



**Comprehensive Disaster Management Programme (Component 5b)**  
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**Support for a Disaster Management Information Network (DMIN)**

**Report on Pilot Testing of Community based Early Warning Systems**

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in collaboration with





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## Acronyms

ADPC	Asian Disaster Preparedness Center
AFD	Armed Forces Division
AVD	Ansar and Village Defence
BARC	Bangladesh Agricultural Research Council
BARI	Bangladesh Agricultural Research Institute
BARL	Bangladesh Amateur Radio League
BB	Bangladesh Betar
BCAS	Bangladesh Centre for Advanced Studies
BDPC	Bangladesh Disaster Preparedness Centre
BDRC	Bangladesh Red Crescent Society
BMD	Bangladesh Meteorological Department
BP	Bangladesh Police
BRRRI	Bangladesh Rice Research Institute
BTTB	Bangladesh Telegraph and Telephone Board
BTV	Bangladesh Television
BWDB	Bangladesh Water Development Board
CDMP	Comprehensive Disaster Management Programme
CEGIS	Center for Environmental and Geographic Information Services
CFAB	Climate Forecast Applications in Bangladesh
CFGD	Community Focus Group Discussions
CFIS	Community Flood Information Systems
CLIFMA	Community Level Information Flow Mapping Assessment
CPP	Cyclone Preparedness Programme
CRA	Community Risk Assessment
DAE	Department of Agriculture Extension
DC	Deputy Commissioners
DER	Disaster Emergency Response (Group)
DFID	Department for International Development
DGF	Directorate General of Food
DMB	Disaster Management Bureau
DMC	Disaster Management Committees
DMIC	Disaster Management Information Centre
DMIN	Disaster Management Information Network
DRM	Disaster Risk Management
DRR	Directorate of Relief and Rehabilitation (internationally used)
DRR	Directorate of Relief and Rehabilitation
DRRO	District Relief and Rehabilitation Officer
EC	European Commission
EU	European Union
EOC	Emergency Operation Centre
EW	Early Warning
EWS	Early Warning System
FFWC	Flood Forecasting and Warning Centre
FSCD	Fire Service and Civil Defence
GOs	Government Organizations
GoB	Government of Bangladesh

GTS	Global Telecommunication System
HF	High Frequency
ICT	Information and Communication Technology
IFGD	Institutional Focus Group Discussion
IGA	Information Generation Agencies
IMD	India Meteorological Department
IMDMCC	Inter Ministerial Disaster Management Coordination Committee
IWM	Institute of Water Modeling
JMA	Japan Meteorological Agency
JMREMP	Jamuna-Meghna River Erosion Mitigation Project
JTWC	Joint Typhoon Warning Center
LDRRF	Local Disaster Risk Reduction Fund (under CDMP)
MFI	Micro Finance Institutions
MoFDM	Ministry of Food and Disaster Management
MoU	Memorandum of Understanding
MoWR	Ministry of Water Resources
NGO	Non Government Organization
PIO	Project Implementation Officer
PM	Project Manager
PTWC	Pacific Tsunami Warning Center
RIMES	Regional Multi-Hazard Early Warning System (ADPC facilitated)
SMRC	SAARC Meteorological Research Centre
SMS	Short Messaging Service
SOD	Standing Orders on Disaster
SODM	Standing Order on Disaster Management
SPARRSO	Space Research and Remote Sensing Organization
SRDI	Soil Research and Development Institute
SWC	Storm Warning Center
TOR	Terms of Reference
TSR	Tropical Storm Risk (a venture of UK on tropical cyclone prediction)
UEWIC	Union Early Warning Information Centre
UNDP	United Nations Development Programme
UNO	Upazila Nirbahi Officer
UNOPS	United Nations Office for Project Services
UP	Union Parishad
UDMC	Union Disaster Management Committee
UDMIC	union Disaster Management Information Centre
USAID	United States Agency for International Development
UzDMIC	Upazila Disaster Management Information Centre
UzDMC	Upazila Disaster Management Committee
VHF	Very High Frequency

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## Chapter 1. Introduction

### 1.1 Background

The Comprehensive Disaster Management Programme (CDMP) adopts a strategic institutional and programming approach to mitigate long-term risks and to strengthen the operational capacities of relevant institutions for responding to emergencies and disaster situations including actions to improve recovery from these events. Through the initiatives taken in the past, the Government of Bangladesh, Ministry of Food and Disaster Management (MoFDM), Disaster Management Bureau (DMB) and other relevant stakeholders have demonstrated significant commitment towards implementing a comprehensive disaster management strategy. The overall CDMP components are outlined in the following table (Table 1-1):

**Table 1-1. CDMP Component Structure.**

Strategic Focus	Corresponding Components
1. Professionalising the disaster management system	<b>1a</b> Policy, Program and Partnership Development Unit (PPDU) <b>1b</b> Professional Development
2. Mainstreaming of risk management programming (partnership development)	<b>2a</b> Advocacy and Awareness <b>2b</b> Capacity Building
3. Strengthening of community institutional mechanisms (community empowerment)	<b>3a</b> Program Gap Analysis <b>3b</b> Risk Reduction Planning <b>3c</b> Local Disaster Risk Reduction Fund <b>3d</b> Support for Livelihood Security – Hazard Awareness
4. Expanding risk reduction programming across a broader range of hazards	<b>4a</b> Earthquake and Tsunami Preparedness <b>4b</b> Climate Change and Research
5. Strengthening emergency response systems (operationalising response)	<b>5a</b> Disaster Management Information Centre <b>5b</b> Support for a Disaster Management Information Network
6. Food security	

Source: CDMP

Under the component 5b of CDMP, the Asian Disaster Preparedness Center (ADPC) in collaboration with local partner Bangladesh Centre for Advance Studies (BCAS) has provided support to CDMP in establishing a Disaster Management Information Network (DMIN). The overall objective of this ADPC support project was to provide technical support to CDMP to “Design, test and demonstrate DMIN down to household level” (Contract agreement no. BGD/01/004-CDMP/EC/5b/PC-1).

In order to implement the project with above objectives, ADPC in active collaboration with the EC component of CDMP has developed a unique methodological framework and developed activities in a sequential manner in several steps. Such steps are: a) review of the existing network disaster management information link from source to destination; b) empirical mapping of community level information flow (particularly from Upazila down to household levels); c) Design hazard specific networks as part of the overall DMIN; d) Pilot testing and field level demonstration; e) final recommendation for making the DMIN operational in future.

## **1.2 Project goal and objectives**

The Comprehensive Disaster Management Program (CDMP) under the Ministry of Food and Disaster Management (MoFDM) has set the overall goal of the Disaster Management Information Center (including this ADPC assisted current support project) as below:

*“...to implement an effective information sharing system to be operational among the disaster management agencies and communities for all hazards and in all sectors in all normal and emergency times throughout the nation and regionally to support sustainable risk reduction and emergency response capacity”.*

Under Component 5b, Support for a Disaster Management Information Network (DMIN), the specific objectives of the project are to:

- Establish status of existing links for information dissemination between source and community level;
- Review options for strengthening existing links and filling gaps where appropriate;
- Participatory assessments of the appropriate target communities predominant hazard types;
- Carry out mock “drills” for rapid onset “emergency” hazards;
- Assess information flow between warning sources, through intermediate levels to upazila and then onward transmission to union, community and household; and
- Design and test appropriate hazard information network(s).

## **1.3 Objectives of Pilot Field Testing**

The Disaster Management Information Link Report (ADPC: October, 2008) and the CLIFMA report (ADPC: July, 2009) came up with the findings from various layers down from upazila to household level and proposed DMIN designs for making the early warning network operational down from Upazila to household level. Before providing the recommendations and DMIN designs, a careful round of field testing is organized through a systematic process of incorporating hazard-wise pilot field testing procedures through community level demonstration, mock exercise-validation etc. The major objectives of the field level pilot testing are to:

- Test the DMIN designs that are recommended from the present project, CLIFMA study and various other past initiatives/projects for the major hazards in the country;
- Through mock-drills simulate and test the information flow procedures for its rapid transmission upto household level;
- Receive recommendations for standardized community level early warning dissemination systems (dissemination modes, messaging packages, institutional structure, sustainability issue etc.) down from upazila to household level;
- Compile recommendations for future establishment, improvement and replication for the national level network (DMIN) that will be functional down to upazila level.

## **1.4 Outline of the report**

The present report is outlined in seven different Chapters and additional annexure. In the first chapter the key objectives of the DMIN pilot field testing is reported. Chapter two starts with the discussion on the methodology and the overall process of the DMIN pilot testing.

In the following three Chapters starting from Chapter three to Chapter five, the pilot field testing process, findings, the institutional arrangement issues for early warning down from upazila to household and various awareness materials are discussed in detailed respectively for Riverine flood, cyclone/storm surge and riverbank erosion. In these three hazard specific chapters the local level pilot testing issues, activities and various detailed factors are discussed elaborately.

Following these hazard specific chapters, in Chapter six, the generic designs to integrate these hazard specific designs with DMIC (to be adopted by DMB in future) is discussed. Two such generic designs are outlined in this Chapter with their details.

The Final Chapter of the report lays out the challenges and gaps of community based hazard specific early warning systems and comes up with the experience-findings based recommendations for future. These recommendations starts with general natured ones and goes into a deeper level with hazard specific recommendations for all three pilot tested hazards. Consideration of future reliability is reflected in these recommendations in a systematic manner,

## Chapter 2. Methodology and Process

Follow up to the project studies and assessments, the project has come up with two proposed DMIN designs one for rapid onset hazards and the other one for regular time operation of the DMIN for various types of hazards.

Specific designs for three major predominant hazards were also taken for pilot field testing. Pilot field testing exercises were carried out for three hazards: riverine flood, cyclone/storm surge and riverbank erosion. Pilot field testing activities were carried out in seven communities. Three communities were considered for riverine flood (Fulchari Upazila of Gaibandha and Chowhali of Sirajgonj district), three communities for cyclone/storm surge in Kutubdia upazila of Cox's bazar district and one community was taken for riverbank erosion in Gaibandha district.

During the field testing specific attention were given to people oriented issues such as needs, understandability, acceptance etc. Future sustainability issues and future potentials for replication in other part of the country with relative ease were also remained as important issues during the pilot testing.

During the pilot testing an active collaboration between the project team and Flood Forecasting Warning Center (FFWC), Bangladesh Meteorological Department (BMD), Cyclone Preparedness Programme (CPP), Bangladesh Water Development Board (BWDB) was ensured.

The DMIN pilot field testing exercise was developed with a systematic methodological framework. Some of the key considerations that were reflected in developing the DMIN pilot testing are:

- a) establishment of an "actionable early warning system" down from upazila to households level which would take stock of the CLIFMA study (ADPC, July 2009) findings and recommendations from other past experiences of community based early warning in the country;
- b) a need to finding out operational modalities to link DMIC with the local EW networks in an end-to-end manner (through the proposed DMIN designs);
- c) an increased attention to consider various types of "diverse contexts" that would be required to address for community level effective early warning success. Contexts such as hazard-wise differences, geographical differences, occupational differences within various communities; and
- d) testing of more "sustainable" means and modes of EW at practical level that can be recommended for country-wide replication in future.

In this line, the following methodological steps and activities are flexibly set and detailed out below:

### **2.1 Selection of hazards and areas for piloting**

In order to come up with a selection of the pilot testing, three most prominent hazards were adopted. The CLIFMA study findings suggested that people pointed out three hazards as most prominent and frequently affecting their households/community in a regular manner. These are: a) riverine flood, b) cyclone/storm surge; and c) riverbank erosion. The CLIFMA report earlier showed various scientific rationales for selection of the districts for riverine flood,

cyclone/storm surge and riverbank erosion. The selection process of the pilot areas are followed through a systematic evaluation that developed in consultation with the district, upazila, union and community level institutional and non-institutional representatives during reconnaissance field visits.

The piloted areas are shown in the following table and in the map below.

**Table 2-1. The respective union names from which the pilot communities are considered.**

Hazard	District	Upazila	Union(s)
<b>Riverine flood</b> (3 communities)	Sirajgonj	Chowhali	Umarpur and Khaspukuria
	Gaibandha	Fulchuri	Gazaria
<b>Cyclone/storm surge</b> (3 communities)	Cox's bazar	Kutubdia	Ali Akbar Dail and Koyarbeel
<b>Riverbank erosion</b> (1 community)	Gaibandha	Saghata	Ghuridaha

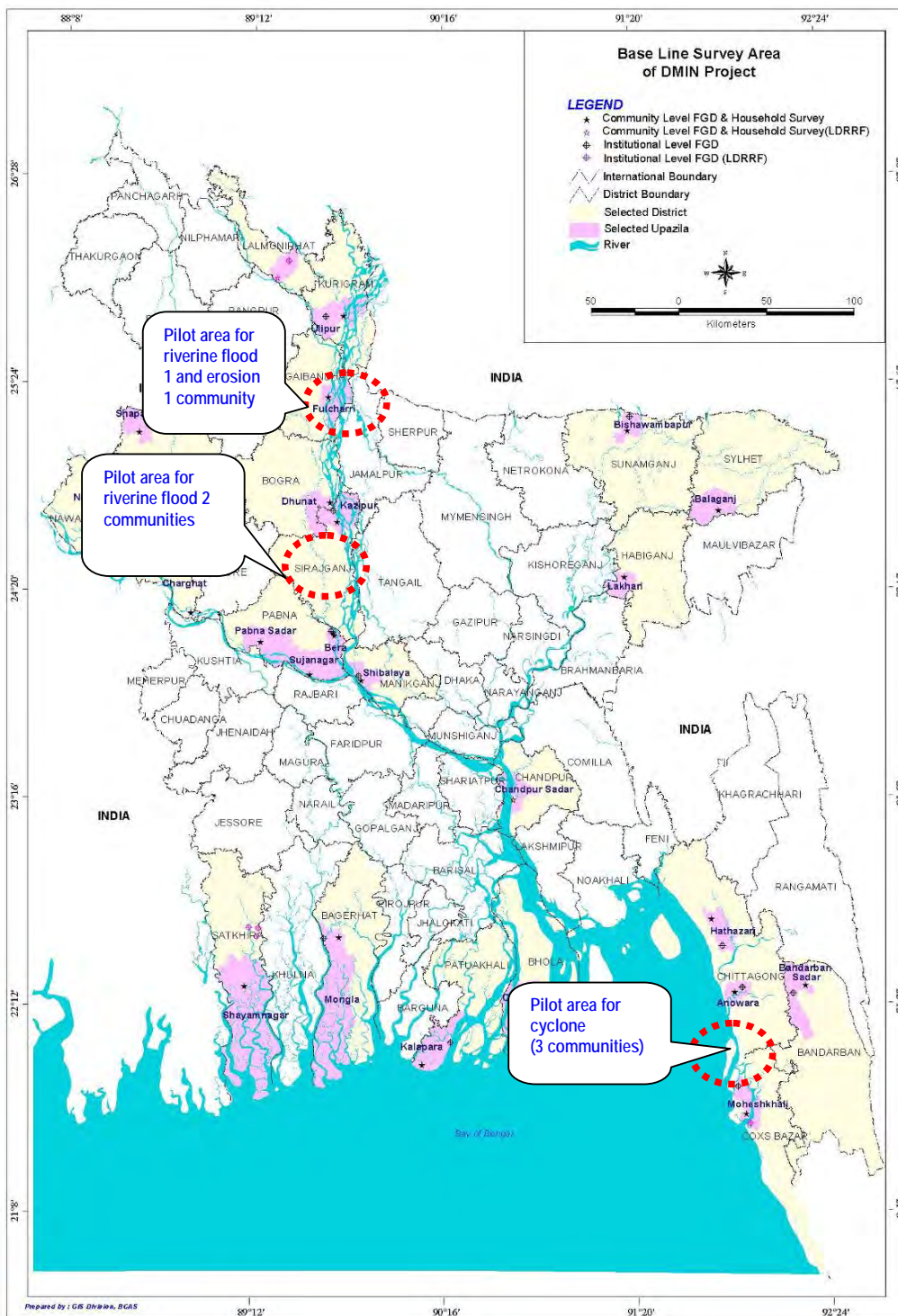


Figure 2-1. Map showing pilot field testing districts for three different hazards.

