



Comprehensive Disaster Management Programme (Component 5b)
 Contract agreement no. BGD/01/004-CDMP/EC/5b/PC-1
Support for a Disaster Management Information Network (DMIN)

Project Completion Report

December, 2009
 Bangkok, Thailand



Submitted to:
 Comprehensive Disaster Management Programme (CDMP), Dhaka, Bangladesh

Submitted by:



in collaboration with





Comprehensive Disaster Management Programme (Component 5b)

Contract agreement no. BGD/01/004-CDMP/EC/5b/PC-1

Support for a Disaster Management Information Network (DMIN)

Project Completion Report

November, 2009
Bangkok, Thailand

Submitted to:
Comprehensive Disaster Management Programme (CDMP), Dhaka, Bangladesh

Table of Contents

Table of Contents.....	iii
List of Tables.....	iv
List of Figures.....	iv
Acronyms	v
Acknowledgements	viii
Executive Summary	x
Chapter 1. Introduction.....	14
1.1 Background	14
1.2 Project goal and objectives	15
1.3 Overall methodology and process of the project.....	15
1.4 Outline of the report.....	16
Chapter 2. Reviews and Assessments under the Project	17
2.1 Review of existing links and gaps.....	17
2.2 Community Level Information Flow Mapping Assessment.....	20
Chapter 3. Pilot Field Testing Experiences	23
3.1 Methodological process of the pilot field testing	23
3.2 Pilot Field Testing: Riverine Flood	29
3.3 Pilot Field Testing: Cyclone/ storm surge	39
4.4 Pilot Field Testing: Riverbank Erosion.....	46
Chapter 4. Generic designs to integrate with DMIC.....	50
Chapter 5. Post-evaluation and Readiness	54
5.1 Criteria to evaluate communication readiness	54
5.2 Findings and lessons learned from CRC evaluation.....	55
Chapter 6. Recommendations and Way ahead.....	61
Bibliography	64

List of Tables

Table 1-1. CDMP Component Structure.	14
Table 2-1. Auditing matrix of existing links and gaps of various EWS in Bangladesh (ADPC: Oct.,2008)	17
Table 2-2. Comparative review of selected local level EW initiatives in Bangladesh.	19
Table 2-3. Emerged recommendations for improvement of community EW from various levels.	21
Table 3-1. The respective union names from which the pilot communities are considered.	24
Table 3-2. Synoptic overview of the methodological activities for three hazards.	28
Table 3-3. Table. Existing Flood Warning Product Dissemination Routes.	31
Table 5-1. Synoptic overview of CRC criteria and its description with tools used to evaluate.	54

List of Figures

Figure 3-1. Map showing pilot field testing districts for three different hazards.	25
Figure 3-2. Meeting with district and upazila officials (DRRO in Sirajganj and Gaibandha) and UzDMC level stakeholders in flood prone pilot sites.	29
Figure 3-3. FFWC Website is visited on an irregular manner at district level.	30
Figure 3-4. Various community level and sensitization meetings held during the pilot testing.	33
Figure 3-5. Community based flood warning system was set for pilot testing in selected sites.	34
Figure 3-6. Some of the billboards established in the pilot field areas.	35
Figure 3-7. FFWC representative presenting and sharing local level flood forecasting issues in Training and Learning events in Gaibandha and in Sirajgonj.	36
Figure 3-8. Follow up awareness sessions after establishing local reference points and billboards.	36
Figure 3-9. Some reflection of the flood warning mock drill where communities demonstrated their roles and responsibilities in warning and dissemination from upazila to household level.	37
Figure 3-10. Recommended design for Flood Forecast/Warning Dissemination Flow from Upazila down to Household level.	38
Figure 3-11. Cyclone bulletin contents.	40
Figure 3-12. BMD bulletin of SIDR and CPP VHF message hand written transmission document.	41
Figure 3-13. The wall-hanging board for indicting the cyclone depression tracks in the field offices of CPP Kutubdia.	41
Figure 3-14. A community sensitization and mobilization meeting with the pilot communities in Koyar beel, Kutubdia, Cox'sbazar.	42
Figure 3-15. Sample of a billboard established from the pilot testing for increased awareness.	42
Figure 3-16. 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.	43
Figure 3-17. Reflections of mass participation and enthusiasm in mock drill in cyclone prone Kutubdia.	44
Figure 3-18. Cyclone/Storm Surge Warning Dissemination Flow from Upazila down to Household level.	45
Figure 3-19. Various types of IEC materials developed for community awareness and interpretation of the cyclone early warning messages at community level.	46
Figure 3-20. Figure. Already started riverbank erosion in many locations of the pilot area.	47
Figure 3-21. Consultation meetings with local BWDB and Upazila Administration on erosion prediction.	47
Figure 3-22. The erosion prediction based vulnerability map of Ghuridaha location (Source: BWDB-CEGIS, 2009).	48
Figure 3-23. Community level sensitization and awareness meeting at the erosion site in Ghuridaha, Saghata upazila in Gaibandha district.	49
Figure 4-1. DMIN generic design-1: for emergency time Rapid Onset & Rapid Seasonal Onset hazards.	52
Figure 4-2. DMIN generic design-2: for regular time operation of slow and slow-seasonal onset hazards.	53

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

Report Prepared by

Atiq Kainan Ahmed

Senior Social Scientist (also Senior Project Manager), ADPC.
Corresponding e-mail: atiqka@adpc.net

With inputs from Project Team

AR Subbiah (Director, Climate Risk Management)
Moloy Chaki (Senior National Consultant)
Md. Abu Syed (Technical Coordinator)
Golam Maainuddin (Project Officer)
Rabi Uzzaman (Project Officer)
Afroza Taznin, (Research Officer)
Md. Aminur Rahman (Research Officer)

Collaborating NGOs/agencies in the pilot areas

GUK (Gaibandha)
BDPC (Cox'sbazar and Sirajgonj)
MMS (Sirajgonj)
BDRCS (Kutubdia, Cox'sbazar)

Collaborating source agencies for respective hazards

FFWC/BWDB, BMD, CPP and CEGIS.

Acknowledgements

The “Project Completion Report” is the final output of the ADPC’s technical support to CDMP to the project titled “Design, test and demonstrate DMIN down to household level” (Contract agreement no. BGD/01/004-CDMP/EC/5b/PC-1). The report outlines the collaborative contributions of several professionals and individuals. The ADPC Disaster Management Information Network (DMIN) support project team comprised of ADPC and BCAS professionals would like to sincerely thank the Disaster Management Bureau (DMB) of the Ministry of Food and Disaster Management (MoFDM), United Nations Development Programme (UNDP), Bangladesh, and Comprehensive Disaster Management Programme (CDMP) for taking up this timely initiative to design test and operationalize a Disaster Management Information Network (DMIN) under which the present report is being produced. ADPC acknowledges exclusively the financial and management contributions of the European Commission (EC) for this support project to establish DMIN in Bangladesh.

ADPC team is thankful to Mr. Ian Rector, Dr. Marco Corsi, Mr. Bidyuth K. Mahalder, Dr. Mustafa Alam, Mr. Tasdiq Ahmed, Mr. Firoj Ahmed and others from the CDMP project team for their time and suggestions in developing this report. The project team is also thankful to the useful contributions received from the various national level hazard information source agencies including Bangladesh Meteorological Department (BMD), Flood Forecasting and Warning Centre (FFWC) of Bangladesh Water Development Board (BWDB), Department of Agriculture Extension (DAE), Center for Environment and Geographic Information Services (CEGIS), CFIS project members, CFAB project team, Bangladesh Disaster Preparedness Center (BDPC), and others for their valuable time and contributions.

Special thank goes to Mr Muhammad Saidur Rahman, Director of Bangladesh Disaster Preparedness Center (BDPC) for his suggestions and guidance to improve the DMIN designs and the proposed pilot testing plan. The team is also grateful to Mr Saiful Islam from FFWC for providing his kind cooperation and Mr Sujit Debsarma (formerly from BMD and now with SMRC) for his support. ADPC team gratefully acknowledges the support of three national NGOs (GUK in Gaibandha, BDPC in Cox’sbazar and Sirajgonj and MMS in Sirajgonj districts) who provided full support during pilot testing exercises. Special thank goes to the CPP Headquarters as well as the field office in Kutubdia for providing their collaborative support.

During the CLIFMA field work and pilot testing, the team has received a significant amount of collaboration from the respective UNOs and Union Parishads. We are grateful for their kind collaborative approach in all the pilot upazilas and pilot sites. Support also received from the district, upazila, union level officials, local government representatives, and knowledgeable people from the respective pilot communities.

Thank goes to all the people of these pilot communities as well as CLIFMA study villages who have given their valuable time and energy during pilot field testing and assessments. We are thankful to all others who have given their time and showed enthusiasm in the process of developing this report.

Atiq Kainan Ahmed

Asian Disaster Preparedness Center (ADPC)

Email: atiqka@adpc.net

December, 2009. Bangkok.

