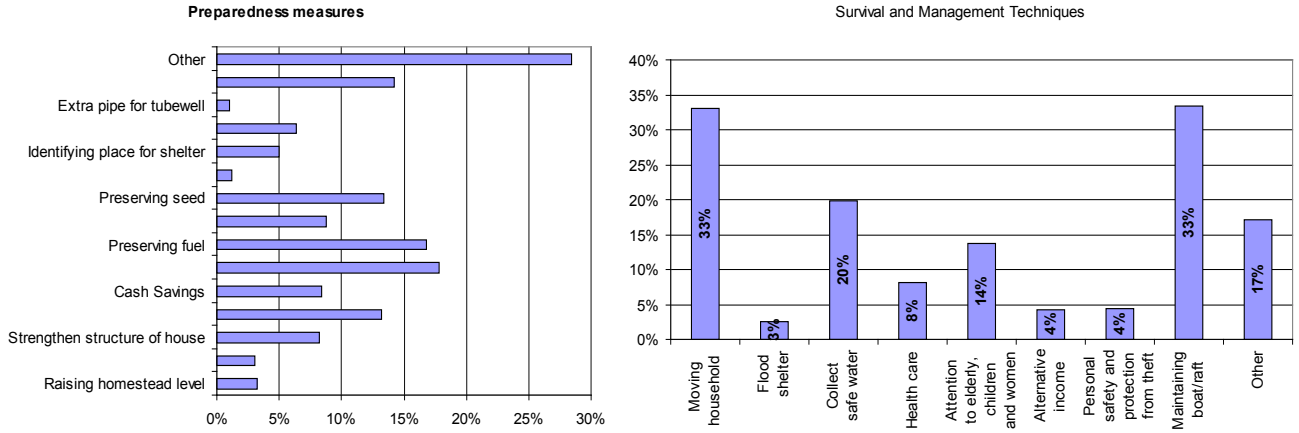

Figure 10: Flood preparedness survival techniques: before and during flood.

Sl.	Perception	Response*	%
1	Disaster means Flood, Cyclone, Heavy Rainfall, River bank erosion, etc.	155	48
2	Flood, cyclone and rainfall become disaster only when these cause physical risk to people, livestock, damage crops, houses, tree	257	80
3	Disaster is an act of God	18	6
4	Other (including disruption of livelihood and in living)	33	10
Total Respondent		320	

*Multiple responses

Table 3: Perception of Disaster.

Sl.	Perception	Responses	%
1	Flood is when overflow of river or heavy rain water damages crops.	10	2
2	Flood means damaging crops and disrupting communication	188	38
3	Flood means houses, roads, and crops damaged, communication and livelihood disrupted, day-to- day living is affected.	302	60
	Total Respondent	500	100

Table 4: Perception of Flood.

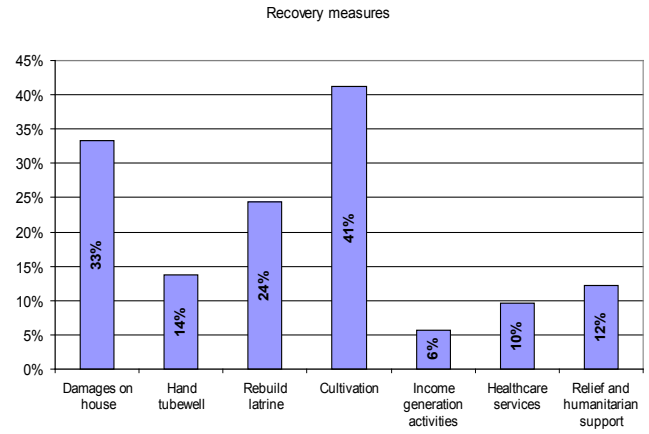

Figure 11: Recovery measures: After Flood.

Discussions and Conclusion

Respondent features defines 75% of the livelihood is depends on agriculture. This sector could be potentially benefits if there is a well established early warning system from national to community level. A medium range to seasonal forecasts and education into different crop types can be given to the farms based on seasonal forecasts coupled with crop simulation models. These forecasts can be used to inform farmers as to the best crop to sow and therefore get the highest yield.

The findings from the survey confirm that households lacked effective flood warning systems at community level. The survey also reveals that timely management, dissemination and use of flood related information are considered essential and vital in all communities. The community people prone to flood disaster are not familiar with flood warning and forecasting very well. The existing flood warning dissemination procedure is not appropriate in the local context. The people do not understand the official languages of weather forecasting on radio and television. The flood warning and forecasting procedure should be area specific and people oriented and the dissemination should be in colloquial dialects. Women don't have the access in the information system. The community wants accurate and timely messages, which must address public concerns, contain what people want to know, gender mainstreaming approach, give guidance on how to respond, and use examples, stories and analogies to make the point. It is also found that long lead forecast is necessary to take pre disaster initiatives. People prefer locally available and easily understandable early warning dissemination system in all unions. Most of the people prefer Mike, TV, Radio, flag and mobile phone technologies for information dissemination.

The people and livelihood of the study areas are affected by flood every year. As of discussions findings, floods of the respective areas have caused serious damage of the agriculture, fisheries, homesteads and infrastructures. To overcome their losses, people are taking several preparedness, response and recovery measures for each sector. People are interested more to preparedness activities to reduce their losses and hope to get permanent solution through embankment or more stable structure. The local people have extensive indigenous knowledge, which need to be incorporated in the national and regional policy. A community action plan is needed for the future. By using the action plan a systematic approach to risk reduction communication is possible and a gender conscious approach will allow better flood risk management.

The villagers generally relied on themselves to obtain flood related information, asking those whom they considered informed. On the other hand, certain members of the community who were in a position to access and acquire information (of all types and sources) voluntarily provide relevant flood related information to their community members as and when they can, as a part of their normal course of daily affairs. Informing and updating people in groups within each community, based on accessibility and relevance of use, provides the basis for need-based flood information dissemination, on an inter-personal basis.

Involving community needs and demand in flood early warning can reduce vulnerabilities and strengthen people's capacity to cope with flood risk. The community is the key resource in disaster risk reduction. They are the key actor as well as the primary beneficiary of any disaster risk reduction. In the community, priority attention needs to give to the most vulnerable people through community identification. Community participation is generally taken to mean that the community takes responsibility for all stages of the program including planning and implementation. National agencies should engage the community in the implementation of projects and should know what they want, how they want it and when they want it. Community involvement in flood early warning needs to be institutionalized. Community based flood early warning and risk management can lead to progressive improvements in public safety and community disaster resilience, and should contribute to equitable and sustainable community development in the long term.

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