## **2.2 “Sensitization and mobilization” of stakeholders at various levels**

The piloting ground activities primarily started with a round of sensitization and mobilization activities in each associated levels starting from respective district DRRO office, UzDMCs, UDMCs and community representatives at each pilot area. Coordination was made with local partner agencies and NGOs in three districts. People from the Upazila Office and Union Parishad were also involved in the piloting process.

## **2.3 Establishment of early warning “linkages with source agencies”**

From national level linkages with BMD, FFWC and DMIC were established. Flood forecasting from FFWC, Cyclone/storm surge related early warning bulletins and information materials from BMD and CPP; and yearly erosion prediction materials from BWDB-CEGIS were obtained to make a necessary linkage with the source agencies for all three hazards. DMIC information materials (e.g. situation reports) were also obtained directly from CDMP website. Necessary coordination with these national level source agencies for linking up this pilot testing at ground was established. The opportunities for newly developed collaboration between CDMP and cell phone companies were also explored through the participation in recently completed orientation meetings by DMB and district authorities.

## **2.4 Enable local agents and institutional “means/channels”**

In the piloting, a specific focus was given towards enabling the local agents and institutional means (those who would be involved to facilitate the early warning) as well as the channels. Institutional and local agent mapping with strengths, weaknesses and opportunities were carried out at this stage. In the community those institutions and agents have more sustainable involvement was chalked out and involved with the piloting exercise for a sustainable interfacing.

## **2.5 EW message “interpretation and decoding”**

It was found from the CLIFMA findings that for all three target hazards, the existing early warning information requires interpretations and decoding for community level effective use. People’s understanding on the available early warning messages are not fully of optimal level. Keeping these issues in mind, in the piloting exercise looked at few interpretational or decoding issues.

- **For riverine flood:** Interpretation of FFWC bulletins at different levels using local context and potential impacts will be attempted. At this point, the flood bulletin provides information for river water level and rainfall information from FFWC. However, during the piloting locally suitable and interpreted/translated messages were introduced to the community.
- **For cyclone/storm surge:** Interpretation of BMD bulletins (and follow up CPP messages at ground level) at different levels using local context and potential impacts were looked at. The flag system based experiences of the CPP were analyze/discussed with the ground level community stakeholder for its sustainability and acceptability.



- **For river bank erosion:** The BWDB yearly erosion prediction maps were taken to the pilot community stakeholders and discussed for specific usage and local maps were discussed in line with the erosion prediction maps produced by the BWDB for the pilot area.

### **2.1.1 Improvement of local “modes” of EW**

Improvement of local level dissemination through preferred modes pointed out by people (emerged in the CLIFMA study and other recommendations) were pilot tested. Redundant mode of early warning communication were tested and later evaluated. The most suitable and sustainable modes of early warning were then considered for recommendation. Public addressing systems both of electronic and non-electronic modes were tested out with the community. Focus was given to the local communication technologies that have potential to become sustainable with minimal resource dependency from outside of the community.

## **2.6 Establishment of “local reference points”**

For all three hazards the local reference points were identified as important issue to be included in the pilot testing and included in the piloting exercise in following manner.

For riverine flood, local “flood markers” were set and “local reference points” were established to give the communities indication of the anticipated flood height. The experiences from the earlier works such as CFIS/CF other existing works looked at and a value added local referencing system for riverine flood was pilot tested.

For cyclone/storm surge, existing local referencing and notification systems are looked at and local modalities to reach EW into “distant” and “isolated” areas were tried out for a sustainable solution.

## **2.7 “Training” and “Capacity building” of local stakeholders**

Under the piloting activities, training and learning workshops were carried out for capacity building of the local professionals, volunteers as well as the UDMC members in respective pilot upazilas. Capacity building issues on early warning flow, dissemination and their role clarification were discussed in the trainings. The trainings provided them information about their roles and responsibilities for receiving and disseminating early warning information focusing in the proposed EW dissemination process. For awareness building purposes in addition to the training rounds, community based billboards were placed in commonly visited locations of the community.

## **2.8 “Evaluation” and “Public awareness” through community “mock-drills”**

Well-organized mock drills were planned for riverine flood and cyclone/storm surge pilot test areas. There were two specific purposes identified. Firstly, mock drills were used as a tool for observing the effective transmission of the early warning messages at each level. The rapid notification gaps and operationality issues for the early warning transmission in a simulated condition are checked and evaluated. How EW messages were received, sent and interpreted at each level and in what pace/rapidity these are transmitting were looked at in

these mock drills. Secondly, the mock exercise was also proved as a good tool for awareness raising purposes. People can learn from the simulation that how this information was transmitting and how these were interpreted for effective disaster preparedness at community and households levels.

## 2.1.2 Synoptic overview of the activities

An overview of the methodological steps and the activities for the piloting is shown in the following table for three specific hazards:

**Table 2-2. Synoptic overview of the methodological activities for three hazards.**

Methodological steps	Activities to be carried out		
	Riverine flood	Cyclone/storm surge	Riverbank erosion
1. Selection of pilot areas	<ul style="list-style-type: none"> <li>• Total 3 communities from 3 unions/upazilas of 2 districts:</li> <li>• <b>Gaibandha:</b> Fulchari upazila (Fulchari union)</li> <li>• <b>Sirajgonj:</b> Chowhali upazila (Chouhali and Umarpur and Ghorjan union)</li> </ul>	<ul style="list-style-type: none"> <li>• A total of 3 communities from <b>Kutubdia</b> upazila of <b>Cox's bazar</b> district.</li> </ul>	<ul style="list-style-type: none"> <li>• Total 1 community from 1 union/upazila of Gaibandha district:</li> <li>• <b>Gaibandha:</b> Shaghata upazila (Ghuridaha, union)</li> </ul>
2. Sensitization and mobilization of stakeholders at various levels	<ul style="list-style-type: none"> <li>• Meeting with UzDMC, UDMC and community representatives</li> </ul>	<ul style="list-style-type: none"> <li>• Meeting with UzDMC, UDMC and community representatives</li> </ul>	<ul style="list-style-type: none"> <li>• Meeting with UzDMC, UDMC and community representatives</li> </ul>
3. Establishment of early warning linkages with source agencies	<ul style="list-style-type: none"> <li>• Meeting with FFWC and make necessary linkages with local DMCs, departments, local NGOs, MFIs etc.</li> </ul>	<ul style="list-style-type: none"> <li>• Meeting with BMD, CPP and make necessary linkages with local DMCs, departments, local NGOs, MFIs etc.</li> </ul>	<ul style="list-style-type: none"> <li>• Meeting with BWDB and CEGIS and make necessary linkages with local DMCs, departments, local NGOs, MFIs etc.</li> </ul>
4. Enable local agents and institutional means/channels	<ul style="list-style-type: none"> <li>• Institutional and local agent mapping with strengths, weaknesses and opportunities identified</li> </ul>	<ul style="list-style-type: none"> <li>• Institutional and local agent mapping with strengths, weaknesses and opportunities identified</li> </ul>	<ul style="list-style-type: none"> <li>• Institutional and local agent mapping with strengths, weaknesses and opportunities identified</li> </ul>
5. EW message interpretation and decoding	<ul style="list-style-type: none"> <li>• Decoding of FFWC bulletins at different levels using local contexts and potential impact.</li> </ul>	<ul style="list-style-type: none"> <li>• Decoding of BMD bulletins at different levels using local contexts and potential impact.</li> </ul>	<ul style="list-style-type: none"> <li>• Interpretation of BWDB erosion prediction map for communities</li> </ul>
6. Improvement of local modes of EW	<ul style="list-style-type: none"> <li>• Improvement of public addressing system through CLIFMA recommended equipments</li> </ul>	<ul style="list-style-type: none"> <li>• Improvement of public addressing system through CLIFMA recommended equipments</li> </ul>	
7. Addressing issues of inter locality/geographical differences	<ul style="list-style-type: none"> <li>• Establishment of local reference points and flood markers</li> </ul>	<ul style="list-style-type: none"> <li>• Identification and establishment of local modalities to reach EW into distant and isolated areas</li> </ul>	<ul style="list-style-type: none"> <li>• Discussion with stakeholders and volunteers</li> </ul>
8. Training and awareness of local stakeholders	<ul style="list-style-type: none"> <li>• Training of stakeholders and volunteers</li> <li>• Billboard installation</li> <li>• Bulletin board establishment in each</li> </ul>	<ul style="list-style-type: none"> <li>• Training of stakeholders and volunteers</li> <li>• Billboard installation</li> <li>• Bulletin board establishment in each</li> </ul>	<ul style="list-style-type: none"> <li>• Discussion with stakeholders and volunteers</li> </ul>

Methodological steps	Activities to be carried out		
	Riverine flood	Cyclone/storm surge	Riverbank erosion
	union.	union.	
9. Evaluation and monitoring through community <b>“mock-drill”</b>	<ul style="list-style-type: none"> <li>• Mock drill outline development</li> <li>• Involvement of local institutions and EW agents</li> <li>• Preparations and logistic mobilization</li> <li>• Mock drill conduction</li> <li>• Post-event evaluation</li> </ul>	<ul style="list-style-type: none"> <li>• Mock drill outline development</li> <li>• Involvement of local institutions and EW agents</li> <li>• Preparations and logistic mobilization</li> <li>• Mock drill conduction</li> <li>• Post-event evaluation</li> </ul>	<ul style="list-style-type: none"> <li>• Not applicable</li> </ul>

## Chapter 3. Pilot Field Testing: Riverine Flood

The pilot testing areas for riverine flood were taken from the Brahmaputra-Jamuna river system both in Sirajgonj and in Gaibandha districts. Historically these two districts are shown vulnerability to riverine flood and have crossed the danger level on a regular basis. As preparatory work for pilot field testing and mock drill, preliminary field reconnaissance visits were made to each of the districts. Following the pilot testing methodology local referencing system setup, training and awareness of the various stakeholders at upazila and community level along with sensitization meetings and mock drill exercises were carried out in the respective pilot areas. Participation of the DRRO, PIOs and other UDMC, UzDMC members, institutional and non-institutional members were crucial in developing the pilot testing and were ensured in the process.

In this chapter, the Pilot Field testing of riverine flood is discussed under three following major sections:

- a) Process and findings;
- b) Institutional roles and responsibilities; and
- c) Recommended IEC materials.

### 3.1 Process and findings

Following the generic methodological steps of the pilot field testing for DMIN, the activities in riverine flood areas have progressed in systematic step-wise manner.

#### *Initial field reconnaissance*

An initial round of field reconnaissance was carried out by the ADPC-BCAS team with objectives to identify the actual field locations and communities where the field testing would be carried out. In this respect, the team has visited the initially identified districts. This round of field reconnaissance was useful to identify the communities with active consultation with the various layers of stakeholders from district level to upazila and down to community levels. Communities from these upazilas were selected through consultation with local officials and local people on the basis of their vulnerability as well as reflecting the early warning pilot testing issues in mind. During this round discussions held on the availability of the early warning, what can be done to improve the situation from upazila down to household level and what could be the suggested setup to accomplish the flood forecasting early warning down to household level in a practical and sustainable way. In the flood prone two pilot districts Sirajgonj and Gaibandha discussions held with DRROs, BWDB offices, DAE offices, UzDMC members, UNO's office and host of others.

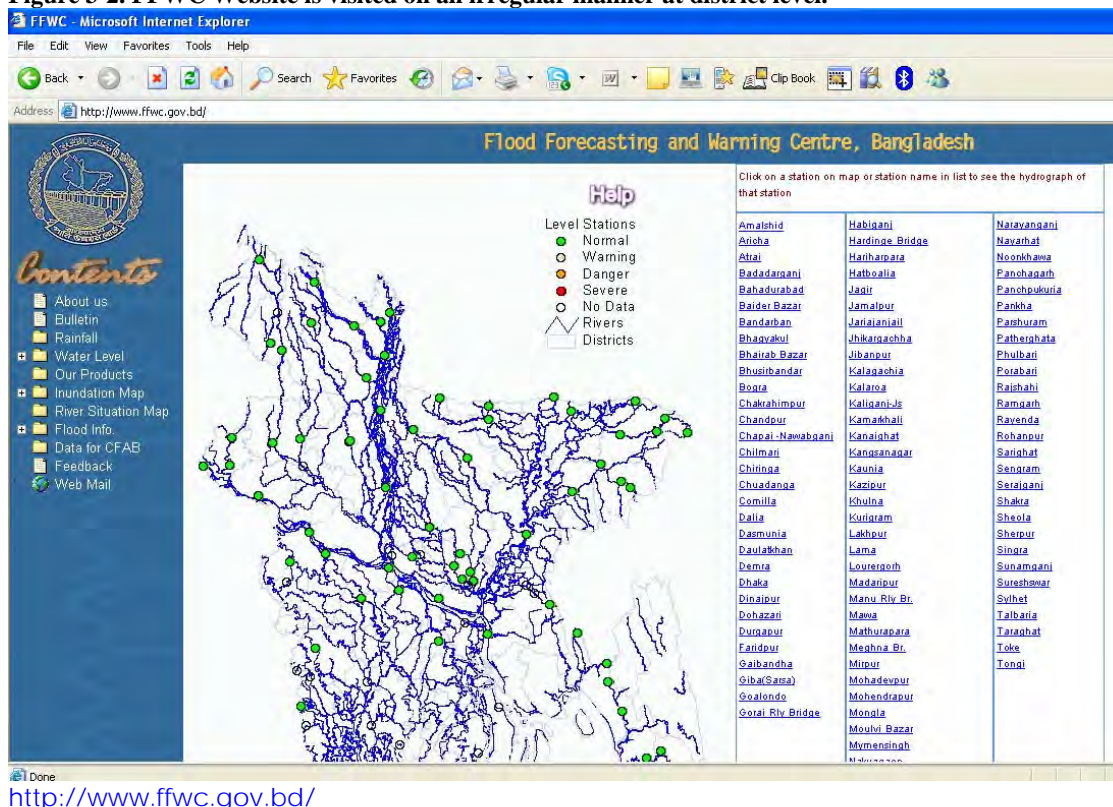


**Figure 3-1. Meeting with district and upazila officials (DRRO in Sirajganj and Gaibandha) and UzDMC level stakeholders in flood prone pilot sites.**

### Exploring what type of forecast information is available from national level

During the pilot testing it was explored that what type of flood forecast information is actually available at local level. It helped to understand what actually is going to district, upazila and union levels from the national sources agency. It was found that at district level, the access of the Flood Forecasting and Warning Centre (FFWC) flood forecast information is available at DRRO offices through multiple means. At district level, some limited capacity to access the FFWC website is observed but not in a regular frequency. However, it was found that DRRO as well as some of the line agencies (BWDB, DAE etc.) receive the situation assessment reports of DMIC and receives the messages from DMB as and when these are issued from central level.