Executive Summary

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). Specific objectives of the project was to: a) establish status of existing links for information dissemination between source and community level; b) review options for strengthening existing links and filling gaps where appropriate; c) participatory assessments of the appropriate target communities predominant hazard types; d) carry out mock “drills” for rapid onset “emergency” hazards; e) assess information flow between warning sources, through intermediate levels to upazila and then onward transmission to union, community and household; and f) design and test appropriate hazard information network(s).

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 several sequential steps. Earlier precedence showed that there has been sporadic works carried out on local level early warning system in the country but this ADPC support project has taken up a comprehensive approach of empirical studies to first hand pilot testing along with a stock taking of the past-present experiences. The project has come up with a set of harmonized and sustainable recommendations for operationalizing EW down from upazila to household level.

ADPC support project undertook gradual and step-wise activities for completion of the project titled Design, Test and Demonstrate a DMIN down to household level. Activities under the project are briefly outlined below:

- Review of the **existing status** of the Community based Early Warning Systems for the major hazards from the source to destination in the country was analyzed in the project. A detailed review of the various levels of early warning activities were looked at and the links and gaps of the existing systems were explored. The output of the review was documented in the “Disaster Management Information Link Report (ADPC: October, 2008)”.
- Adopting a unique methodology blending household surveys and participatory stakeholder interaction, an empirical field assessment called “Community Level Information Flow Mapping Assessment (CLIFMA)” was carried out under the project. The current **status of various community level EW** (primarily down from upazila upto household level) in various hazard prone areas was looked at. Issues such as existing practices of community EW, perceptions and preferences on various EW issues were investigated. A household survey was carried out among 800 sample households from 25 communities in 24 upazilas in 21 districts focusing on 7 commonly occurred hazards in the country. The study output was documented in

Key reports produced under the project

- **Disaster Management Information Link Report**
[a secondary review of existing early warning status in the country]
- **Report on Communication Mapping and Planning at Community Levels**
[the findings and recommendations of the CLIFMA study and the proposed DMIN designs are reported]
- **Report on Pilot Testing of Community based Early Warning Systems**
[the report documents the results and recommendations of the pilot testing exercise of DMIN designs]
- **Project Final Report**
[the report documents the overall process, findings and the recommendations of the project]

the “Report on Communication Mapping and Planning at Community Levels (ADPC: July, 2009)”.

- On the basis of the existing reviews and CLIFMA findings, various set of recommendations were compiled for **developing DMIN design**. Two set of designs were proposed: one for rapid onset hazard and the other one for slow and seasonal slow onset disaster. These designs were then put forward for pilot field testing in next activity of the project.
- DMIN designs along with the recommendations for developing the community based early warning were then taken into the **field pilot testing** through three different piloting hazards including riverine flood, cyclone/storm surge and riverbank erosion. These were carried out in three districts of the country. During the pilot testing, activities included are: establishment of EW warning linkages with source agencies at community, strengthening of local agents, develop interpretation of messages, improvement of local modes of EW, addressing the issues of inter-locality (local referencing), training/awareness activities, demonstrative “simulations/mock-drill” etc. The output of the pilot field testing experiences are reported in the “Report on Pilot Testing of Community based Early Warning Systems (ADPC: November, 2009)”
- On the basis of these reviews, studies, designing, pilot field testing (in stepwise phases of the project) and other accumulated lessons learned from the existing projects/initiatives, a concrete set of recommendations for **future replications and sustainable linkage of EW from upazila down to household level** are outlined and reported in the project final report and piloting report – which would be useful for future designing, replication and further development of community based EW in the country.

Results of the project:

- One of the major results of the project was to come up with an **EW information network that would be operational from upazila down to household level**. In this respect, the studies and piloting activities under the project have resulted identifying systematic designs for bringing the community level EW information down to household level. The project recommended a network for the rapid onset, seasonal and slow onset hazards respectively. Particularly a “**parallel information sharing**” to the union level was identified as a crucial system for effective dissemination, preparedness and immediate actions. This parallel system of EW basically resulted bringing along a system for **rapid notification of the communities and households** during the pre-disaster situation and would be useful for saving lives, livelihoods and assets for the community as well as households.
- Another key concentration under the project was the focus on **geographically-location specific and timelier dissemination of EW** at ground level. In this respect, the project has introduced “local referencing systems” (particularly for the riverine flood) and this allowed the remote and differentially located geographical areas to identify EW information for their own areas and localities. This has been a very useful result for the local communities and households in particular.
- In terms of EW dissemination modes, the project studies found that people in the communities and households are more willing to receive “**verbal/audible systems**” using cell phones, megaphones, door-to-door, community based bill-boards and so forth. The project has particularly focused on introducing or developing further of various verbal/audible systems of dissemination. This focus of the project has actually resulted

bringing a system of EW information that can be reachable -accessible to a big proportion of population without literacy.

- The project has particularly focused on **developing methodology and modalities that would be replicable and sustainable in future**. In this respect, the project has developed and built-on various mechanisms of EW dissemination, institutional arrangements and learning process that would contribute as a sustainable mechanism. Such examples are, establishing the local referencing systems using locally situated infrastructure; popularizing local institutions such as *haat-bazar* committee, further operational UP/UDMC; bringing the locally situated billboard; introducing community led mock drills etc. are among others. At the same time, the project has identified various already available institutions (e.g. Ansar-VDP, mosque imams) that could be linked up with the existing EW systems and can be potentially used for 24/7 round the clock EW agent at community level.
- In addition to the above mentioned issues, the project has contributed towards hazard specific prescribed **institutional engagement** that would be useful for rapid and systematic EW information sharing. In this respect, the project resulted providing a guideline for establishing an enabling institutional framework that would be replicable in future and set a mechanism for local level collaboration of **UPs, UDMCs, local NGOs, social institutions** (such as schools, *haat-bazar* committees etc.) and keep them engaged in regular early warning and responses.

Recommendations from the project:

Both generic and hazard-wise recommendations have emerged from the project which can be reported below:

- The project recommended that EW information particularly for the rapid onset hazards should be channelized through a **“parallel system” from national to directly to union levels**. At this point, besides the regular official channels through the district and Upazila Administration a parallel system is not present but both the demand and necessity is huge and it is crucial for a rapid notification of both flood and cyclones.
- It emerged from the studies and pilot testing, that at the **Union Disaster Management Committees (UDMCs)** in most of the areas are not effectively functioning and they lack capacities to operationalize EW disseminations upto household level. It can be recommended that the UDMC's should be made more active in EW dissemination.
- A process of **minimal resource mobilization to the UDMCs for EW dissemination** purposes can be thought of. This is a point to be explored further but at this point the some portion of the VGF, VGD etc. related funds can be channelized to UDMCs.
- For EW dissemination purposes, various **volunteers, agents, educational institutions, religious entities, haat-bazaar committees and other social institutions** and their representatives can be innovatively used.
- **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. This is often crucial for household level EW dissemination as well as women's participation.

- **Volunteering coordination** at ground level is another area which needs a systematic coordination mechanism where national standards and local activation can be further improved.
- Capacity building and enhancement of **“hazard-livelihoods-geography specific” early warning** system needs to be developed further. In this line, more localized products and local referencing systems can be developed in future.
- The present **Standing Order (SOD)** should be further updated or refined considering the community level EW issues. 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 at national level as well as for the agencies at ground.
- **For flood “flag system”** and a simple **“informational sharing board”** can be encouraged that may include the forecast information for the local forecast point of FFWC. This helps public notification and awareness systems.
- For the **local interpretation of the flood/cyclone forecast information** the information content can be further developed from centrally.
- The presently available (under testing), **SMS based flood early warning** information needs further elaboration. This is a good start but there is a need for further research, detailed testing and piloting to see its full affectivity in the country.
- **Flood forecasting for other major river-systems** (other than the Jamuna) needs to be further strengthened for nation wide development of the community based flood early forecasting.
- For cyclone, 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, regular training and resource mobilization are crucial.
- The **proposed new cyclone early warning categories are not yet functional at community level**. However, it is recommended the new categories are needed but needs to be incorporated with the system in **a crateful way**.
- 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.
- For riverbank erosion, the present system of river bank erosion prediction in the Jamuna has a good result. This system **needs to be made available** at local level in time each year to at least local BWDB, local administration, local NGOs and respective communities.
- Early warning related **awareness and educational** programs needs to be stepped up in future.

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

The project started from December, 2007 and the Inception report was finalized in February, 2008. The project closes with this final report submission and completed within the overall time-frame of CDMP-EC component implementation phase.

The project was implementation activities were carried out through the active participation of the ADPC SIA team jointly collaborated with the BCAS professionals as local level partner and worked very closely with CDMP5b component team members.

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”.