**Figure 3-2. FFWC Website is visited on an irregular manner at district level.**



However, it was found that FFWC receives raw data from these agencies and sixty-four FFWC's own station and after processing the data they disseminate warning message at first all the Ministry and then DMIC, NDMC, DDMC, UDMC and all other organizations relevant to disaster management by Fax and e-mail. FFWC issues forecasting for 24, 48 and 72 hour forecasts everyday. In our pilot areas, Gaibandha has governing points of Noonkhawa, Chilmari, Bahadularad stations where as for Sirajgonj three above mentioned stations as well as the Sirajgonj stations respectively. A daily bulletin, based on observed data and results of forecast models, is prepared, and distributed by FFWC at around 12:00 noon. The bulletin, mostly in tabular and graph format, include the following:

- a cover page showing geographical, environmental settings of Bangladesh and location of all monitoring stations;
- river stage of all monitoring stations with respect to danger level, followed by rise/fall of water level on the respective date;
- rainfall situation for a specific date, followed by monthly normal and cumulative rainfall;

- d) summary of rainfall and river situation based on major findings;
- e) 24-48 and 72 hour forecasts for some important stations;
- f) flood warning messages that display trends of water levels (if close to or exceeds the danger levels, at which flooding becomes a serious threat); and
- g) a detail statistics on river stage and rainfall for three consecutive days.

Some of the products that FFWC shares through their regular and emergency network (shown in Table below) are shown in the following section.

**Table 3-1. Table. Existing Flood Warning Product Dissemination Routes.**

Dissemination Medium	FFWC Product	Recipient Group
Hard Copy (hand delivered), Fax and Email	Bulletins	Prime Minister's Office, government ministries, BWDB officials, government organizations
Fax and/or Email only	Bulletins	DMB, DMIC-CDMP, NGO's, embassies, international donor and aid organizations, news media
Internet	Bulletins, plots, flood map, Thana status	General public, international

**Product-1.** A sample FFWC regular flood bulletin – “River Situation” (shown for a basin only).

RIVER SITUATION AS ON 24-04-2008 AT 06:00 HOURS

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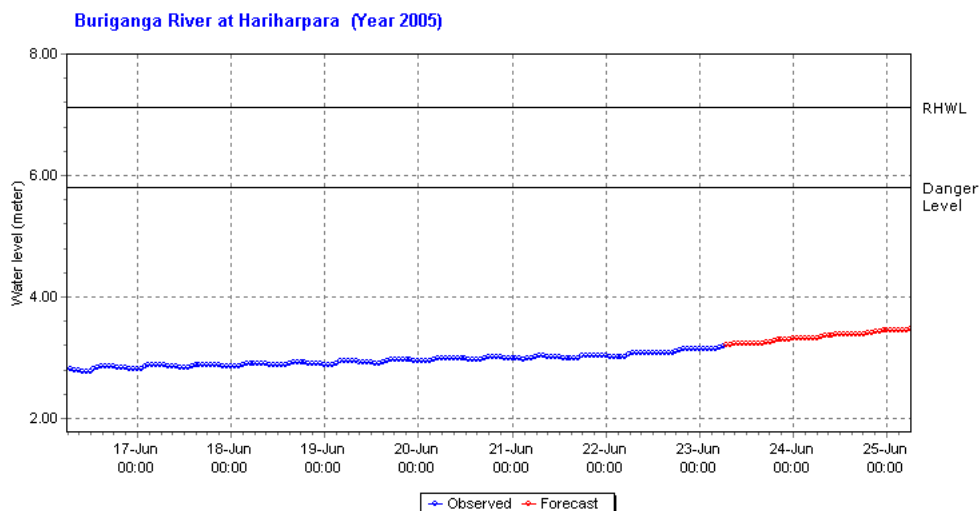
SL	RIVER	STATION NAME	RHWL (m)	D.L. (m)	W A T E R L E V E L	+ Rise Above
					23-04-2008 24-04-2008	- Fall D.L in cm in c
BRAHMAPUTRA BASIN						
1	DHARLA	KURIGRAM	27.52	26.50	22.66	22.84 + 18
2	TEESTA	DALIA	52.97	52.25	50.50	50.30 -20
3	TEESTA	KAUNIA	30.52	30.00	26.84	26.85 + 1
4	JAMUNESWARI	BADARGANJ	32.92	32.16	27.94	27.93 -1
5	GHAGOT	GAIBANDHA	22.81	21.70	16.77	16.77 0
6	KARATOA	CHAKRAHIMPUR	21.41	20.15	15.77	15.77 -1
7	KARATOA	BOGRA	17.45	16.32	10.84	10.84 0
8	BRAHMAPUTRA	NOONKHAWA	28.10	27.25	21.80	21.90 + 10
9	BRAHMAPUTRA	CHILMARI	25.06	24.00	18.79	18.91 + 12
10	JAMUNA	BAHADURABAD	20.62	19.50	14.50	14.54 + 4
11	JAMUNA	SERAJGANJ	15.12	13.75	8.31	8.40 + 9
12	JAMUNA	ARICHA	10.76	9.40	3.57	3.64 + 7
13	OLD BRAHMAPUTRA	JAMALPUR	18.00	17.00	11.33	11.31 -2
14	OLD BRAHMAPUTRA	MYMENSINGH	13.71	12.50	5.71	5.71 0
15	BURIGANGA	DHAKA	7.58	6.00	1.51	1.52 + 1
16	BALU	DEMRA	7.13	5.75	1.79	1.87 + 8
17	LAKHYA	NARAYANGANJ	6.93	5.50	1.85	1.83 -2
18	TURAG	MIRPUR	8.35	5.94	1.91	1.91 0
19	TONGI KHAL	TONGI	7.84	6.08	3.11	3.57 + 46
20	KALIGANGA	TARAGHAT	10.21	8.38	1.97	1.95 -2
21	DHALESWARI	REKABI BAZAR	7.66	5.18	1.65	1.63 -2
22	BANSHI	NAYARHAT	8.39	7.32	1.79	1.78 -1

**Product-2.** A sample FFWC regular flood bulletin – “Rainfall Situation” (shown for a basin only).

RAINFALL SITUATION AS ON 24-04-2008 (IN MM)

SL NO	STATION	MAXIMUM FOR	NORMAL FOR	RAINFALL FOR 2008			TOTAL UPTO DATE (UPTO 24-04-2008)
		APRIL	APRIL	22-04	23-04	24-04	
BRAHMAPUTRA BASIN							
1	KURIGRAM	282.5	119.2	0.0	0.0	0.0	88.8
2	DALIA	242.4	102.1	0.0	0.0	0.0	30.0
3	KAUNIA	332.5	113.3	0.0	0.0	0.0	93.0
4	RANGPUR	189.9	164.8	0.0	0.0	0.0	49.8
5	CHILMARI	315.5	116.8	0.0	0.0	0.0	73.5
6	DEWANGANJ	434.3	129.0	0.0	0.0	0.0	23.0
7	GAIBANDBA	0.0	101.7	0.0	0.0	0.0	0.0
8	SERAJGANJ	314.8	110.9	0.0	0.0	0.0	30.0
9	BOGRA	242.6	89.4	0.0	0.0	0.0	8.5
10	JAMALPUR	345.8	116.4	0.0	0.0	0.0	38.5
11	MYMENSINGH	346.2	145.3	0.0	0.0	0.0	28.7
12	DHAKA	318.0	159.1	0.0	0.0	0.0	76.3
13	TANGAIL	267.7	112.7	0.0	0.0	0.0	11.7

**Product 3.** A sample of a hydrograph that FFWC shares on the observed and predicted water level of the respective rivers.



**Product 4.** The district BWDB offices maintain records of more number of local points (e.g. Gaibandha Division maintaining records of four other points).

পানির সন্মতন ডিলাট

ক্র. নং	নদীর নাম আবর্ত	বিমানসীমা মিলি (FWB)	পানির সন্মতন				সুবিধার সিঙ্ক্রিট/মিলি
			২০১০।২০০৯ সন্মতন ১৫-০০ টা	২০১০।২০০৯ সন্মতন ১৫-০০ টা	২০১০।২০০৯ সন্মতন ১৫-০০ টা	২০১০।২০০৯ সন্মতন ১৫-০০ টা	
১।	ব্রহ্মপুত্র (পূর্বদিক)	১১৬১৭	২২	২২	২২		
২।	ধাকাত (সামান্য)	২১৭০০	২২	২২	২২	০.০০	
৩।	কলোভাড়া (কোমলি)	২০১৪৫	২০.৬০	২০	২০		
৪।	তিস্তা (স্বয়ংস্বত্ব)	২৫১৬৪	২৪	২৪	২৪		

### *Sensitization meetings and Training event*

Once the communities are identified a round of sensitization meetings were held with the community members. In the community level meetings detail participatory discussions held on flood experiences of the community, early warning dissemination process, local referencing and local reference identified in consultation with the community members. DMIN design, pilot testing and mock drill issues were also discussed. The role of ADPC-BCAS team, Local NGO partner, Community Volunteers and community members were discussed and role of each group members were identified.



**Figure 3-3. Various community level and sensitization meetings held during the pilot testing.**

### *Establishment of “local flood reference system” at community level*

During the piloting exercise in Chouhali (Sirajgonj) as well as in Fulchari (Gaibandha) it was found that the existing flood forecast information available is generic to the respective river stations and needs local flood referencing through some means.

In Gaibandha the existing flood forecast information is generated based data from Noonkhawa, Chilmari and Bahadurabad point and forecast is given water level information of those stations. Similarly, in case of Chouhali, forecast is generated based on data from Sariakandi, Sirajganj (35km upstream of Chouhali and opposite bank of the river Jamuna) and Aricha. At community level it is was found that some sort of local referencing system needs to be established to translate the generic forecast point information to a relevant level that is useful for respective community.



During pilot testing an innovative “local flood reference system” has been adopted on the basis of existing experiences of the flood local referencing attempts made in various other projects (e.g. CFAB/CFIS project etc.).

In the process, local reference point and flood level were identified in discussion with community members and technical suggestions from the team. In identifying local reference point importance were given to:

- a) the direct link of the reference point with main flow of the river;
- b) accessibility; and
- c) maximum visibility to the community members.

Historical flood levels in the community affecting their homesteads, crops and livelihood activities were identified with participatory discussions with community members. Local knowledge on flood early warning and forecasting was also taken account in developing the community based flood early warning.




In identifying the local reference points and flood markers a more sustainable place/establishment was looked for. It was found that the locally situated build structures on the nearest reference canals or secondary canals would be more useful as flood marker. The pools of the locally build structure vis-à-vis bridge was taken as a reference point. It is immediately unmovable and can be thought of as a sustainable marker and out of risk of immediate shifting. The UDMC members and community people together with ADPC-BCAS team identified a “locally situated bridge” over small channel with direct connection with Jamuna main flow for local flood referencing.

Community observed flood levels were further regularly checked with FFWC daily data during the course of field testing. Probable locations for awareness bill boards/signs were also identified in consultation with community members and were established for awareness and public education purposes.



**Figure 3-4. Community based flood warning system was set for pilot testing in selected sites.**

A community based flood warning system was set for pilot testing in the selected sites. Flood levels were marked with distinct colors on pillar of a “locally situated bridge” in the community with specific level different hazard levels:

Normal flow of the river	
Preparedness period	
Danger level/period	

On messaging and interpretation it was found that for district and upazila level officials or the members of UzDMCs, the warning message of the FFWC quite sound and understandable. But for the union and community level people are not habituated to the terms such as millimeter (mm) and centimeter (cm). So to ensure the understandability of the warning message, FFWC messages and forecasts have been converted into flag systems.

The red and yellow color flag respectively can be identified for the increasing and decreasing of water level. Increase of water level from 1 to 25 centimeter (cm) can be equal to 1(one) red flag which means possibility of half hand water increase. 26-50 cm equals to 2 (two) red flags which means possibility of the one hand water increase and above 50 cm equals to 3 (three) red flags. Similarly decrease of water from 1 to 25cm equals to 1 yellow flag which means possibility of half hand water decrease; 26-50 cm equals to 2 yellow flags which mean possibility of the one hand water decrease and above 50 cm equals to 3 yellow flags.

Under the pilot testing, responsibility of converting the FFWC bulletin into flag was given to UDMC (particularly the chairman and secretary of the union parishad) who would further identify and nominate people to maintain this system during the flood seasons in respective community. During the piloting, the overall responsibility of flag hoisting was given to the ward members, village police and local change agents or other identified people from the community. In each community potential such people could be designated flag operator, or mosque, chokidar/dofadar, haat bazaar committee or any responsible person that is identified by the UDMC. During the field testing, the flag hoisting places were identified by the local people. It was proved through the study that flag system was quite understandable.



Figure 3-5. Some of the billboards established in the pilot field areas.

### *Training sessions and community orientation meetings*

After establishing the local referencing system and the local billboards and communication materials the role clarification exercise were carried out with two different tiers. First, training and learning meeting was held at upazila level by inviting the community representatives, upazila representatives, union parishad and all other stakeholders that have presence from upazila down to community level. In this training and learning event the experiences of local referencing and piloting were further shared and feedback was taken. Particularly the field level roles and responsibilities were specifically discussed and came into a consensus within the stakeholders. This exercise was particularly useful for identifying who can do what in sharing the flood forecasting and warning upto household level.



**Figure 3-6. FFWC representative presenting and sharing local level flood forecasting issues in Training and Learning events in Gaibandha and in Sirajgonj.**

Follow up to the training and learning event which was specifically useful to get a clear idea who will be playing what role in flood forecast and warning dissemination, the piloting experiences and the process of local level food forecasting and warning messages with its interpretations were informed to the common mass people in the community.



**Figure 3-7. Follow up awareness sessions were held after establishing local reference points and billboards. Men, women, children and other members of the community were briefed about the process.**

### *Community Awareness and Mock drills*

To create mass awareness regarding proposed flood warning procedure, a number of mock drills were organized by involving the representatives from all parties related to dissemination procedure from upozilla to household level.

As an effective tool mock drill increase the awareness of the community at desire level. To create awareness regarding local reference and flag system, billboards were developed and used at the pilot areas which also created a large number of positive impacts in awareness raising. In the flood pilot testing the mock exercise was carried out using following few episodes:

- Episode 1: Daily life of a riverine flood community;
- Episode 2: Community mobilization of pre-flood activity;
- Episode 3: Integrated process of warning dissemination from upazila to down to household;
- Episode 4: Response of the Community after received EW on flood; and
- Episode 5: Response of the Community after received information on flood water decreases.

Through these mock episodes the community people were made aware about the flood forecasting, how it can be done locally, who plays what role in it and what needs to be done to prepare for flood following this flood warning system at community level.

One mock was organized on 10 October 2009 in Chowhali upazila and people from all the sectors and community were invited to follow that for awareness raising and evaluation. The Upazila Nirbahi Officer of Chowhali, Upazila parishad Chairman and vice chairman, Union parishad Chairman, secretary and members, Political leaders, elite person and more than one and half a thousand spectators enjoy the mock on flood in the Khaspukuria BM high school play ground at chowhali Upazila of Sirajganj District.