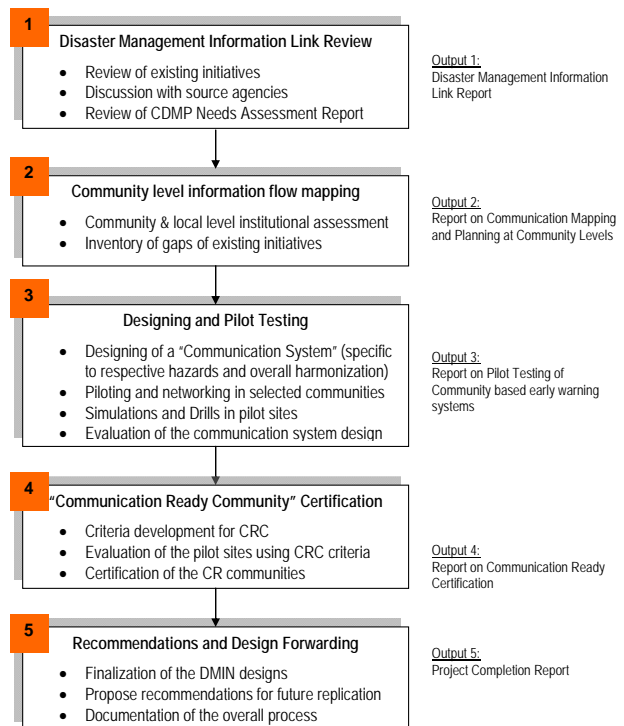
Under Component 5b, Support for a Disaster Management Information Network (DMIN), the specific objectives and scope of work (SoW) of the ADPC SIA remained as below:

- ➔ 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 of predominant hazard types;
- ➔ **Carry out mock “drills”** for rapid onset “emergency” hazards;
- ➔ **Test 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) through pilot field testing.

1.3 Overall methodology and process of the project

In order to implement the project with its objectives, ADPC team in active collaboration with the EC component of CDMP has developed a unique methodological framework and developed activities through sequential steps. Five major steps that are adopted in the project development 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; and e) final design and recommendations forwarding to CDMP for making the DMIN operational in future.

The methodological steps, corresponding project activities and the outputs are shown in the diagram on the right.



After the inception, the project design was revisited in September, 2008 and reflecting the recent developments in the country the project design was revised to some extent from its inception and the above process was adopted. This process was documented in the Supplementary note to Inception Report (ADPC: 2008b).

1.4 Outline of the report

This project completion report is outlined in five major chapters summarizing the project activities, process, results, outputs and recommendations.

In the first chapter of the report, provides the background of the project, its goals-objectives and the brief overview of the overall process of the project implementation.

Chapter two reflects on the various reviews and assessments that are carried out during the project phase. Particularly two activities: the Disaster Management Information Link Report findings which was based primarily on the secondary reviews and the empirical assessment of CLIFMA was discussed elaborately. The core findings from these reviews as well as empirical field assessment were discussed along with a brief description of their process and findings. The recommendations from the CLIFMA field assessment were discussed in this section as well.

The next chapter, Chapter three, focuses on documenting the process and outcomes of the Pilot Field testing of the project. In this chapter, the pilot field testing methodology in general and the pilot field testing lessons in riverine flood, cyclone/storm surge and riverbank erosion prone areas are discussed in detailed manner.

The generic design(s) that was developed from the findings of the CLIFMA study as well as from the recommendations of the DM link report was documented in the Chapter four. In this chapter two updated DMIN designs: one for rapid onset hazards and the other one for regular time operation of the DMIN for various types of hazards were elaborated. The pilot field testing experiences has shaped up the designs further to its latest state.

In the Chapter five, the experiences of the Communication Ready Certification (CRC) process that was adopted at the final phase of the project is described. The communication ready certification exercise is actually the last set of activities of the DMIN project and through evaluation this process attempted to find out answers of following few set of questions relating to the community readiness.

In this final Chapter (Chapter six), the experience driven recommendations from the project are outlined in a sequential manner and the issues of way ahead for future were discussed with synergies.

Chapter 2. Reviews and Assessments under the Project

In order to design the context specific DMIN network that can be operational from upazila down to household level the project has initially carried out two set of background studies and assessments. Following two major reports were produced out of these activities:

- a) The “Disaster Management Information Link Report” (ADPC: October, 2008) that has come up with secondary review and institutional level observations and documented the major links and gaps existing from national (source level) to down to local level (upto Union); and
- b) The Report on Communication Mapping and Planning at Community Levels (i.e. CLIFMA report, ADPC: July, 2009) which documented the field study findings and proposed designs for DMIN.



2.1 Review of existing links and gaps

Review of the existing status of the Community based Early Warning Systems for the major hazards from the source to destination in the country was analyzed in the project. A detailed review of the various levels of early warning activities were looked at and the links and gaps of the existing systems were explored. The output of the review was documented in the “Disaster Management Information Link Report (ADPC: October, 2008)”.

This report has reported the status and gaps in the disaster management information link for various hazards from source to destination level. The performance on source-destination connectivity, information content type, dissemination mode, information/material quality, lead-time, disaster management/response setup etc. are also looked at and reported in following manner.

Table 2-1. Auditing matrix of existing links and gaps of various EWS in Bangladesh (ADPC: Oct.,2008)

	EWS source agencies	EWS availability stage	Source to destination connectivity	Information content type	Community Dissemination mode	Information/material quality	Timing/ lead-time of the early warning	Disaster management/ response setup
Riverine Flood	FFWC (BWDB)	Existing stage	Good	Bulletin, SMS, Fax, Call	Flag, agency instruction, local government notification, news media	Good	72 hours operational and 10-days with experimental	Moderate
Flash Flood	FFWC, (External: ADPC/ RIMES)	Developmental stage	Poor	Bulletin, SMS, Fax, Call	Flag, agency instruction, local government notification, news media	Medium (experimental)	24 hours (Experimental)	Moderate
Cyclone	BMD, , (external: IMD, TSR, ADPC/ RIMES)	Long standing, Redundant systems	Very good	Bulletin, SMS, Fax, Call, Megaphone, Door to Door through	Flag, agency instruction, local government notification,	Very good	Very good. 72 hours	Good

	EWS source agencies	EWS availability stage	Source to destination connectivity	Information content type	Community Dissemination mode	Information/material quality	Timing/ lead-time of the early warning	Disaster management/ response setup
		available		volunteers	news media			
Tsunami	BMD, PTWC, JMA, IOC/IOTWS	Regional: existing, National: Developmental	Medium	Bulletin, SMS, Fax, Call, Megaphone, Door to Door through volunteers	Flag, agency instruction, local government notification, news media	Good	Depending on the epicenter. But in general threat of long distant tsunami	Moderate
Drought	SRDI, SMRC, DAE, CEGIS (DRAS model)	Experimental stage	Poor	Agricultural departmental notification (DAE, Irrigation etc.)	Official notification	Poor	Not available	Poor
Earthquake	BUET, SoB, ADPC, USGS	Micro-zonation developed for major cities	Poor	Micro-zonation mapping, land use planning	Not developed	Not developed	None	Very poor
Riverbank erosion	BWDB-CEGIS, JMR EMP	Developmental stage	Poor	Maps, Satellite imagery, BWDB notification	Land zoning and are planning	Good	Seasonal	Moderate (structural measures are taken)

From the review following set of additional **challenges and gaps** emerged which are summarized below:

- **Geographical/location 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.
- **Consideration of livelihoods protection issues:** 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.
- **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.

Under the project, a secondary review of the existing projects and initiatives relating to the community level early warning systems for various hazards were also carried out. The brief summary of these initiatives were presented as below (see table below).

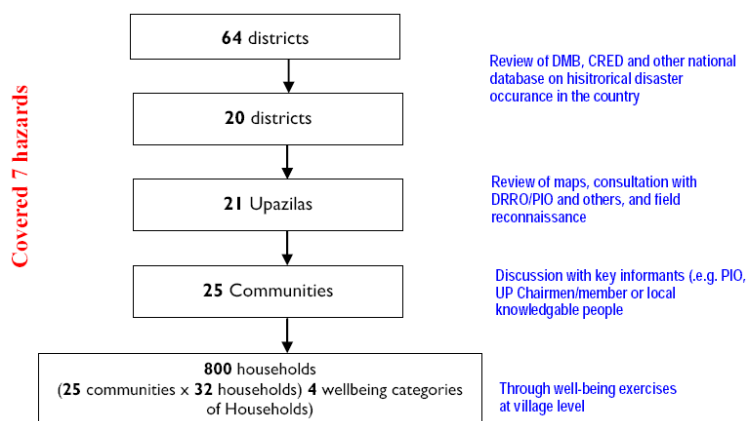
Table 2-2. Comparative review of selected local level EW initiatives in Bangladesh.