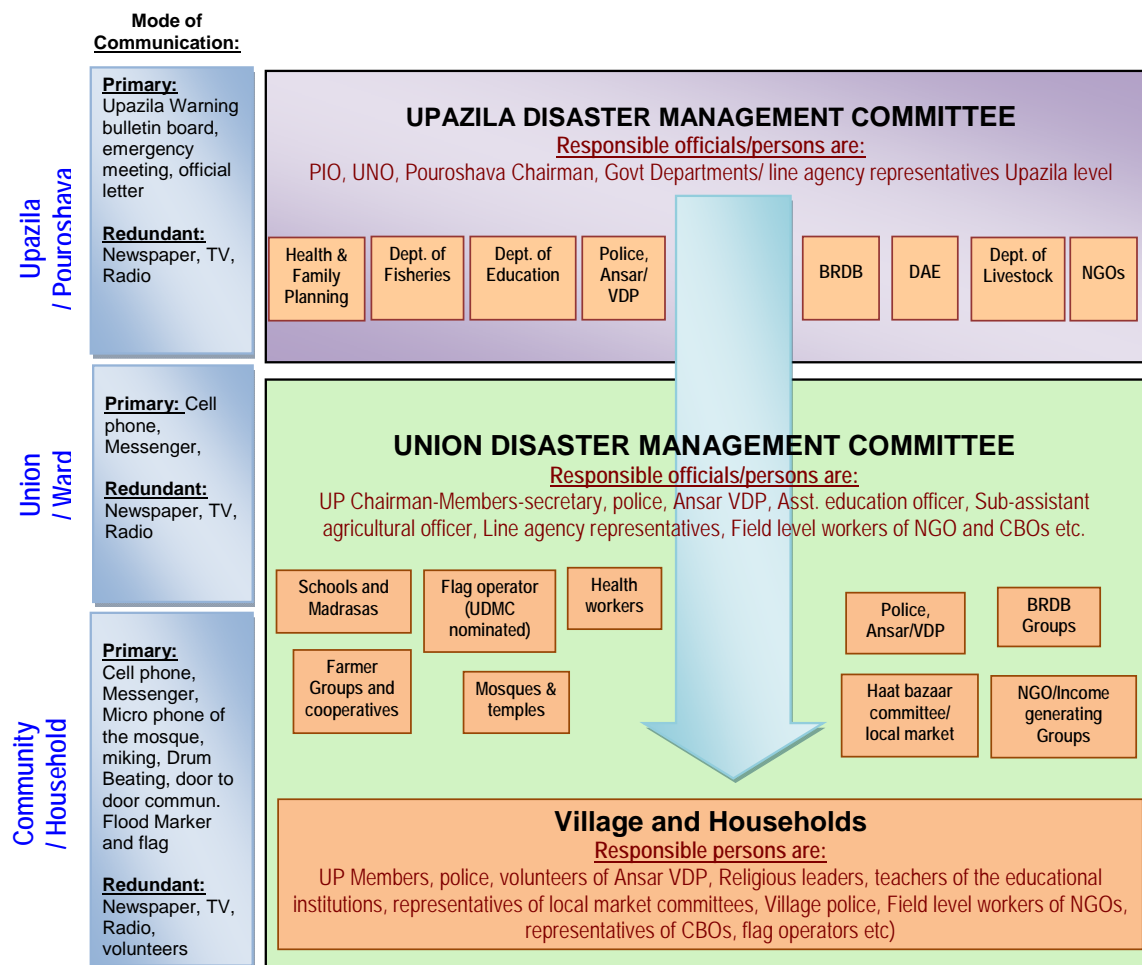
**Figure 3-8. Some reflection of the flood warning mock drill where communities demonstrated their roles and responsibilities in warning and dissemination from upazila to household level.**

### **3.2 Institutional arrangement and role clarification**

From the piloting testing following institutional lessons emerged:

- Upazila Disaster Management Committee (UzDMC) is the nearest source for union level to get the flood forecast messages. Although it is not mentioned in the SOD, usually Chairman or Secretary of the Union Parishad plays the vital role in getting and disseminating warning message at community level. But it is also found during the pilot testing that these two key public representatives remain occupied with their other duties and sometimes they could not pay their full attention to dissemination of warning message during flood. During the piloting it was found that they often rely on cell phone communications or individual messengers for communication tool for warning dissemination and information sharing.
- To disseminate the flood early warning message from Union to community and household level ward members of the Union Prishad are found as key individuals.
- It was also found that the religious leaders like Imam of the mosques teachers of the educational institutions field level government officials, NGO workers, representatives of the local market committees can play useful role in disseminating the warning message at community level.
- It was found that all the member of the union parishad do not have the formal cell phone access. If they have any, due to network problem dissemination flow of warning messages is often disrupted. To some extent, they feel that the cell phone calling charge is an extra burden to them which indicates that some amount of financial support for communication purposes can be very useful for getting a good response from the community level.
- The role of mosques, temples, educational institutions, local hat-bazar committees were also found useful for dissemination purposes upto household level. Microphone of the mosque, handmade mike and drum/ CI sheet beating were successfully adopted as communication tools for disseminating flood early warning at community level. These are some of the findings that emerged from the mock drill evaluations as well.

**Figure 3-9. Recommended design for Flood Forecast/Warning Dissemination Flow from Upazila down to Household level.**



### 3.3 Recommended IEC materials

Item 1: IEC Materials for the community explaining the local referencing and flag system for flood forecasting.

**স্থানীয় বন্যা ফলকের রং দেখে বন্যা পরিস্থিতি বুঝুন এবং ক্ষয়ক্ষতি কমাতে প্রয়োজনীয় পদক্ষেপ নিন-**

**লাল রং অর্থ বিপদসীমা**  
অর্থাৎ যে সীমায় পানি উঠলে জীবন ও সম্পদের ক্ষয়ক্ষতি হওয়ার সম্ভাবনা থাকে

**হলুদ রং অর্থ প্রত্নতিকালা**  
অর্থাৎ যে সীমায় পানি উঠলে জীবন ও সম্পদের ক্ষয়ক্ষতি কমাতে আমাদের প্রত্নতি গ্রহণ করতে হবে

**সবুজ রং অর্থ স্বাভাবিক অবস্থা বা বর্ষা**  
অর্থাৎ আমাদের ক্ষয়ক্ষতি হয় না বরং উপকার হয়

মনে রাখবেন-  
রাস্তা বা বাঁধের বাইরে চর এলাকার জনগণের জন্য সবুজ রং হবে হলুদ এর সমান এবং হলুদ রং হবে লাল এর সমান।

**পতাকার রং দেখে পানি বাড়ার বা কমার সম্ভাবনা বুঝুন**

একটি লাল পতাকা অর্থ আগামী ২৪ বা ৪৮ ঘন্টায় আধাহাত এবং দুইটি লাল পতাকা অর্থ একহাত পরিমান পানি বাড়ার সম্ভাবনা আছে

একটি হলুদ পতাকা অর্থ আগামী ২৪ বা ৪৮ ঘন্টায় আধাহাত এবং দুইটি হলুদ পতাকা অর্থ একহাত পরিমান পানি কমার সম্ভাবনা আছে

মনে রাখবেন লাল পতাকা অর্থ পানি বাড়বে এবং হলুদ পতাকা অর্থ পানি কমবে।




Item 2: A format for bulletin board that can be established to facilitate UzDMC decisions. Can be posted maintained in each UNO offices.


**নদী বাহিত বন্যা পরিস্থিতি ও পূর্বাভাস তথ্য**  
জেলা ৪  
তারিখ ৪

নদীর নাম	স্থানের নাম	বিপদসীমা (meter PWD)	পানির অবস্থান (meter PWD)			
			গতকালের অবস্থা	আজকের অবস্থা	২৪ ঘন্টা পরের অবস্থা	৪৮ ঘন্টা পরের অবস্থা
ব্রহ্মপুত্র	নুন খাওয়া	২৭.২৫	২৪.১৪	২৪.০০	০.০০	০.০০
ব্রহ্মপুত্র	চাঁদমারী	২৪.০০	২১.৫৮	২১.৪১	২১.২৭	২১.১৫
যমুনা	বাহাদুরাবাদ	১৯.৫০	১৭.৬০	১৭.৪৩	১৭.৩০	১৭.১৭
যমুনা	গিরাজগঞ্জ	১৩.৭৫	১২.৪২	১২.২৮	১২.১৫	১২.০১

উদন : এক এক ভিন্নই দি, ওয়েবলাইট



**Item 3:** A IEC material that comprises of the important contact numbers for flood warning. This could be maintained in each UNO offices.



### দুর্যোগ পূর্বাভাস ও সতর্কীকরণ বার্তা প্রচার কার্যক্রম চৌহালী, সিরাজগঞ্জ

#### যোগাযোগের জন্য জরুরী টেলিফোন নম্বরসমূহ

প্রতিষ্ঠান	টেলিফোন নম্বর	মোবাইল নম্বর
বাংলাদেশ আবহাওয়া অধিদপ্তর	০২-৮১১৩০৭১, ০২-৯১৩৫৭৪২	-
বন্যা পূর্বাভাস ও সতর্কীকরণ কেন্দ্র	০২-৯৫৫৩১১৮, ০২-৯৫৫০৭৫৫, ০২-৯৫৬৪৬৩১	০১৭১ ৫৫৫ ২৪৪২ (শুধুমাত্র জরুরী ক্ষেত্রে)
জেলা প্রশাসক, সিরাজগঞ্জ	০৭৫১-৬২৪১৪	-
ত্রাণ ও পুনর্বাসন অধিদপ্তর, সিরাজগঞ্জ	০৭৫১-৬২১৫৩	-
পানি উন্নয়ন বোর্ড, সিরাজগঞ্জ	০৭৫১-৬২২৬৮	-
উপজেলা দুর্যোগ ব্যবস্থাপনা কমিটি	-	০১৭২ ৬১৭ ৯২৫৯
ইউনিয়ন দুর্যোগ ব্যবস্থাপনা কমিটি, সাদিয়া চাঁদপুর	-	০১৭২ ৬১৭ ৫৩৮১
ইউনিয়ন দুর্যোগ ব্যবস্থাপনা কমিটি, খাস কাউলিয়া	-	০১৭২ ৬৬৭ ৬৪৮০
ইউনিয়ন দুর্যোগ ব্যবস্থাপনা কমিটি, ঘোড়জান	-	০১৭২ ৬৬৭ ৬৪৮১
ইউনিয়ন দুর্যোগ ব্যবস্থাপনা কমিটি, স্থল	-	০১৭২ ৬৬৭ ৬৪৮২
ইউনিয়ন দুর্যোগ ব্যবস্থাপনা কমিটি, উমারপুর	-	০১৭২ ৬১৭ ৭৬৪১
ইউনিয়ন দুর্যোগ ব্যবস্থাপনা কমিটি, বাঘুটিয়া	-	০১৭২ ৬১৭ ৭৬৪২
ইউনিয়ন দুর্যোগ ব্যবস্থাপনা কমিটি, খাস পুকুরিয়া	-	০১৭২ ৬১৭ ৭৬৪৩

**জরুরী তথ্য :**

- প্রতিদিনের তাপমাত্রা, ঝড়ের সম্ভাবনা, বৃষ্টিপাতের সম্ভাবনা, খরার সম্ভাবনা, শৈত্যপ্রবাহের সম্ভাবনা এবং সামুদ্রিক সুর্গিঝড়ের সম্ভাবনা সম্পর্কে তথ্য জানতে বাংলাদেশ আবহাওয়া অধিদপ্তরের সাথে যোগাযোগ করুন। সর্বশেষ তথ্য জানতে বিকাল ৩টার পর যোগাযোগ করুন।
- বন্যা পূর্বাভাস ও সতর্কীকরণ বার্তা সম্পর্কে জানতে বন্যা পূর্বাভাস ও সতর্কীকরণ কেন্দ্রের সাথে যোগাযোগ করুন। সর্বশেষ তথ্য জানতে দুপুর ১২টার পর যোগাযোগ করুন।
- সিরাজগঞ্জ জেলার বন্যা পূর্বাভাস ও সতর্কীকরণ বার্তা সম্পর্কে জানতে পানি উন্নয়ন বোর্ড, সিরাজগঞ্জ এর সাথে যোগাযোগ করুন। সর্বশেষ তথ্য জানতে দুপুর ২টার পর যোগাযোগ করুন।
- প্রতিদিন রেডিও, টেলিভিশন ও পত্র-পত্রিকা থেকে আবহাওয়া বার্তা ও পূর্বাভাস সম্পর্কে অবগত হউন।
- দুর্যোগকালীন ও পরবর্তী সময়ে নিজেদের অবস্থা জানাতে প্রয়োজনে জেলা প্রশাসক সিরাজগঞ্জ এবং ত্রাণ ও পুনর্বাসন কর্মকর্তা সিরাজগঞ্জের সাথে যোগাযোগ করুন।

**জনস্বার্থে-**  
কম্প্রহেনসিভ ডিজাস্টার ম্যানেজমেন্ট প্রোগ্রাম (সিডিএমপি) ও  
এশিয়ান ডিজাস্টার প্রিপেয়ার্ডনেস সেন্টার (এডিপিসি)

## Chapter 4. Pilot Field Testing: Cyclone/storm surge

The pilot testing areas for cyclone/storm surge were taken from Cox'sbazar district. Historically, Cox'sbazar has been exposed to numerous cyclone and storm surge and the selected upazila Kutubdia has been one of the most heavily affected upazilas that was affected by the devastating 1991 cyclone.

Kutubdia island has been selected on the basis of its vulnerability as well as due to its remoteness as well. During the preliminary field reconnaissance visit the pilot testing communities are picked from the island. In order to implement the pilot testing exercise a strong collaboration was established with the Kutubdia Upazila Parishad and with the Cyclone Preparedness Programme (CPP) headquarter and local office. Following the pilot testing methodology local dissemination setup, training and awareness of the various stakeholders at upazila and community level along with sensitization meetings and mock drill exercises were carried out in Kutubdia upazila. Participation of the DRRO, PIOs and other UDMC, UzDMC members, institutional and non-institutional members remained as crucial in developing the pilot testing.

In this chapter, the Pilot Field testing of cyclone/storm surge is discussed under following major sections:

- d) Process and findings;
- e) Institutional roles and responsibilities; and
- f) Recommended IEC materials.

### 4.1 Process and findings

#### *Initial field reconnaissance*

With the objective to select most cyclone prone upazilas from Cox'sbazar district, pilot testing team has conducted a reconnaissance field visits to various parts of the district and met with district level authorities, DDMC members and eventually Kutubdia UzDMC members. During this reconnaissance field visit sensitization meetings about objective of the pilot testing, DMIN design elaboration, and other pilot testing details were consultation with DRRO, PIOs and other DDMC, UzDMC members. Most of the DDMC members in Cox's bazaar singled out Kutubdia upazila as most affected by cyclone because of difficult surface communication infrastructure and exposure to sea. Considering all these factors the reconnaissance findings identified Kutubdia as the final selection of upazila to be considered for pilot testing.

#### *Exploring what type of Cyclone prediction is available from national level*

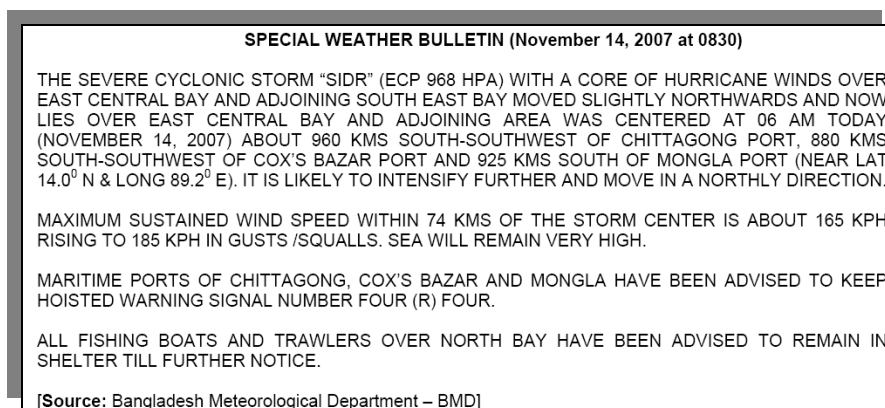
The Bangladesh Meteorological Department (BMD) is the responsible agency for cyclone hazard warning. The Department has its Headquarters in Dhaka with two regional centres i.e. Storm Warning Centre (SWC), Dhaka and Meteorological & Geo-Physical Centre (M&GC), Chittagong. The SWC produce daily RADAR images depicting information on depression, cyclonic storm in the Bay of Bengal from Cox's Bazar RADAR Station.

The Cyclone Preparedness Programme (CPP) is the leading entity responsible for dissemination of cyclone early warning in the country. For generating EW, primarily, the CPP receives a warning message first from BMD (Storm Warning Center) and then from DMB, DRR, MoFDM and other stakeholders by Fax. CPP disseminates the cyclone and storm related

early warning to their 32 “CPP field offices” and coordinates at the local level through a volunteer structure of CPP and BDRCS.

Various types of information take place in the content of cyclone early warning information. The types of information generally included in the content are:

- Severity
- Wind speed within the cyclone
- Speed of the cyclone
- Direction
- Distance from the coast
- Signal
- Possible areas to be inundated by tides and surges



**Figure 4-1. Cyclone bulletin contents.**

The BMD circulated Special Weather Bulletin on the left and the CPP field office copy of the VHF radio transmitted messages which goes at local level is shown below. On receiving the BMD special weather bulletin usually the central CPP headquarters issues the VHF message to the respective CPP field offices and the field office message receiver usually transcribes the message upon receipt of the message.

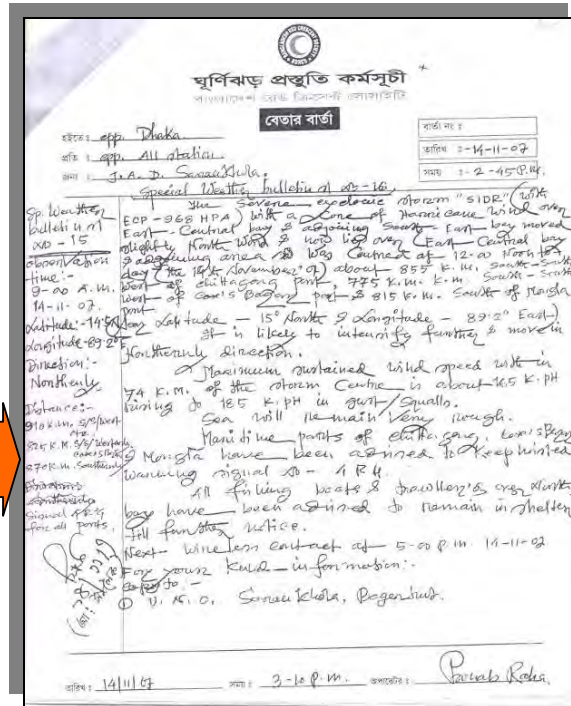
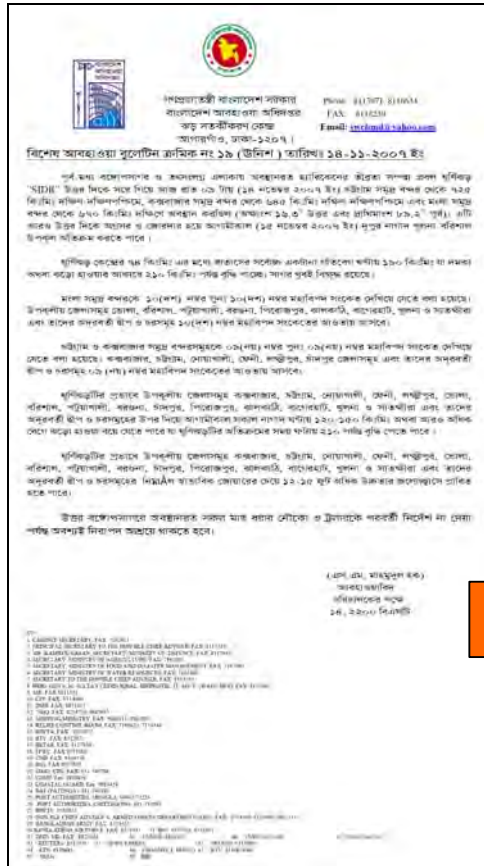


Figure 4-2. BMD bulletin of SIDR and CPP VHF message hand written transmission document.

The CPP field offices also maintains the track of the cyclones as predicted from the central sources and usually demonstrates on a wall-hanging board in their respective field offices. Such boards for indicating the cyclone tracks are shown in the figure below.

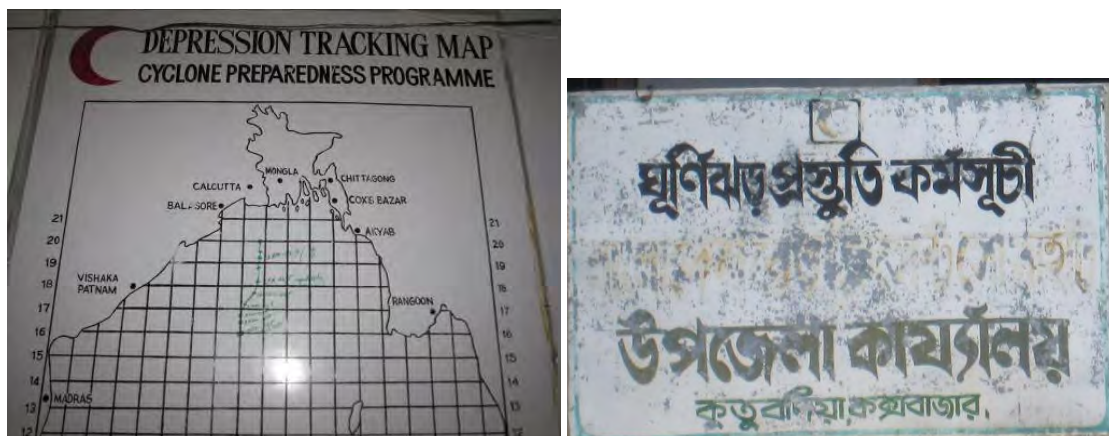


Figure 4-3. The wall-hanging board for indicating the cyclone depression tracks in the field offices of CPP Kutubdia.

### *Sensitization meetings and community mobilization*

Having consultation with UzDMC, UDMC members and CPP upazila unit field level were made to Ali Akber dail and Koyar Beel unions of Kutubdia upazila. In all three communities meetings with UDMC members were held and following the meetings along with UDMC members communities were visited. In these meetings existing early warning system for cyclone and DMIN proposed design were discussed. Recommendations and assistance from community were sought to implement the proposed design. From the community level discussion strong feeling was that CPP has been instrumental in effective dissemination of cyclone early warning. However, it was pointed out by the local people that in recent times, the CPP volunteers have lost some of their motivation as they lack logistics which hamper their performance at ground for effective cyclone early warning dissemination.



**Figure 4-4. A community sensitization and mobilization meeting with the pilot communities in Koyar beel, Kutubdia, Cox'sbazar.**

### *Local "flag hoisting" based signal system*

During the pilot testing in Kutubdia island, the issue of local flag hoisting system was discussed. It was found that CPP in association with the BDRCS and UNO office has established the local flag hoisting based cyclone warning dissemination system in Kutubdia. The system followed the existing flag hoisting protocols and procedures of CPP and have arrangements in this line. However, it was found that the local level awareness for these warning signal particularly among the younger generations needs to be more popularized. Keeping these in mind from the DMIN pilot testing exercise various billboards, IEC awareness materials, discussions and debriefing sessions and end-to-end mock drill for cyclone preparedness was arranged. An active collaboration was made between the Kutubdia UNO office, local CPP office and other upazila based line agencies (e.g. DAE, Health department,

Ansar-VDP, schools and others) to share a collaborative arrangement for cyclone early warning dissemination awareness at ground.



Figure 4-5. Sample of a billboard established from the pilot testing for increased awareness of the cyclone early warning signal and their interpretation in Kutubdia pilot sites.

#### *Training sessions and community orientation meetings*

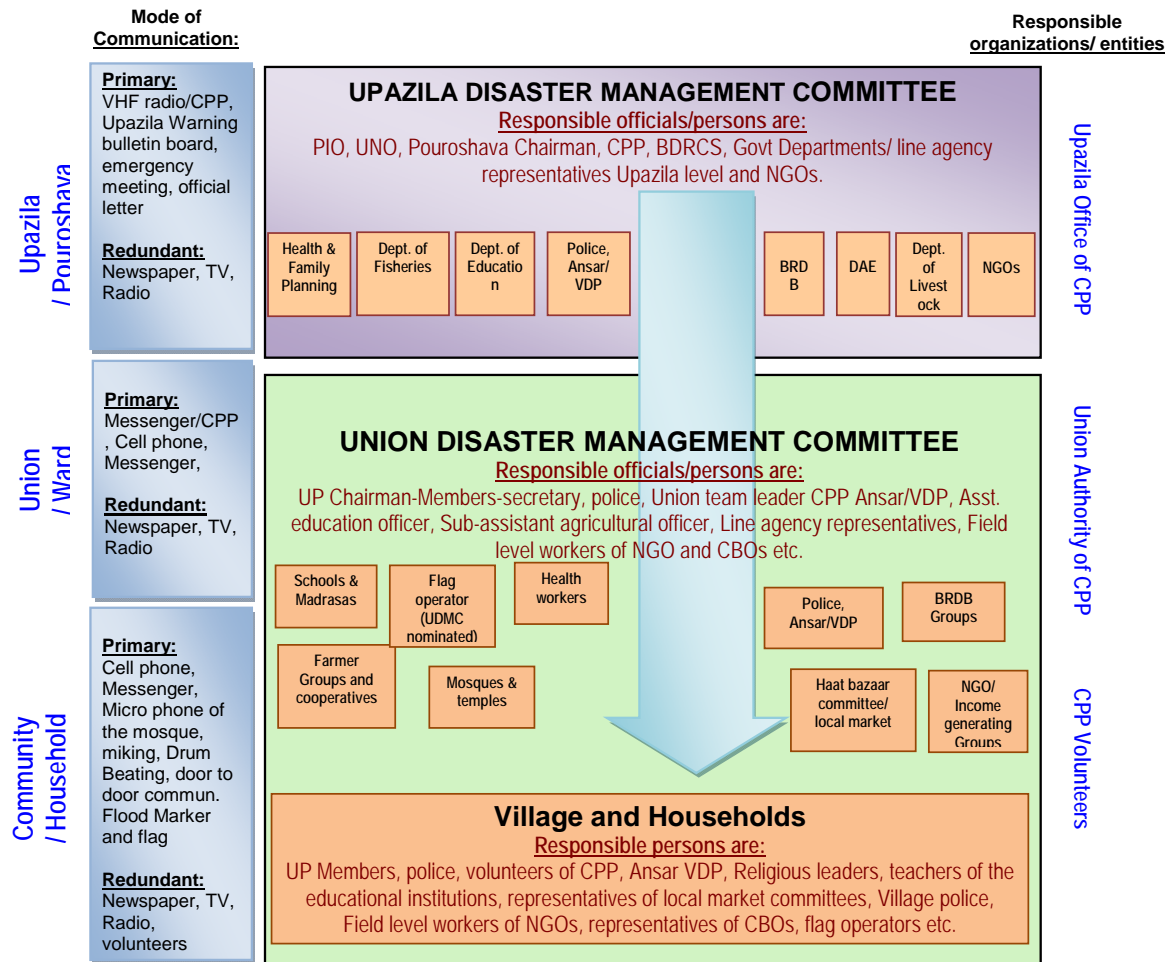


Figure 4-6. Local Hon'ble Member of Parliament is delivering his speech during the pilot testing training and learning event for cyclone/storm surge early warning in Kutubdia.

## 4.2 Institutional arrangement and roles and responsibilities

The institutional arrangement for cyclone/storm surge early warning dissemination down from upazila to households level can be articulated in following diagram. The responsibilities for each of the agencies in respective tiers are shown in a synchronized manner below.

Figure 4-7. Cyclone/Storm Surge Warning Dissemination Flow from Upazila down to Household level.



### 4.3 Recommended IEC materials for cyclone



Figure 4-8. Various types of IEC materials developed for community awareness and interpretation of the cyclone early warning messages at community level.



**ঘূর্ণিঝড় সংকেত ও সংকেতের ব্যাখ্যা**

**সতর্ক সংকেত ও হুঁশিয়ারী সংকেত**

১ নম্বর দূরবর্তী সতর্ক সংকেত	২ নম্বর দূরবর্তী হুঁশিয়ারী সংকেত	৩ নম্বর স্থানীয় সতর্ক সংকেত	৪ নম্বর স্থানীয় হুঁশিয়ারী সংকেত
দূর সমুদ্রের কোন একটি অঞ্চলে ঝড়ো হাওয়া বইছে এবং সেখানে ঝড় সৃষ্টি হতে পারে।	দূর সমুদ্রে একটি ঘূর্ণিঝড় সৃষ্টি হয়েছে।	বন্দরের দমকা হাওয়ার সম্মুখীন হওয়ার সম্ভাবনা আছে।	বন্দর ঝড়ের সম্মুখীন। তবে বিপদের আশংকা এমন নয় যে, চরম নিরাপত্তা ব্যবস্থাদি গ্রহণ করতে হবে।

**বিপদসংকেত**  
(বাতাসের গতিবেগ ঘন্টায় ৬২ থেকে ৮৭ কিলোমিটার পর্যন্ত)

৫ নম্বর বিপদ সংকেত	৬ নম্বর বিপদ সংকেত	৭ নম্বর বিপদ সংকেত
অল্প বা মাঝারী ধরণের ঘূর্ণিঝড়ের প্রভাবে উপকূলীয় অঞ্চলের আবহাওয়া দুর্যোগপূর্ণ থাকবে এবং ঘূর্ণিঝড়টি চট্টগ্রাম ও কক্সবাজার বন্দরের দক্ষিণ দিক দিয়ে উপকূল অতিক্রম করার আশংকা রয়েছে। (মংলা বন্দরের ক্ষেত্রে পূর্ব দিক দিয়ে)	অল্প বা মাঝারী ধরণের ঘূর্ণিঝড়ের প্রভাবে উপকূলীয় অঞ্চলের আবহাওয়া দুর্যোগপূর্ণ থাকবে এবং ঘূর্ণিঝড়টি চট্টগ্রাম ও কক্সবাজার বন্দরের উত্তর দিক দিয়ে উপকূল অতিক্রম করার আশংকা রয়েছে। (মংলা বন্দরের ক্ষেত্রে পশ্চিম দিক দিয়ে)	অল্প বা মাঝারী ধরণের ঘূর্ণিঝড়ের প্রভাবে বন্দরের আবহাওয়া দুর্যোগপূর্ণ থাকবে এবং ঘূর্ণিঝড়টি বন্দরের নিকট অথবা উপর দিয়ে উপকূল অতিক্রম করার আশংকা রয়েছে।

**মহাবিপদ সংকেত**  
(বাতাসের গতিবেগ ঘন্টায় ৮৮ থেকে ২৫০ কিলোমিটার বা তার উর্ধ্বে)

৮ নম্বর মহাবিপদ সংকেত	৯ নম্বর মহাবিপদ সংকেত	১০ নম্বর মহাবিপদ সংকেত
প্রচন্ড ঘূর্ণিঝড়ের প্রভাবে উপকূলীয় অঞ্চলের আবহাওয়া দুর্যোগপূর্ণ থাকবে এবং ঘূর্ণিঝড়টি চট্টগ্রাম ও কক্সবাজার বন্দরের দক্ষিণ দিক দিয়ে উপকূল অতিক্রম করার আশংকা রয়েছে। (মংলা বন্দরের ক্ষেত্রে পূর্ব দিক দিয়ে)	প্রচন্ড ঘূর্ণিঝড়ের প্রভাবে উপকূলীয় অঞ্চলের আবহাওয়া দুর্যোগপূর্ণ থাকবে এবং ঘূর্ণিঝড়টি চট্টগ্রাম ও কক্সবাজার বন্দরের উত্তর দিক দিয়ে উপকূল অতিক্রম করার আশংকা রয়েছে। (মংলা বন্দরের ক্ষেত্রে পশ্চিম দিক দিয়ে)	প্রচন্ড ঘূর্ণিঝড়ের প্রভাবে বন্দরের আবহাওয়া গুরুতর দুর্যোগপূর্ণ থাকবে এবং ঘূর্ণিঝড়টি বন্দরের নিকট অথবা উপর দিয়ে উপকূল অতিক্রম করার আশংকা রয়েছে।

**জনস্বার্থে**














Figure 4-9. A detailed description of the various signal system should be demonstrated publicly to have a clear understanding of the community.