Initiative	Major Hazard focus	Dissemination mode- protocols suggested	On parallel dissemination flow for EW	NGO involvement	Key focal local institutional entity recommended
CPP initiative	Cyclone (also Tsunami recently)	VHF radio, CPP volunteers, collaboration with local setup	Emphasis on existing CPP-BDRC and collaboration with Govt. system	BDRC, CPP and Govt. entity involvement recommended	CPP units and volunteers
CFIS/CFAB project	Riverine flood	SMS and Fax; flag hoisting	Parallel dissemination flow recommended upto union system and flag operators	NGO network and Local NGO involvement recommended	Union Parishad and Union Disaster Management Committees
CEGIS-BDPC (LDRRF in Lalmonirhat) project	Multi-hazard (Flood, drought, Cold spell and erosion)	SMS and Fax; flag hoisting. 5-days lead-time is operational	Parallel dissemination flow recommended upto union system	Recommended	Union Parishad and Union Disaster Management Committees and Ward Disaster Management Committees
BDPC and FFWC	Riverine flood	SMS and Fax; flag hoisting	Parallel dissemination flow recommended upto union system and flag operators	Local NGO involvement also encouraged	BWDB Local Flood Cells (along with the District and upazila administration was recommended). Union Parishad and Union Disaster Management Committees and Change Agents are recommended for local level.
CNRS Flash Flood under LDRRF	Flash flood	1-2 and 3 day lead-time requirements shown. Talked about a need for a communication plan. Specific protocols are not specified.	FFWC/BWDB and IMD/Indian universities' collaboration suggested	Recommended. Also recommended collaboration with IMD and other regional entities	UP, UDMC and Volunteer groups are recommended.
ActionAid-BDPC project	Flood	SMS and Fax; flag hoisting	Parallel dissemination flow recommended upto change agents	Partner NGO involvement recommended	Union Parishad and Union Disaster Management Committees and Change Agents are recommended
BUET study under UNOPS and CDMP	Cyclone and Tsunami	WorldSpace Satellite system	Parallel dissemination flow recommended upto community and remote areas	Technical solution directly to community recommended	

Initiative	Major Hazard focus	Dissemination mode-protocols suggested	On parallel dissemination flow for EW	NGO involvement	Key focal local institutional entity recommended
KU-ADO under LDRRF	Multi-hazard (but cyclone major)	SMS, Fax and Cell phone based system developed	Parallel dissemination flow recommended upto union and ward volunteers	Recommended	Union Parishad and Union Disaster Management Committees and Ward representatives are recommended
CEGIS-BWDB/JMR EMP initiative	Riverbank erosion	Fax, maps and flag hoisting in vulnerable areas	Parallel dissemination flow recommended upto union system	Recommended	Union Parishad and UNDMC are recommended

2.2 Community Level Information Flow Mapping Assessment

Adopting a systematic methodology, the project has carried out empirical field assessment called "Community Level Information Flow Mapping Assessment" or "CLIFMA". Seven hazards are covered under the study taking samples from all around the country. The study involved early warning end users and local level early warning dissemination agents (local institutions and local communities) from upazila down to household level and investigated host of issues relevant for rapid and sustainable information flow.



A household survey was carried out among 800 sample households from 25 communities in 24 upazilas in 21 districts focusing on 7 commonly occurred hazards in the country: cyclone/storm surge, riverine flood, flash flood, riverbank erosion, tsunami and landslide. A set of 25 Community level focus group discussions (FGDs) and 15 institutional FGDs were also conducted in 15 upazilas using participatory approaches to collect qualitative primary information.

The current status of local level EW in various hazard prone areas, existing practices of EW, perceptions and preferences on various early warning issues were investigated in a systematic way.

Some of the **findings** emerged from the CLIFMA study are as follows:

- The CLIFMA study revealed that community level **EW systems for various hazards were not developed in a similar scale**, capacity and level. For some hazards the EW systems have developed upto community level networks where as for other types there are no developments existed. The situation for cyclone/storm surge and riverine flood per se is relatively better than the other hazards. The early warning for riverbank erosion, tsunami, drought, flash flood are still in experimental stage while the status of landslide early warning is yet to be conceptually developed further. The need for multi-hazard early warning dissemination is not articulated widely contrary hazard specific EW dissemination system was sought about.
- From the findings it emerged that almost over two third of the **households at community receive the EW information in varied frequency and scale**. Primarily in the coastal areas people often receive cyclone early warning from specialized institutions

(e.g. CPP) but a large number of people get this information from national and divisional broadcastings of radio/television as well. The expansion of cellular phone networks has also started to contribute quite substantially.

- It was found that both in community level and household level **people often have dual reliance over formal/official EW sources and other informal sources** of hazard detection. A mix and match of validation often found as a common practice for repeated confirmation.
- The CLIFMA study revealed that **problems** relating to lead-time, dissemination down to union level, full understanding of the EW messages with its interpretations for the likely damages, early warning availability specific to geographical conditions with accuracy, occupational **“need based early warning”** are often not adequately addressed in the existing EW systems. There is a big need of improvement of EW messages and contents in that line for both riverine flood and cyclone/storm surge.
- In terms of community and household level **preferences**, it was found that people want a “direct or parallel mode” of early warning information sharing upto the union levels instead of district only. In case of rapid onset hazards, people suggested that a **“parallel information sharing”** to the union level would enhance the awareness of the early warning as well as effective dissemination of the messages for preparedness. A round the clock-weekly (i.e. 24/7) EW system is also sought by the communities.
- In terms of dissemination mode, people from the household level have repeatedly talked about **“verbal/audible systems”** using cell phones, megaphones, door-to-door and so forth. People suggested that these verbal or audible modes are often quite important for the household level information sharing.
- In terms of institutional engagement, people have talked about finding modalities to make the **UPs, UDMCs, local NGOs, social institutions** (such as schools, *haat-bazar* committees etc.) engage in regular early warning and preparedness.

The CLIFMA study has come up with several sets of recommendations. An overview of some the recommendations came from various levels is summarized in the following table.

Table 2-3. Emerged recommendations for improvement of community EW from various levels.

SL No.	Recommendation	Level recommendations came from		
		Institutional	Community	Household
1.	Institutional strengthening through organizing committees at local level on EW and DM is needed	+	++	+
2.	Door-to-door and road to road visit EW dissemination is needed for household level		+	++
3.	NGO mobilization and engagement of MFI for EW dissemination would enhance further	++	++	+
4.	Timely availability/ sharing of EW information needs to be ensured		++	+
5.	Strengthening of Union based Early Warning information sharing mechanism	++	++	++
6.	Strengthening of UDMC with minimum required public addressing and communication equipments (e.g. mike, radio, megaphone etc.) are essential	+	++	+
7.	Priority should be given to the community preferred messages development that would include downscaled information (area and occupation wise)		++	+
8.	Encourage systematic volunteerism for EW at all levels	+	++	+
9.	Provision of public awareness, educational programs and trainings need to be enhanced	+	++	++
10.	Parallel direct communication/information receival system at union level	+	++	++
11.	SMS-Cell phone based dissemination development	++	++	++

SL No.	Recommendation	Level recommendations came from		
		Institutional	Community	Household
	in a easy mode needs to be considered			
12.	Rainfall and water level data availability at district/upazila level might	++		
13.	Minimal Financial support for early warning by the Government to UDMC can be considered	++	++	+
14.	Sequential progression of EW signals (i.e. not directly jump to higher signal for cyclone)		+	++
15.	Web-based protocols should be developed for sharing rapid and daily information to Upazilas	++		

Chapter 3. Pilot Field Testing Experiences

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 predominant hazards.

Specific designs for three major predominant hazards were 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.

In the pilot field testing, a systematic set of activities were carried out in a step-wise manner. Activities included are: a) establishment of EW warning linkages with source agencies at community, b) strengthening of local agents, c) develop interpretation of messages, d) improvement of local modes of EW, e) addressing the issues of inter-locality (local referencing), f) training/awareness activities, g) demonstrative "simulations/mock-drill" and so forth.

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 major objectives of the field level pilot testing were to: a) 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; b) through demonstrative mock-drills simulate and test the information flow procedures for its rapid transmission upto household level; c) 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; and d) compile recommendations for future establishment, improvement and replication for the national level network (DMIN) that will be functional down to upazila level.

3.1 Methodological process of the pilot field testing

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:

3.1.1 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 3-1. The respective union names from which the pilot communities are considered.