## Chapter 5. Pilot Field Testing: Riverbank Erosion

For riverbank erosion pilot testing, Gaibandha district was considered. Historically in the left bank of the Jamuna river, Gaibandha, Bogra and Sirajgonj district have shown a significant amount of bank erosion. However, the pilot testing exercise of the riverbank erosion prone areas have been developed in a limited scale comparing to the cyclone or flood pilot testing. There are two major reasons behind this. Firstly, during the field level interaction it was found that the Jamuna river erosion this year has started relatively earlier in this current year. Some of the areas in Gaibandha has faced relatively higher amount of erosion. On the other hand, the erosion prediction report of the year 2009 has been made open in a relatively late this year. The time was thereby was a bit limited to carry out a full-scale prediction based pilot testing.

Secondly, the needed downscaled level of erosion vulnerability maps was not found available in an open or publicly shared format. At present, a prediction system is developed for some rivers through national systems from BWDB (with assistance from CEGIS). The present erosion prediction is provided for one calendar year incrementally. The current technology is based on satellite image analysis and a demarcation system of the risk zones is using GPS technology which is largely facilitated by CEGIS and BWDB technical professionals. At community level, the demarcation of the risk zones are demonstrated using flag systems.

The existing system of riverbank erosion as pointed out by professionals and institutional representatives in field consultations are highly of technical nature and scientifically driven approach. At this point the demarcation system is also based on a technical equipment intensive approach which is still to be available at community level. Thereby, at community level, the respective communities have only a little to contribute solely without the technical inputs from the central/national sources. At this point this was found as a barrier to get immediate access to those services for public good.



**Figure 5-1. Figure. Already started riverbank erosion in many locations of the pilot area.**

### *Initial field reconnaissance*

As preparatory work for pilot testing, preliminary field reconnaissance visit was made to Gaibandha and Sirajgonj districts. During these reconnaissance visits detailed consultation meetings held with DDMC and UzDMC members and with the UNO offices. Meeting with UzDMC in Saghata of Gaibandha district was very helpful in finding the erosion prone areas in the upazila. Following discussion with UNO and UzDMC representatives, the piloting team visited erosion affected locations in Ghuridha and Saghata. Subsequently a community from Chinior patol village under Ghuridaha union was identified for piloting.



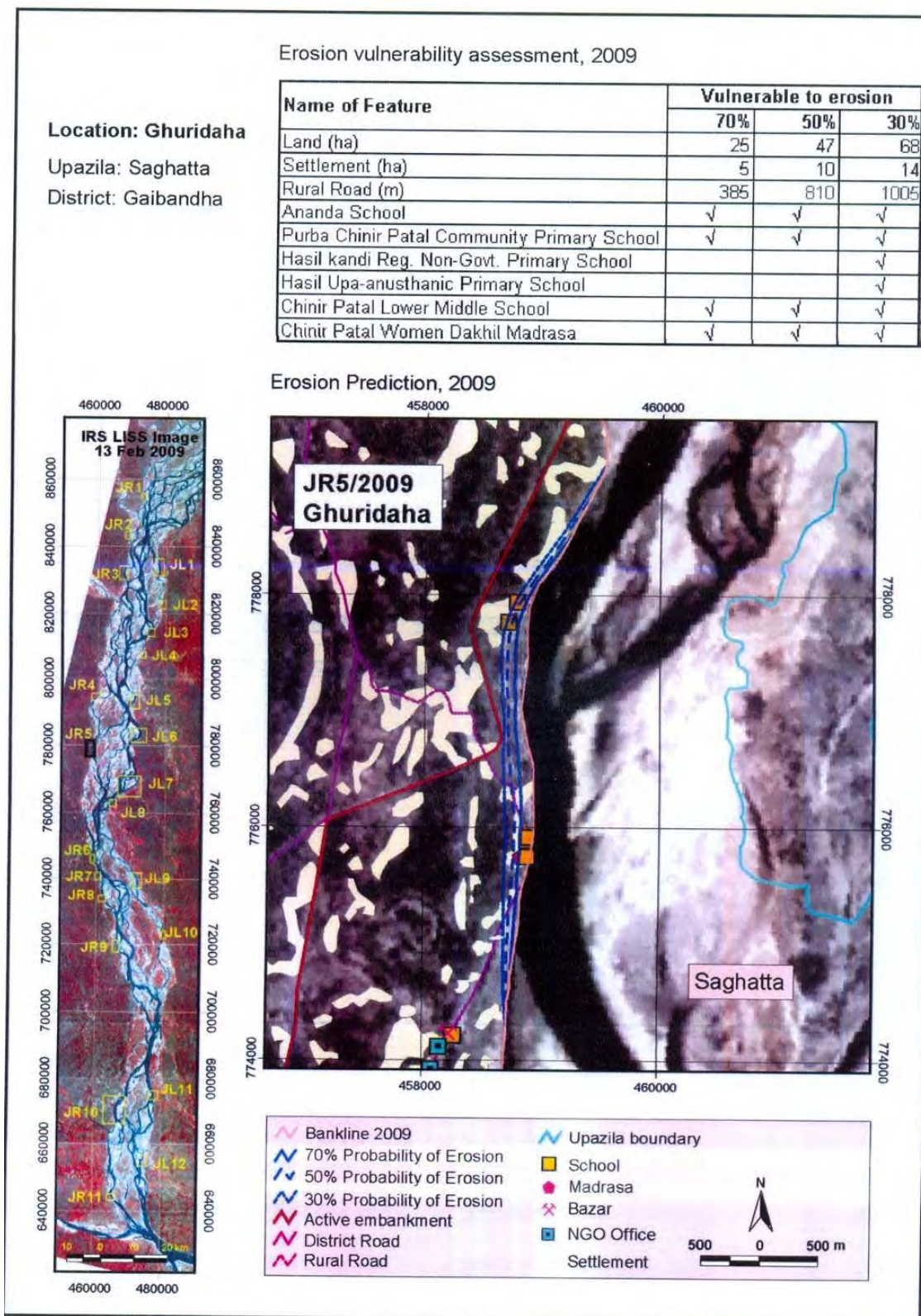
**Figure 5-2. Consultation meetings held with local BWDB office and subsequently meetings held at Upazila Headquarter on erosion prediction issues.**

*Exploring what type of “erosion prediction” information is available from national level*

For the year 2009, it was found that Bangladesh Water Development Board (BWDB) with support from CEGIS has provided the erosion prediction of the whole year. The prediction is based on a morphological and riverbank erosion prediction method using satellite imagery. This is primarily based on an empirical method developed by CEGIS-BWDB for the Jamuna-Meghna-Padma Rivers.

This erosion prediction based maps are still highly technology driven outputs and often difficult to communicate without having access to high resolution maps with predicted information. At the point of writing, the datasets are not available with adequate scale in any open or publicly shared platform.

The following map shows the erosion prediction based vulnerability map of Ghuridaha location of Saghatta upazila of Gaibandha district. This level of erosion vulnerability map is available for open sharing but downscaled information beyond this is not available in public domain.



**Figure 5-3.** The erosion prediction based vulnerability map of Ghuridaha location (Source: CEGIS, 2009).

### *Community sensitization and awareness*

Once the community is identified in Chinir Patol village of Ghuridaha Union of Saghata Upazila sensitization meeting was held with the community members. In the community level meetings detailed participatory discussions held on erosion experiences of the community, early warning dissemination process with the community members. With the support of local NGO partner, GUK and their community volunteers and Upazila administration community sensitization meetings were held and people are made aware of about the further erosion prediction that was indicated in the erosion vulnerability map produced by CEGIS and BWDB.



**Figure 5-4. Community level sensitization and awareness meeting at the erosion site in Ghuridaha, Saghata upazila in Gaibandha district.**

It was found from the discussions that in many cases the ongoing erosion is taking away dwelling homes, homesteads and arable lands which makes the communities heavily vulnerable. The local peoples suggested the erosion prediction made available in more downscaled manner which they can use for resettlement. However, the Upazila administration suggested that the local demarcation exercise should be avoided this year as there are areas have already been eroded heavily in this upazila.

## Chapter 6. Generic designs to integrate with DMIC

From the experiences of CLIFMA study and the recently conducted pilot testing for all three hazards two sets of generic designs to integrate with DMIC is recommended. Two designs are: a) one for emergency time rapid onset and rapid seasonal onset hazards, and b) the other for regular time operation of slow and seasonal onset hazards.

- **DMIN Generic Design-1** (Figure 6-1): This first design is primarily for the rapid and rapid seasonal onset hazards and this has both the regular time hazard warning and information sharing mode as well as the emergency mode. The design has two major provisions which are parallel methods. When any hazard warning comes from the source agency the hazard EW starts from the central source agencies (such as BMD and FFWC) and through their regular modes the FFWC and/or BMD will issue a formal warning to their regular list of dissemination recipients which includes DMB (including DMIC), DRR control room as well as ministries, respective authorities and the media. It is expected that under the DMB in future, the central DMIC will work as a central control room with a functioning 24/7 system. In this line, during the rapid onset hazard, DMIC (currently under CDMP and in future under DMB) from DMB should be able to receive the information and transmit the warning to the following pre-listed focal points:
  - a) The regular administrative channels (to districts DC/DRRO offices and their district DMICs; and
  - b) In future directly to the UzDMCs/UzDMICs which is under the overall vision of future DMIC expansion. It is expected that UzDMC and UDMC will share this information as and when the early warning messages will be circulated. UDMC should have a minimal capacity to receive the EW information over cellular phone and also have the capacity to organize dissemination through the UDMC focal points and other community entities with some facilities available for public addressing systems such as miking facilities.

In the figure the **red line** represents rapid onset risk communication and the **black line** represents regular, slow seasonal onset and slow onset risk communication which has enough lead-time for formal institutional machinery to operate. During the rapid onset (both episodic and seasonal), the system starts a voluntary rapid step (**red line**) and follows up with the regular formal institutional procedures for resource mobilization and so forth.

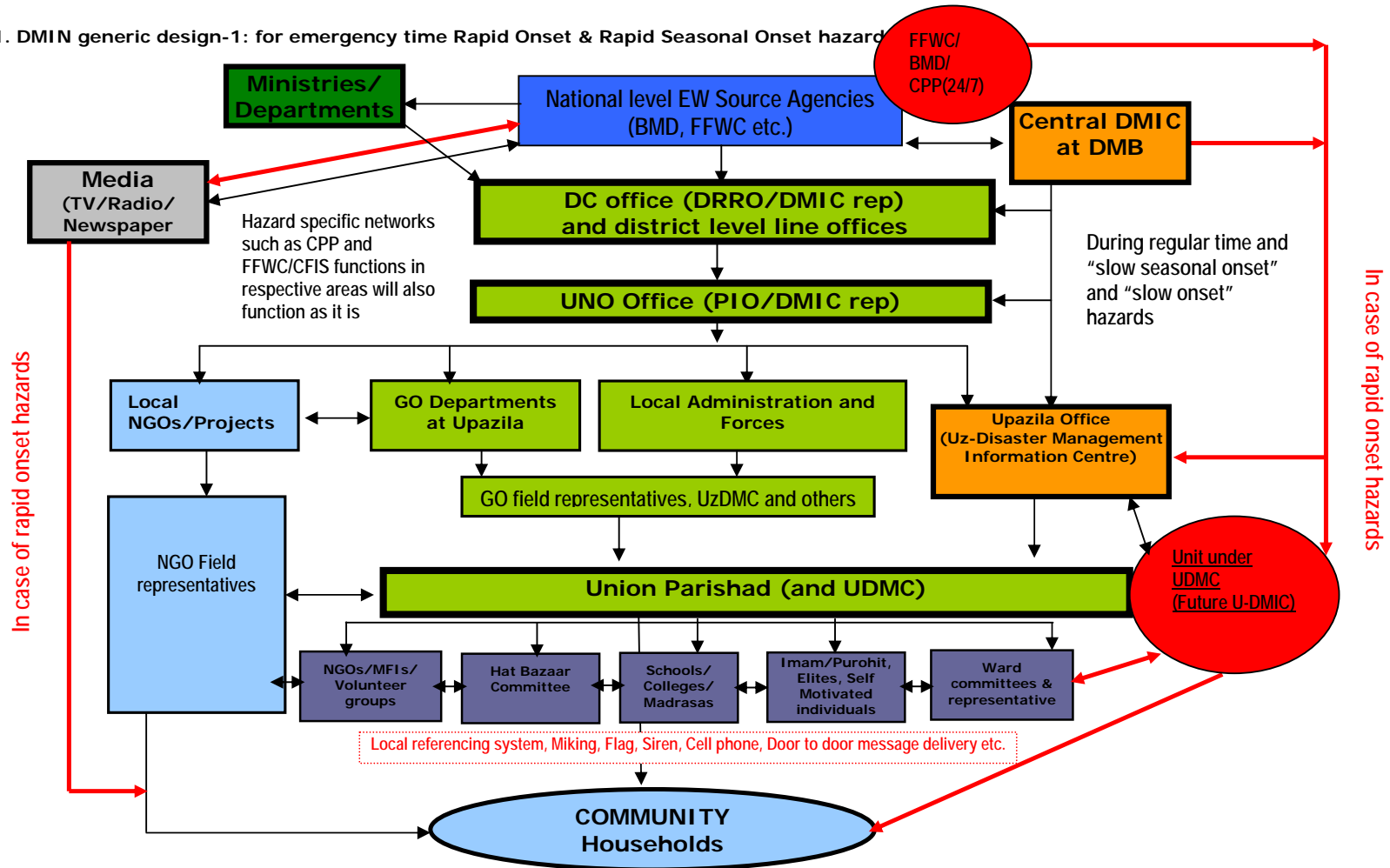
This particular parallel system with **red line** is not expected to nullify the formal system. Rather, this is a complementary system to the existing formal system which flows through the regular administrative system. This is just for a faster process of EW information sharing provision in favour of the community and would be formally endorsed by the districts and upazila administration when they formally convene the meetings and routine operation of emergency preparedness and response. The newly proposed UEWIC and the **red line** will be fully integrated with the existing DRRO and PIO operations as well as with the any available initiatives of FFWC or CPP in general.

- **DMIN Generic Design-2** (Figure 6-2): The second proposed design of DMIN is primarily for the slow and slow seasonal onset hazards. This is also a design for regular hazard wise advisories and EW information sharing. This network follows primarily the sectoral line incorporating the DMIC into it. For example, this design would be useful for slow onset drought or other slow onset hazards. Following the regular time progression, the disaster and hazard related information and actions can be taken continuously

through this network. Primarily, the disaster management information system would be mainstreamed into the overall agency and sectoral networks where the hazard specific developments and situations can be addressed on with a regular basis. Besides the rapid onset hazard network for very urgent emergency rapid onset hazards (Design 1). This design will also complement the DMIC with a regular information sharing mechanism to the community and respective agencies and will always remain in touch about regular activities. This habit would allow DMIC to become more usefully networked with the other departmental and sectoral networks and operations in a complementary way. This would be a value added system for the DMIC in the future. Through this design in the regular system, DMIC can also collect information from the ground on the other risk and disaster management information in a bottom up manner.

The two generic designs are graphically laid out in the following section for a greater clarity.

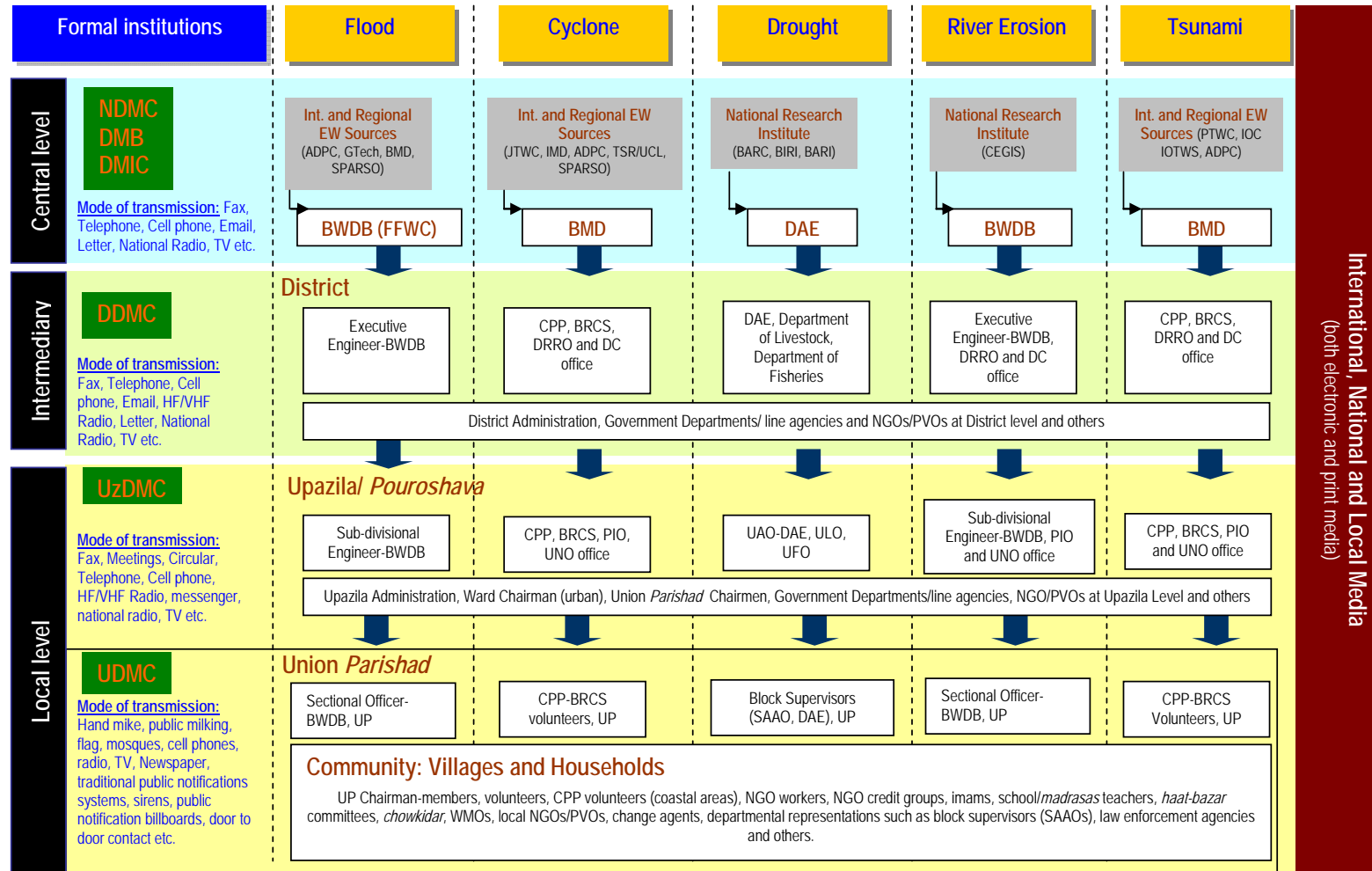
Figure 6-1. DMIN generic design-1: for emergency time Rapid Onset & Rapid Seasonal Onset hazard



Note: Red line represents rapid onset risk communication and black line represents regular, slow seasonal onset and slow onset risk communication which has enough lead-time for formal institutional machinery to start operate. During the rapid onset (both episodic and seasonal) the systems starts a voluntary rapid step (red line) and follows up with the regular formal institutional procedures for resources mobilization and so forth.



Figure 6-2. DMIN generic design-2: for regular time operation of slow and slow-seasonal onset hazards.



Source: Adapted and updated from ADPC, Oct, 2008

## Chapter 7. Challenges, Gaps and Recommendations

### 7.1 Existing challenges and gaps

From the review of these existing initiatives several challenges and gaps emerged. Some of these are as below:

- **Geographical specificity:** The flood related early warning systems are found to be well developed and largely dependent on the river water level monitoring systems particularly along the Brahmaputra and the Ganges river systems. It is often pointed out that the geographic locations that are inland from the riverine areas are yet to be covered/tested for community level early warning systems. People often want to know more information on flooding beyond the river water level.
- **Cell phone based EW systems:** Cell phone and SMS based systems for flood early warning is in its initial stage. This can be further developed with a national system with innovative but simple messaging systems. Some of the examples of sms protocols are developed for the local facilitators but how these can be more popularized for the household level and common users needs to be thought of.
- **Consideration of livelihoods protection issue:** For cyclone early warning the CPP led system has already been proved to be very effect for saving lives. However, one of the challenges faced by the CPP in recent time is its fullest coverage to safeguard people's livelihoods besides their lives. In this respect, further additional development of this type of people centric community level early warning and to expand measures to protect people's livelihoods (e.g. saving standing crops, households assets) would be a major value added initiative.
- **Sustainable enabling institutions:** One of the key questions identified in most of the initiatives is the issue of sustainability of the community based early warning system in a low cost but effective sustainable system that can be managed by the communities themselves. Among the existing initiatives some of the examples particularly the institutional setups in this line are tested. These needs further testing in the post project/initiative stage when the project led functions are phased out.
- **Sustainability of the network in non-emergency time:** Most of the initiatives promoted the systems for rapid dissemination and even led forecast dissemination protocols. These projects have also come up with innovating ideas of early warning dissemination in respective contexts. However, how in the regular time (in not emergency mode) these systems will function or sustain needs greater clarification and remains as a challenge.
- **Household level early warning information flow:** In most of these initiatives the early warning systems are considered as a system to inform rapidly upto the Upazila or upto Union layers. However, how early warning information will flow in different situation is a relatively least studied area. But the how people react at household level after receiving early warning has always been a critical point of query for community level early warning dissemination and response.
- **Linked connectivity with a central national dissemination system:** In almost all the previously discussed initiatives, it was found that the suggested community level early warning systems are largely connected to the piloted agency or two major national sources such as BWDB/FFWC for flood and BMD for cyclone. However, for national

coordination from the MoFDM a central control room for active dissemination of the institutional early warning system a central control room from DMB in the forms of future DMIC is not often connected. A central need for DMIC has already been documented in various documents including the DMIC Needs Assessment Report.

The above specified gaps and challenges of the existing early warning systems are briefly discussed in the light of scoping the CLIFMA contributions as well. CLIFMA with its multiple-layer of investigation and follow up field testing through piloting DMIN design can contribute to these layers in an integrated manner. Making synergies of the existing good examples and making a central level connection with the DMIC, the present CLIFMA initiative can provide useful contributions for national level standardization.

The CLIFMA findings from household and community level is therefore is a value added element of the standardization of the national community level early warning systems for piloted hazards as well as with the in-depth study findings from the various districts and hazard area can contribute towards national replication of the good/better practices that have already started.

## 7.2 Recommendations

Several layers of recommendations emerged from the ADPC support project. Some recommendations came from the CLIFMA study and some are from the pilot field testing experiences under the project. The key recommendations that emerged from the project are documented below.

### General:

- For rapid onset hazards EW dissemination upto household level, effective development of a **“parallel system” of early warning from national directly to union levels** are crucial beside the formal administrative system of early warning dissemination through the district system. The formal system is important but for rapid notification a parallel system directly to UDMC’s are important.
- At this point it was found that the **Union Disaster Management Committees (UDMCs)** in most of the cases are not very effective and they lack capacities to operationalize early warning disseminations upto household level. It can be recommended that the UDMC’s should be made more active in EW dissemination through capacity building logistically (e.g. provided necessary support for EW dissemination technologies) as well institutionally. UDMCs can be more involved in supervisory role and for overseeing the early warning dissemination at community level but within the UDMCs or from the agencies that are working at community levels (such as disciplinary agencies – police, Ansar-VDPs or *chowkidar/dofadar* and others can be used for operational dissemination.
- Capacity building and enhancement of **“hazard-livelihoods-geography specific” early warning** system needs to be developed further. The content of the most of the early warning systems flood, cyclone, riverbank erosion are not sufficiently interpreted or elaborated for addressing such occupational or geographical differences which are often crucial considerations at community level.
- Early warning related **awareness and educational** programs needs to be developed in a gradual manner.

- **Micro Finance Institution (MFI)'s, NGOs, CBOs** and their respective village/credit groups which are operational at community level can be effectively linked with the UDMC and UzDMC on EW dissemination networks.
- Various **educational, religious, haat-bazaar committees and other social institutions** and their representatives can be effectively used for early warning information sharing at community levels. Imams from the mosques, teachers can be brought into sharing of early warning information at community level.
- The present **Standing Oder (SOD)** should be further updated considering the community level EW issues as well. Particularly for the role assignment of the institutions at community level and specifically to hazards needs to be clearly mentioned in SOD so that agencies have clear mandate what to do at local level.
- Hazard specific **Standard Operating Procedures (SOP)** following the SOD and other hazard specific standards should be developed for further rapid operation of the DMIN and DMIC itself. This would also lead a good overall coordination horizontally between DMIC and other source providers such as FFWC, BMD and vertically would help in situating protocols for EW dissemination at community level. At this point this is found largely missing.

#### Riverine flood:

- For riverine flood forecasting more localized products should be developed from national level. Where its not possible then **“local reference systems”** for flood with respect to the nearest flood forecast point of FFWC should be followed.
- **“Flag system”** and a simple **“informational sharing board”** can be encouraged that may include the forecast information for the local forecast point of FFWC. UDMC's can play a role of either operationalizing this at local level or from within the locality UDMC can assign this responsibility for regular updating of information and the UDMC members can play supervisory/overseeing role on maintaining the information regularly through actively designated person from the locality. Imams, *haat-bazar* committee, *dofadar-chokidar* or locally based NGOs could be potential candidates who could be designated to carry out this task of maintaining flag and information board locally. In each community the coordination mechanism may vary but it is recommended that the UDMCs at least play the role of overseeing the process in respective unions.
- For the **local interpretation of the flood forecast information** the information content can be further developed from centrally. However, if that is not possible for all the communities who has essentially different contexts then the community themselves may decide locally about the interpretation of the forecast information in the UDMC meetings. Other actors in the community such as line agency representatives (e.g. SAAOs of DAE, BWDB) can play a facilitating role in this.
- The presently available (under testing), SMS based flood early warning information needs further elaboration if it needs to play any effective role in agricultural preparedness or planning at community level. There are scopes of developing this cellular phone based flood information sharing in future through further specifying the messages in terms of locality, occupation and other parameters.

#### Cyclone/storm surge:

- At present, CPP system (in areas where this is established) is catalyzing the cyclone early warning from their Upazila units. They have further networks down to community

levels as well. However, it was found that the **capacity and functionality of CPP needs to be enhanced** further to have a fully effective cyclone EW system unto household level. In this respect, manpower, logistics and resource mobilization is crucial.

- The **newly proposed warning categories are not yet functional at community level**. There is a plan to operationalize it in future. However, it is recommended (taking community responses into account), the new categories are needed but needs to be incorporated with the system in a very careful way as people have already have perceived their ideas and understanding according to the existing categories and flagging systems in place.
- **Operational linkages of CPP activities with the sectoral line agencies** (such as DAE, Fisheries, LGED, BWDB and others) needs to be strengthened further for community based EW activities. For EW dissemination widely to the cyclone prone communities CPP linkages with the other GoB departments, local government and NGOs can play a meaningful role particularly in the coastal zone. Particularly the disciplinary agencies such as police, Ansar, VDP and other are potentially useful government agencies who can be part of the CPP cyclone early warning system more effectively to establish a 24/7 system of EW. This could also create a further opportunity to establish a “redundant” system of cyclone EW dissemination at community level.
- It emerged from the pilot exercise that there is a big need of expansion of cyclone early warning information through **expansion of the radio networks and cell broadcast network in the sea areas** (e.g. upto Exclusive Economic Zone in the Bay of Bengal) for the marine fishers and to respond to the cyclone warnings in time.