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

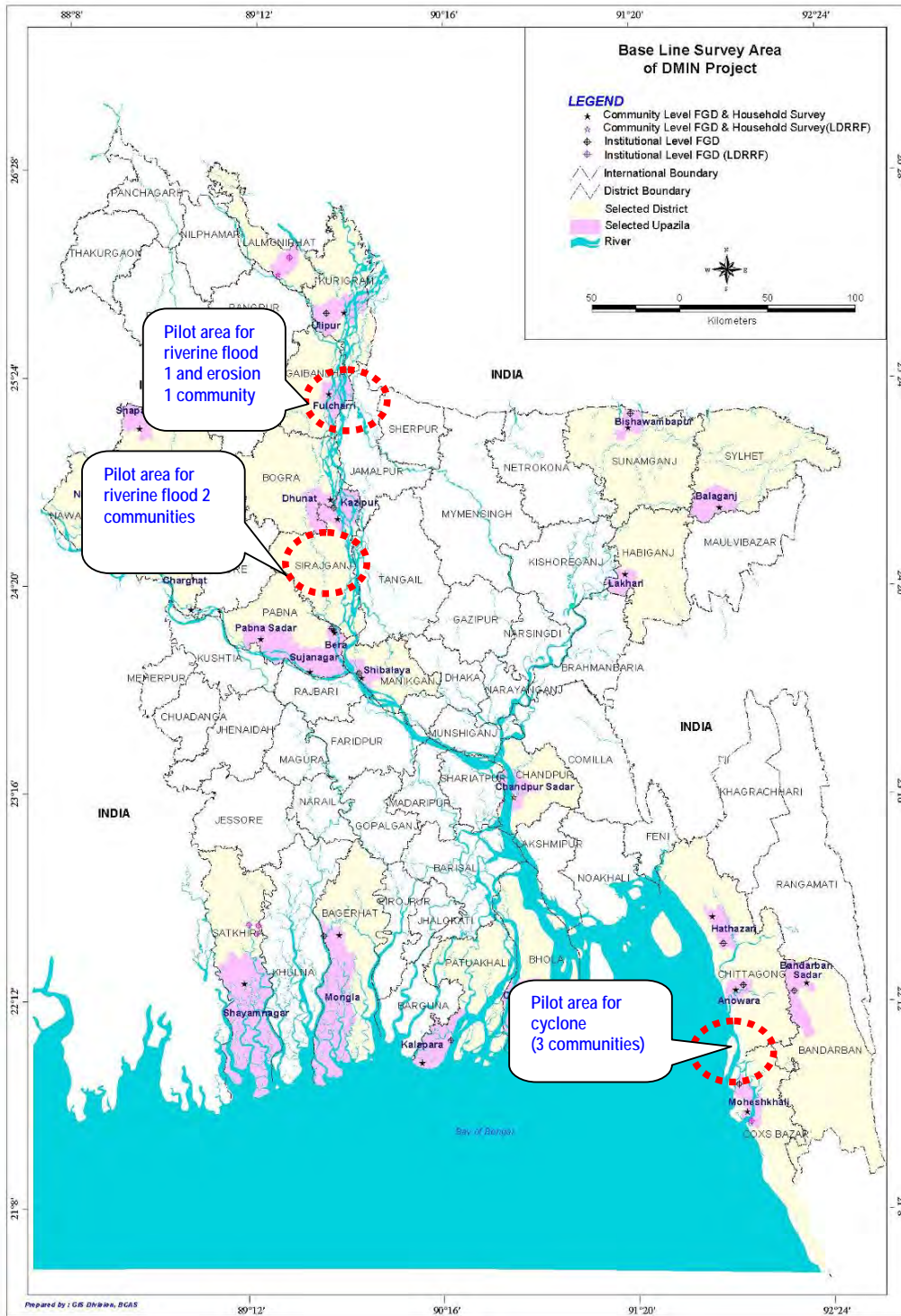


Figure 3-1. Map showing pilot field testing districts for three different hazards.

3.1.2 “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.

3.1.3 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.

3.1.4 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.

3.1.5 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.

3.1.6 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.

3.1.7 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.

3.1.8 “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.

3.1.9 “Evaluation” and “Public awareness” through “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 operability 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.

3.1.10 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 3-2. 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"> Total 3 communities from 3 unions/upazilas of 2 districts: Gaibandha: Fulchari upazila (Fulchari union) Sirajgonj: Chowhali upazila (Chowhali and Umarpur and Ghorjan union) 	<ul style="list-style-type: none"> A total of 3 communities from Kutubdia upazila of Cox's bazar district. 	<ul style="list-style-type: none"> Total 1 community from 1 union/upazila of Gaibandha district: Gaibandha: Shaghata upazila (Ghuridaha, union)
2. Sensitization and mobilization of stakeholders at various levels	<ul style="list-style-type: none"> Meeting with UzDMC, UDMC and community representatives 	<ul style="list-style-type: none"> Meeting with UzDMC, UDMC and community representatives 	<ul style="list-style-type: none"> Meeting with UzDMC, UDMC and community representatives
3. Establishment of early warning linkages with source agencies	<ul style="list-style-type: none"> Meeting with FFWC and make necessary linkages with local DMCs, departments, local NGOs, MFIs etc. 	<ul style="list-style-type: none"> Meeting with BMD, CPP and make necessary linkages with local DMCs, departments, local NGOs, MFIs etc. 	<ul style="list-style-type: none"> Meeting with BWDB and CEGIS and make necessary linkages with local DMCs, departments, local NGOs, MFIs etc.
4. Enable local agents and institutional means/channels	<ul style="list-style-type: none"> Institutional and local agent mapping with strengths, weaknesses and opportunities identified 	<ul style="list-style-type: none"> Institutional and local agent mapping with strengths, weaknesses and opportunities identified 	<ul style="list-style-type: none"> Institutional and local agent mapping with strengths, weaknesses and opportunities identified
5. EW message interpretation and decoding	<ul style="list-style-type: none"> Decoding of FFWC bulletins at different levels using local contexts 	<ul style="list-style-type: none"> Decoding of BMD bulletins at different levels using local contexts 	<ul style="list-style-type: none"> Interpretation of BWDB erosion prediction map for communities
6. Improvement of local modes of EW	<ul style="list-style-type: none"> Improvement of public addressing system through CLIFMA recommended equipments 	<ul style="list-style-type: none"> Improvement of public addressing system through CLIFMA recommended equipments 	
7. Addressing issues of inter locality/geographical differences	<ul style="list-style-type: none"> Establishment of local reference points and flood markers 	<ul style="list-style-type: none"> Identification and establishment of local modalities to reach EW into distant and isolated areas 	<ul style="list-style-type: none"> Discussion with stakeholders and volunteers
8. Training and awareness of local stakeholders	<ul style="list-style-type: none"> Training of stakeholders & volunteers Billboard installation Bulletin board establishment in each union. 	<ul style="list-style-type: none"> Training of stakeholders & volunteers Billboard installation Bulletin board establishment in each union. 	<ul style="list-style-type: none"> Discussion with stakeholders and volunteers
9. Evaluation and monitoring through community "mock-drill"	<ul style="list-style-type: none"> Mock drill outline development Involvement of local institutions & EW agents Preparations and logistic mobilization Mock drill conduction Post-event evaluation 	<ul style="list-style-type: none"> Mock drill outline development Involvement of local institutions & agents Preparations and logistic mobilization Mock drill conduction Post-event evaluation 	<ul style="list-style-type: none"> Not applicable

3.2 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.

During the pilot testing, pilot communities were taken considering three criteria where the community is located to a river gauge station, distant from a gauge station and community where no gauge is established at all. 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.

3.2.1 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.



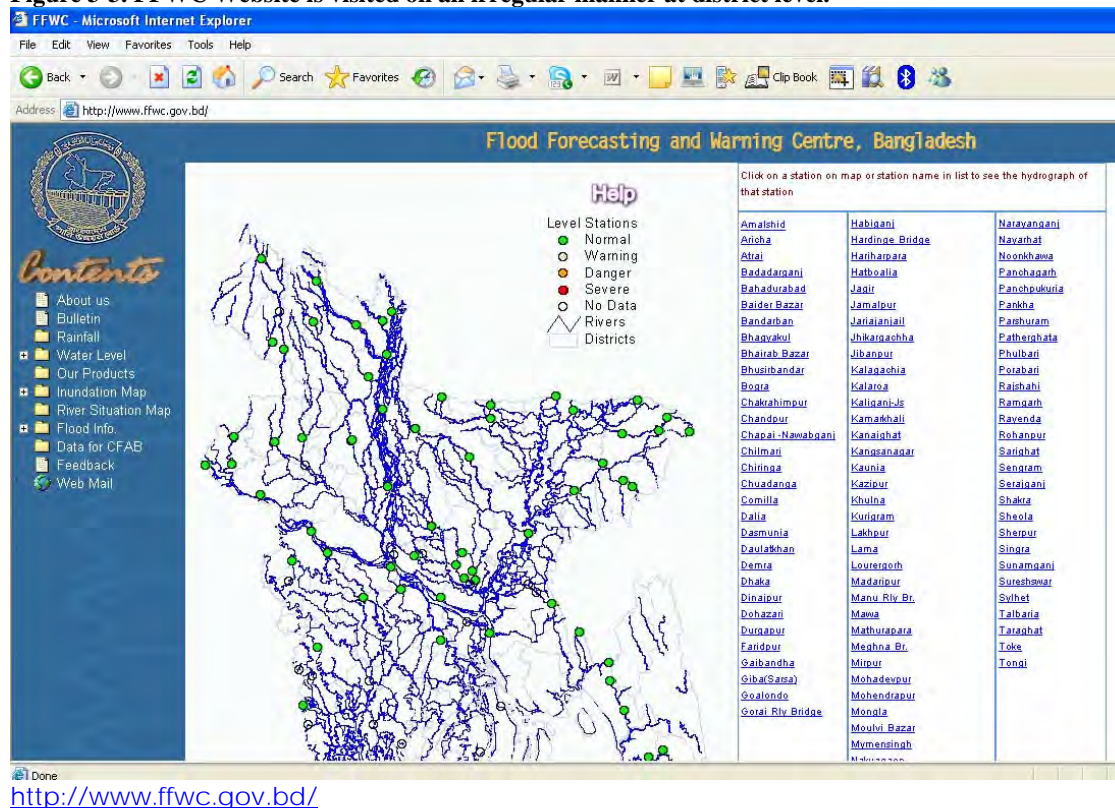
Figure 3-2. Meeting with district and upazila officials (DRRO in Sirajganj and Gaibandha) and UzDMC level stakeholders in flood prone pilot sites.

3.2.2 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 3-3. 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;
- summary of rainfall and river situation based on major findings;
- 24-48 and 72 hour forecasts for some important stations;
- 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
- 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 3-3. 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

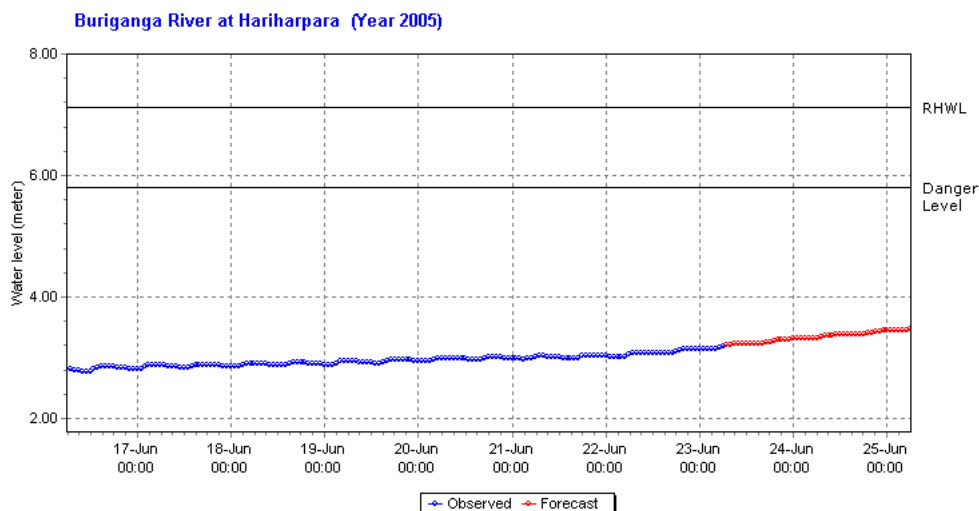
SL	RIVER	STATION NAME	RHWL (m)	D. L. W A T E R L E V E L		+ Rise - Fall in cm	Abov D.L in c
				23-04-2008	24-04-2008		
BRAHMAPUTRA BASIN							
1	DHARLA	KURIGRAM	27.52	26.50	22.66	22.84	+ 18
2	TEESTA	DALIA	52.97	52.25	50.50	50.30	-20
3	TEESTA	KAUNIA	30.52	30.00	26.84	26.85	+ 1
4	JAMUNESWARI	BADARGANJ	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 BASAR	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 UPTODATE (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 সঞ্চালন ডিলাট

ক্র. নং	নদীর নাম আওঁড়	বিমানসীমা নিন্দ্য (FWB)	পানির সঞ্চালন				সুবিধিতার সিদ্ধি/অসিদ্ধি
			২০১০-১২-০১ সন্ধ্যা ৬-০০ টা	২০১০-১২-০১ সন্ধ্যা ৬-০০ টা	২০১০-১২-০১ সন্ধ্যা ৬-০০ টা	২০১০-১২-০১ সন্ধ্যা ৬-০০ টা	
১	ব্রহ্মপুত্র (পূর্বদিক)	১১৬১৭	২২	২২	২২		
২	ধাকাত (সামান্য)	২১৭০০	২২	২২	২২		০.০০
৩	কলোভাড়া (কালোভাড়া)	২০১৪৫	২০.৬০	২০	২০		
৪	তিস্তা (সামান্য)	২৫১৬৪	২৪	২৪	২৪		

3.2.3 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 3-4. Various community level and sensitization meetings held during the pilot testing.

3.2.4 Establishment of “local flood reference” 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” was 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 this 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:

- The direct link of the reference point with main flow of the river;
- Accessibility; and
- 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 3-5. 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 3-6. Some of the billboards established in the pilot field areas.

3.2.5 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 3-7. 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 3-8. Follow up awareness sessions after establishing local reference points and billboards.

3.2.6 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 upozilla 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 3-9. Some reflection of the flood warning mock drill where communities demonstrated their roles and responsibilities in warning and dissemination from upazila to household level.

3.2.7 Institutional arrangement and role clarification

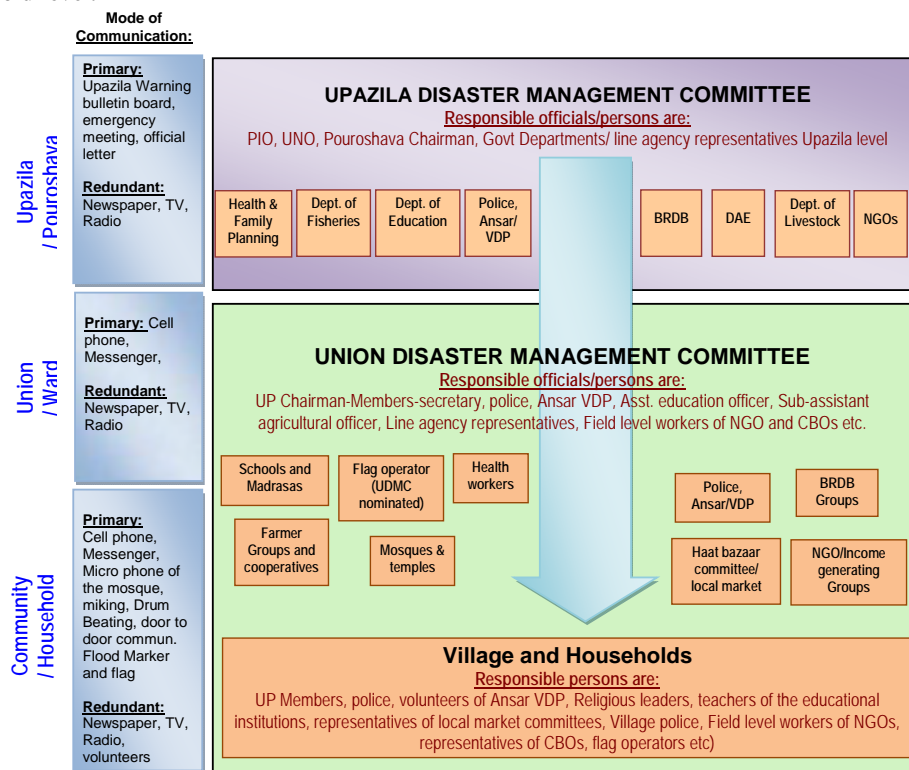
From the piloting testing following institutional lessons emerged:

- Upazila Disaster Management Committee (UzDMC) is the nearest source for union level to get the flood forecast messages. It was observed that Chairman or Secretary of the Union Parishad often 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 cannot pay their full attention to dissemination of warning message during the hazard period. 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 found useful for dissemination purposes upto household level. Microphone of the mosque, handmade mike and drum/ metal sheet beating were seen adopted as communication tools for disseminating flood early warning at community level.
- There was a need expressed from community and from Upzila level for establishing more clear Standing Operating Procedures (SoP) and a specific updating of SOD section on EW. This would allow clearer task description and accountability at all levels for flood forecasting responses.
- From the pilot testing experiences the recommended flood forecast/warning dissemination is shown as below:

Figure 3-10. Recommended design for Flood Forecast/Warning Dissemination Flow from Upzila down to Household level.



3.3 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:

- Process and findings;
- Institutional roles and responsibilities; and
- Recommended IEC materials.

3.3.1 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.