#### Riverbank erosion:

- At present, a prediction system is developed for some rivers through national systems from BWDB (with assistance from CEGIS). The present erosion prediction is provided for **one calendar year incrementally**. The current technology is based on satellite image based analysis and a **demarcation system of the risk zones is using GPS technology** which is largely facilitated by CEGIS and BWDB. At community level the demarcation of the risk zones are demonstrated using flag systems. Awareness program is also developed using some IEC materials and disseminated using the information sharing exercises through the Union and Uz DMCs along with other stakeholders at community.
- The existing system of riverbank erosion as pointed out by professionals and institutional representatives are **highly technical and scientifically driven approach**. At this point the demarcation system is also based on a technical equipment intensive approach which is still not widely available at community level. Thereby, at community level the respective communities have only a little to contribute solely without the technical inputs or capacity building from the central/national sources.
- However, this is recommended that for wider sharing of the erosion prediction information and to increase the wide usability of the prediction sustainably at community level, some **system of easily accessible data sharing** is developed. Such as if any agency/institution can have the coordinates of further disaggregated satellite images/maps with erosion prediction data overlaid then communities or local NGOs can do that demarcation by themselves. Usually it's preceded that local NGOs or local communities are good at identifying maps when these are created with sufficient scale, resolution and with identifying local reference points. This is recommended that such open sharing maps and data sets are shared each year with the yearly prediction results so that UDMCs/UzDMCs can carry out their own local

demarcation of the risk zones by themselves and capacitate themselves without any external technical support. The present system has potential for such development.

## Annexes

### Annex 1. Chronology of pilot testing stakeholder interactions

#### Orientation and Sensitization meetings on Flood

Type of meeting	Date	Location				participants
		District	Upazila	Union(s)	Village	
Orientation meeting	14/07/09	Sirajganj	--	--	--	07
	29/07/09	Sirajganj	Chowhali	Khaspukuria union	--	30
	30/07/09	Sirajganj	Chowhali	Omarpur union		35
	30/07/09	Sirajganj	Chowhali	Khaspukuria union	Shakpal	50
	28/08/09	Gaibandha	Fulchuri	Gazaria	---	25
	15/07/09	Gaibandha	--	--	--	05
	15/07/09	Gaibandha	Fulchuri	--	--	04
	15/07/09	Gaibandha	Shagata	--	--	08
	15/07/09	Gaibandha	Shagata	Holdia	Chinirpatol	40
	27/08/09	Gaibandha	Shagata	--	---	07
	Sensitization meeting	14/07/09	Sirajganj	Chowhali	--	--
28/07/09		Sirajganj	Chowhali	Khaspukuria		30
06/09/09		Sirajganj	Chowhali	Khaspukuria	Shakpal	35
11/09/09		Sirajganj	Chowhali	Khaspukuria	Shakpal	30
28/08/09		Gaibandha	Fulchuri	Gazaria	---	28
31/08/09		Gaibandha	Fulchuri	Gazaria	---	25
01/09/09		Gaibandha	Fulchuri	Gazaria	---	35
31/07/09		Sirajganj	Chowhali	Omarpur	Pachuria	50
Training and Learning Workshop for Flood Early Warning	02/09/09	Gaibandha	Fulchari	-	-	45
	14/09/09	Sirajganj	Chowhali	Khaspukuria	Shakpal	38
Mick drill for community level demonstration for flood	10/09/09	Sirajganj	Chowhali	Khaspukuria	Shakpal	800+

### Meetings on riverbank erosion

Level	Date	Location				participants
		District	Upazila	Union(s)	Village	
Central level meetings	Various dates	Dhaka	-	-	-	5
Upazila and community level meetings	28/08/09	Gaibandha	Fulchuri	Gazaria	--	25
	14/07/09	Sirajganj	--	--	--	07
	14/07/09	Sirajganj	Sadar Upazila	--	--	06
	15/07/09	Gaibandha	Fulchuri	--	--	04
	15/07/09	Gaibandha	Shaghata	Shaghata	Chinirpatol	40

### Meetings on Cyclone/storm surge

Type of meetings	Date	Location				participants
		District	Upazila	Union(s)	Village	
Orientation meeting	09/09/09	Cox'sbazar	--	--	--	06
	10/09/09	Cox'sbazar	Kutubdia	--	--	10
Sensitization meeting	09/09/09	Cox'sbazar	--	--	--	06
	10/09/09	Cox'sbazar	Kutubdia	Ali Akbar dale	Tabolar char	46
	11/09/09	Cox'sbazar	Kutubdia	Koyerbeel	Uttar Nazirpara	35
	11/09/09	Cox'sbazar	Kutubdia	Koyerbeel	Dakshin Nazirpara	38
	07/10/09	Cox'sbazar	Kutubdia	Ali Akbar dale	Tabolar char	30
	08/10/09	Cox'sbazar	Kutubdia	Koyerbeel	Dakshin Nazirpara	25
Training and Learning Workshop for Cyclone Early Warning	12/10/09	Cox'sbazar	Kutubdia	-	-	50
Mick drill for community level demonstration for cyclone	26/09/09	Cox'sbazar	Kutubdia	-	-	-



## **Annex 2. Participants list of the three training and learning events in the field**

### **A. Fulchari, Gaibandha**

#### **Training and Learning Workshop on Community Level Flood Forecasting and Warning Pilot Testing**

**September 2, 2009  
Fulchari, Gaibandha**

**Venue: Meeting Room, Upazila Office, Fulchari, Gaibandha**

<b>Sl. No.</b>	<b>Name</b>	<b>Position and organization</b>	<b>Contacts Tel and Cell</b>
1	Md. Shawkat Ali Sarker	UAO, DAE	01714031936
2	Md. Alen Syed	Research Fellow	01730019213
3	Moloy Chow	SNC. DDPC	01711488343
4	Md. Saiful Hossain	Executive Engineer FFWC, BWDB	01715552422
5	A.F.M. Hassan	USEO	01712009151
6	Md. Amirul Islam	V.S.O	01712831706
7	Md. Badsha Mia	SAE-DPHE	01711-058446
8	Rekha Rani Paul	UWAO	01714-494760
9	Md. Monzil Hossain	OPAS	01711-149102
10	Md. Amzad Hossain	FIS	01717937834
11	Md. A. Rahman	Fulchari (Press Club)	01717487425
12	Bhabatosh Mona	General Secretary Fulchari (Press Club)	01715-949803
13	Md. Ayub Hossain	President (Press Club)	01716-049584
14	Md. Shamsul Alam	AUE, Fulchari	01721-915175
15	Md. Mairul Islam Tushar	Program Manager	01713484612
16	Basudeb Dutta	ESP Member	01718220322
17	Md. Moniruzzaman Mugal	PM-GUK	01713484677
18	A.S.M. Ruhul Amin	P.O. – GUK	01714-862098
19	Md. Shamsuddoha (Bablu)	Reporter, Dainik Manabjamin	01713780466
20	Md. Raihan Islam	Upazila Poshushampad	01720377380
21	Ms. Firoza Begum	UST Gram Sahajogi	01734378843
22	Begum Sahida Islam	Chairman, Gazaria	01712171397
23	Md. Roknuzaman Jillu	Project Manager	01713484678
24	Md. Mahbubur Rahman	Chairman, Udakhali	01712848858
25	Meskour Rahman	A.M.	01730025265
26	Md. Joynal Abedin	Office Assistant	

<b>Sl. No.</b>	<b>Name</b>	<b>Position and organization</b>	<b>Contacts Tel and Cell</b>
27	Md. Aminul Islam	Imam	01719-793645
28	Shamsul Haque	Local resource	0171048854
29	Md. Abdul Quader	Local gentleman	01913358357
30	Nazima Begum	Reserve Woman Secretary	01745759795
31	Kalpana Begum	UP Member	01725446810
32	Moazzem Hossain	Secretary	01716697765
33	Manatosh Roy (Mitu)	UP Member	01715234603
34	Md. Shahidul Islam	Social worker	01723809474
35	Md. Abdul Halim	Upazila .....LGED	01712529907
36	Md. Abul Kalam	Upazila Ansar & VDP Officer	01816616117
37	Md. Aminul Islam	Conveynor, Upazila Press Club	01729760783
38	Ms. Bimala Roy	Project Manager, AWARE-SKS	01723766697
39	Muskur Rahman	GOU	01730025265
40	Belal Hossain	D.A.	01725674722
41	Md. Wahab Miah	Social Communicator	
42	Md. Mamunul Haquqa	P.M.	01713484696
43	Ms. Afsana Hossain	UP Member	-
44	Atiq K. Ahmed	Social scientist, ADPC	
45	Golam Mainuddin	Research Officer, BCAS	01712579769

**B. Chowhali, Sirajganj**

**Training and Learning Workshop on Community Level  
Flood Forecasting and Warning Pilot Testing**

**September 14, 2009  
Chowhali, Sirajganj**

**Venue: Meeting Room, Upazila Office, Chowhali, Sirajganj**

<b>Sl. No.</b>	<b>Name</b>	<b>Position and organization</b>	<b>Contacts Tel and Cell</b>
1	Md. Kamrul Hyder	Vice Chairman, Upazila Parishad, Chowhali	01716-766099
2	Md. Saiful Hossain	FFWC, BWDB, Executive Engineer	01715552442
3	Firoj Ahmed	MEE Specialist, CDMP/UNDP	01914-333896
4	Moloy Chow	SNC ADPC	01711488343
5	Md. Abu Syed	Research Fellow, BCAS	01730019213
6	Md. Gous Uddin	U.F.P.A	01716219174
7	Md., Shahidul Islam	CARE (Shouhardo)	01915181891
8	Md., Selim Miah	Local man (Chowhali)	01918737098
9	Shantosh Kanti	Disaster Rep, BDIC	01716589406
10	Md. Juel Sarker	Local men, Chowhali	0175625443
11	Md. Helaluddin Sarker	Member, Umarpur	01726-118806
12	Md. Jaber Hossain	BDPP	01720048934
13	Narayan Malakar	Reporter, Karatoa	01718785242
14	Shadat Hossain	Local gentlemen	01918737098
15	Md. Shahidul Haqua Bhuiyan	Representative M.S.S.	01918494927
16	Abdur Razzak	Representative, Chayaneer	01718758524
17	Golam Mainuddin	Research Officer, BCAS	01712979769
18	Md. Kakrul Hyder	Vice Chairman, Upazila Parishad, Chowhali	01716-766099
19	Md. Jakir Hossen	PID-DRR	01712803649
20	Md. Abdul Kader Sarker	Chairman, Umarpur, U.P.	01726-177641
21	Md. Mizanur Rahman	Chairman, Khaspukiria, UP	01726-177643
22	Md. Mahmudul Hasan	Village Pradon Mitwari	01734751713
23	Md. A. Zabbar	UP Member-7	01719790850
24	Md. Lutfar Rahman	Assistant Secretary, Saspukuria UP	01913641988
25	Md. Moksed Ali	Chowhali Sadar Jame Masjid	
26	Md. A. Kader Sarker	URDO, Bithardibi, Chowhali	01718875775
27	Md. Abdul Wahab	Representative, Upazila Samaj Sebak	01718785239
28	Md. Zahirul Islam Akand	Upazila Fish Officer	01712-242487
29	Niranjana Sarker	North DE Agriculture Officer	01712-616336
30	Md. Saiful Islam	Upazila Animal Husbandry Officer, Chowhali	01912417679
31	Md. Monim Khan	Secretary, 04 No. Umarpur, U.P.	01710721218

<b>Sl. No.</b>	<b>Name</b>	<b>Position and organization</b>	<b>Contacts Tel and Cell</b>
32	Md. Mahbubul Alam	Representative, Upazila Secondary Education Officer	01714-954961
33	Md. A. Jabbar Shekh	Trainer, Ansar VDP	01717-012110
34	Md. Quamruzzaman	Field Coordinator, BDPC	01817537835
35	Md. A. Latif	Imam, Shakpal 7 No. Wa	01919443420
36	Md. A. Razzam	Shakpal No.7 Ward	01718269471
37	Md. Rezaul Karim	CA/OS	01716746119
38	Md. Akteruzzaman	M.M.S	01713-256516
39	Md. Abdur Razzak	Umarpur	017134199645

**C. Kutubdia, Cox's Bazar**

**Training and Learning Workshop on Community Level  
END TO END CYCLONE WARNING AND DISSEMINATION PILOT TESTING**

**October 12, 2009  
Kutubdia, Cox's Bazar**

**Venue: Officer's Club, Kutubdia, Cox's Bazar**

Sl.	Name	Dept./organization & Designation
1	Md. Zafar Alam	UAO, Kutubdia
2	Md. Nurul Alam Niazi	URDO, BRDB
3	Atiq K. Ahmed	ADPC
4	Hafiz Md. Abdullah	Prin. Barghap IS. Pazil, Madrasha, Kutubdia
5	Asad Ullah Khan	AD. Red Crescent
6	Golam Rashid	CPP, BDRCS
7	Mohammad Aain	SAE-PHE
8	Nasir Uddin	Kutubdia Model High, Headmaster
9	Ashraf Ali	UP, Habokhola
10	Abul Hocsem	Ali Akbar .....
11	Kamal Hossain	Kutubdia, Cox's Bazar
12	Shafiul Alam	MUP, Kayer Bill
13	Dilshad Aertzum	MUP
14	Burhan Uddin	USSO
15	Gias Uddin Kutab	SAPPO
16	M. Mozammel Haque	PIO
17	Md. Khurshed Alam	Manager, Grameen Bank
18	Md. Mahadi Hassan	Upazila Project Officer, RLP, BRDB
19	Dr. Md. Abul Bashar	TH&FPO (in charge) Upazila Health Complex
20	Md. Osman Gani	UCO, Kutubdia
21	Badal Kanti Shill	SUP, Ali Akbar Dail UP
22	Faridul Alam	SUP, Kayerbil UP
23	Hasam Ali	MUP, Kayerbil, UP
24	Ramat Ullah	MUP, Ali Akbar Dail
25	Md. Zahidul Islam	JSA, Stacies Officer
26	Motajul Hoque	CS, Youth Development Officer
27	Abu Taher	DOF
28	Abu Yakar	Ali Akbar Dail
29	Pronab Chy	Secondary High .....
30	Kapil Uddin	MUP, Kayerbil
31	Moayzzem Hossain	UWO
32	Jahangir Hossain	FMV
33	Khandakar Masud Rana	Field Coordinator, BDPC, Kutubdia
34	Junnun Ahmed	BDPC, Kutubdia
35	Md. Ahad A Mridha Jewel	BDPC, Kutubdia
36	Md. Jashim Uddin Chy	Ansar and VDP Officer

<b>Sl.</b>	<b>Name</b>	<b>Dept./organization &amp; Designation</b>
37	Md. Abu Syed	BCAS
38	Rezaul Hoque	AHI, UHC
39	Zaker Ahmed Kutubi	HA, UHC
40	Dr. Monirul Mannan	MO, UHC
41	Mafijul Alam	MCSS
42	Md. Abu Naser	Head Assistant Cum Accountant
43	Daya Chowdhury SSn	SSN
44	Prof. Delwar Hossain	Kutubdia College
45	A M Mannan	Professor, Kutubdia
46	Yousuf Siddique	OC, Kutubdia, PS
47	Moloy Chaki	SNC, ADPC
48	Golam Mainuddin	Research Officer, BCAS
49	Md. Rabiuzzaman	Research Officer, BCAS

### Annex 3. Reflections of participation



Reconnaissance visit at Sirajganj



Reconnaissance visit at Gaibandha



Sensitization Meeting at Chowhali



Sensitization Meeting at Gaibandha



Referencing on flood in Sirajganj



Referencing on flood in Gaibandha



Spectators enjoying mock on Flood



Guests showing EW dissemination process



Training and Learning Workshop on Community Level Flood Forecasting and Warning Pilot Testing at Fulchuri upazila of Gaibandha





Training and Learning Workshop on “End to end cyclone warning and dissemination pilot testing” at Kutubdia of Coxs bazaar



Sensitization and awareness meeting with communities in Koyar beel, Kutubdia, Cox'sbazar.