3.3.2 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

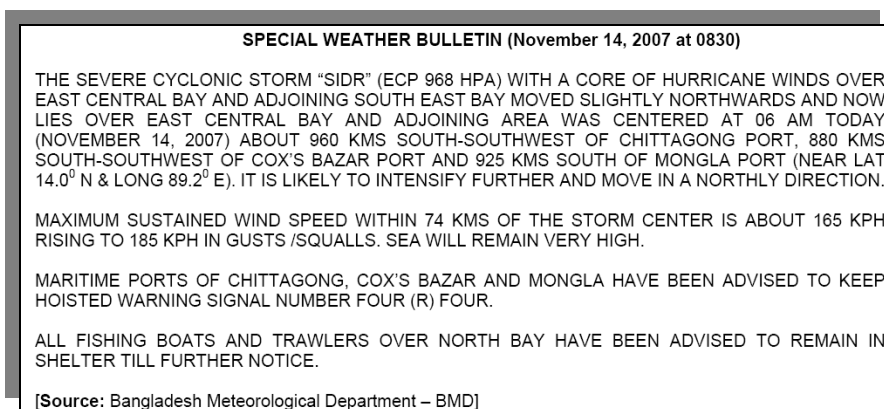
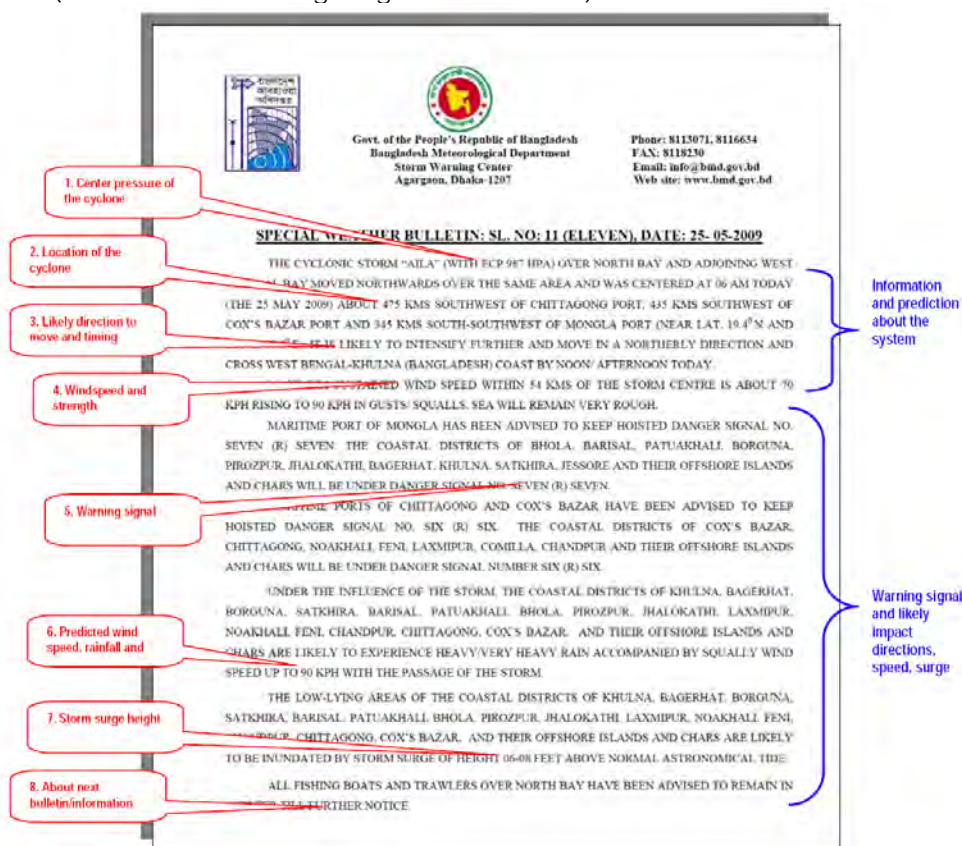


Figure 3-11. Cyclone bulletin contents.

A typical Special Weather Bulletin issued by BMD contains almost following eight types of information (shown in the following diagram in red color).



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.

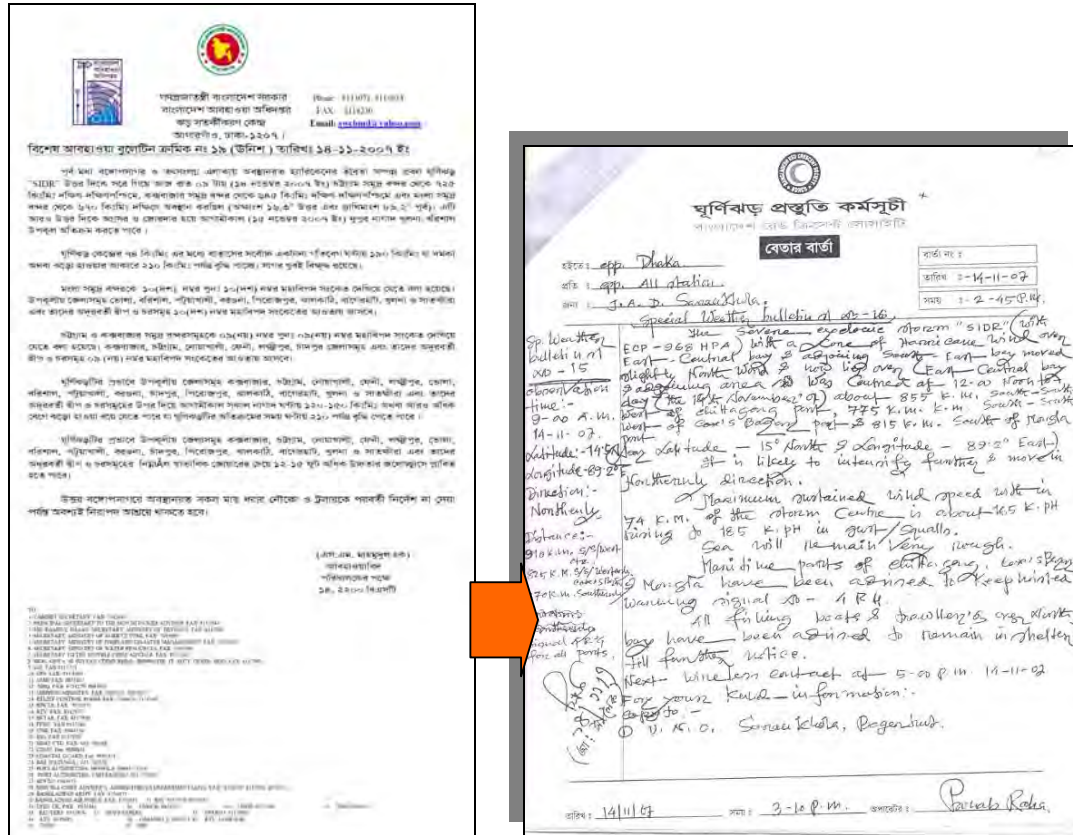


Figure 3-12. BMD bulletin of SIDR and CPP VHF message hand written transmission document.

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

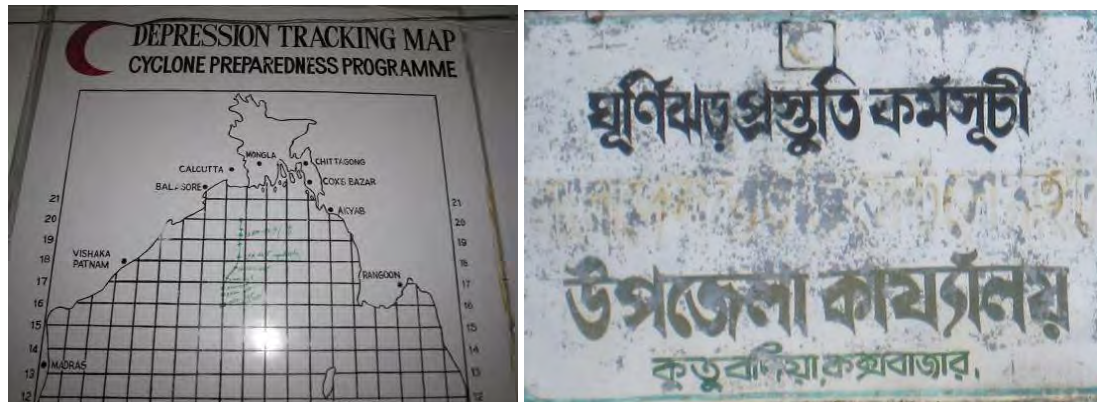


Figure 3-13. The wall-hanging board for indicating the cyclone depression tracks in the field offices of CPP Kutubdia.

3.3.3 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 3-14. A community sensitization and mobilization meeting with the pilot communities in Koyar beel, Kutubdia, Cox'sbazar.

3.3.4 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 of CPP and has arrangements. However, it was found that the local level awareness for these warning signals particularly among the younger generations needs to be more popularized. Keeping these in mind, the DMIN pilot testing exercise installed various billboards, awareness materials and carried out discussion/debriefing sessions and a “end-to-end” mock drill for the community. An active collaboration was made with the Kutubdia UNO office, local CPP office and other upazila based line agencies (e.g. DAE, Health department, Ansar-VDP, schools and others).



Figure 3-15. Sample of a billboard established from the pilot testing for increased awareness.

3.3.5 Training sessions, community orientation meetings and demonstrative mock drill

During the piloting exercise in the Kutubdia upazila a systematic training session was organized in collaboration with the Upazila administration, local CPP offices, most of the upazila based line agency (sectoral agency representatives), NGOs, schools, hospital, local fishermen cooperatives, local people and local political people as well. The training and orientation session was extensively useful to for sharing and discursive capacity building of the stakeholders in the upazila. The local CPP has also elaborated their program activities and their expectation for collaborating and pilot testing of the ADPC-CPP collaborative mock drill at the ground. It was found that there has not been a mock drill carried out in this area that can show the information flow and preparedness needs for cyclone.



Figure 3-16. 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.

The demonstrative mock drill experience in Kutubdia has showed that people are often know that there is a cyclone warning system available in the area but often have a clear idea about the role delineation of the agencies, agents or who needs to do what during the crisis. The demonstrative mock drill has brought clarity in this line and found to be a good tool for letting people know and engage in the process of community based cyclone early warning.

With the collaborative work with CPP at ground the value added by the ADPC DMIN initiative is the role clarification, active engagement of the line agencies, local social institutions with the existing CPP system. It also showed that through the training on "end-to-end" cyclone early warning systems, its technical elaboration to some extent, and involving stakeholders both in capacity building activities and knowledge sharing platform remains crucial in overall success and cyclone EW information flow upto household levels.

It also puts a standard to the process as well which can be replicated further in collaboration with the local CPPs and other stakeholders in the ground.

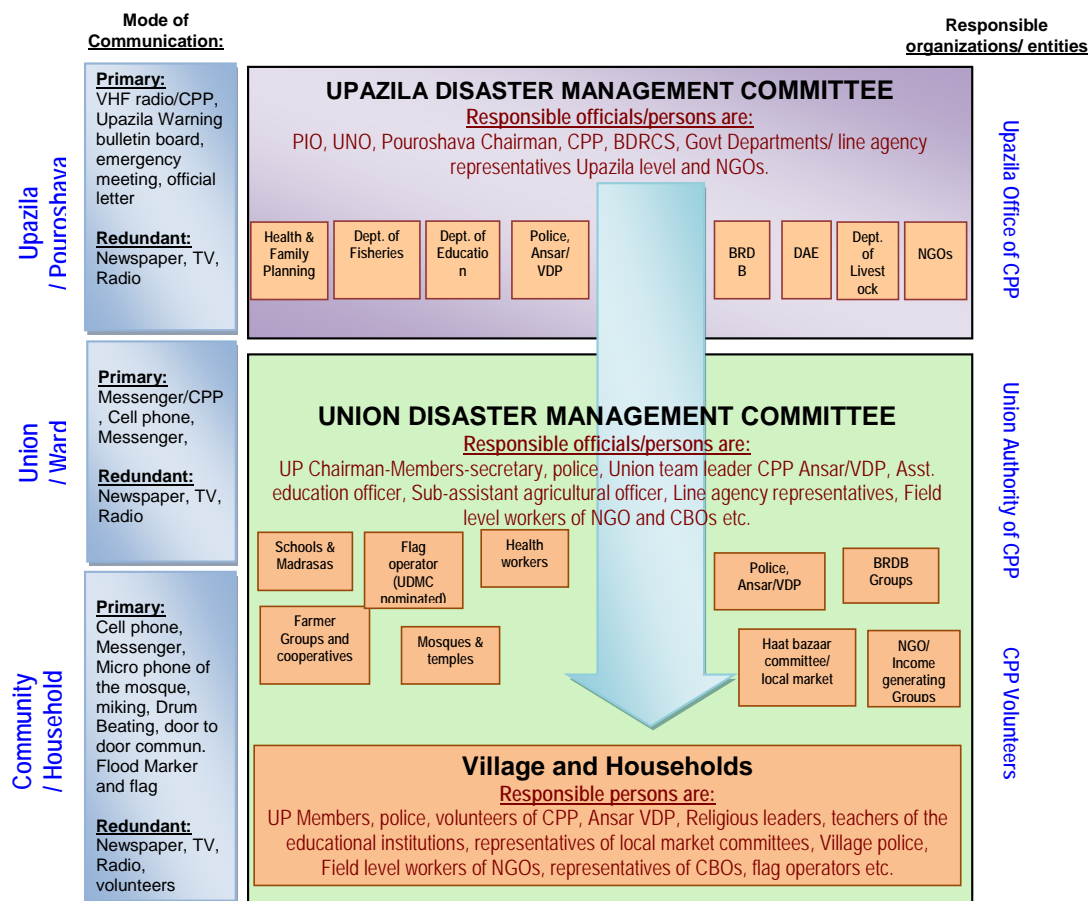


Figure 3-17. Reflections of mass participation and enthusiasm in mock drill in cyclone prone Kutubdia.

3.3.6 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 3-18. Cyclone/Storm Surge Warning Dissemination Flow from Upazila down to Household level.



The suggested diagram showing the institutional arrangements for cyclone EW dissemination and maintenance needs to be supported with adequate mechanism of accountability. During the pilot testing the setup proved useful. However, in the present Standing Order (SOD) this role clarification is not very well defined for EW and this can be proposed for further updating or refinement.

EW section incorporation is needed. Particularly for the role assignment and accountability of the institutions at community level and specifically to hazards needs to be clearly mentioned in SOD. It would allow the agencies to have a clear mandate what to do for local level EW. 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 at national level as well as for the agencies at ground.

3.3.7 Awareness materials for cyclone

Some of the IEC materials that can be recommended for the cyclone prone areas are as follows. During the piloting local people found these very useful for knowing and refreshering their knowledge about the cyclone warning codes and meanings. These are collaboratively prepared on the basis of the existing materials that are used earlier by the CPP in the coastal areas.



Figure 3-19. Various types of IEC materials developed for community awareness and interpretation of the cyclone early warning messages at community level.

4.4 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 3-20. Figure. Already started riverbank erosion in many locations of the pilot area.

3.3.8 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 3-21. Consultation meetings with local BWDB and Upazila Administration on erosion prediction.

3.3.9 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.

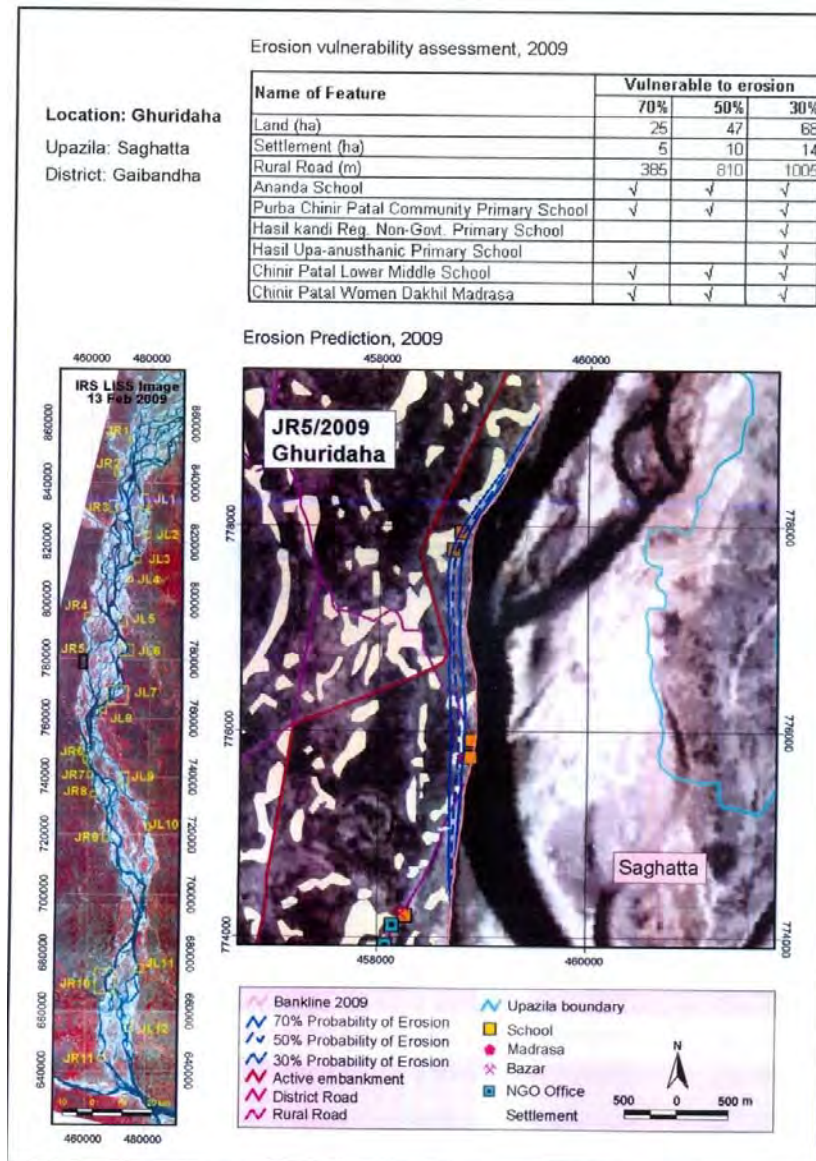


Figure 3-22. The erosion prediction based vulnerability map of Ghuridaha location (Source: BWDB-CEGIS, 2009).

3.3.10 Community sensitization and awareness

Once the community is identified in Chinir Patol village of Ghuridaha Union of Saghatta 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 3-23. 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 4. 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.

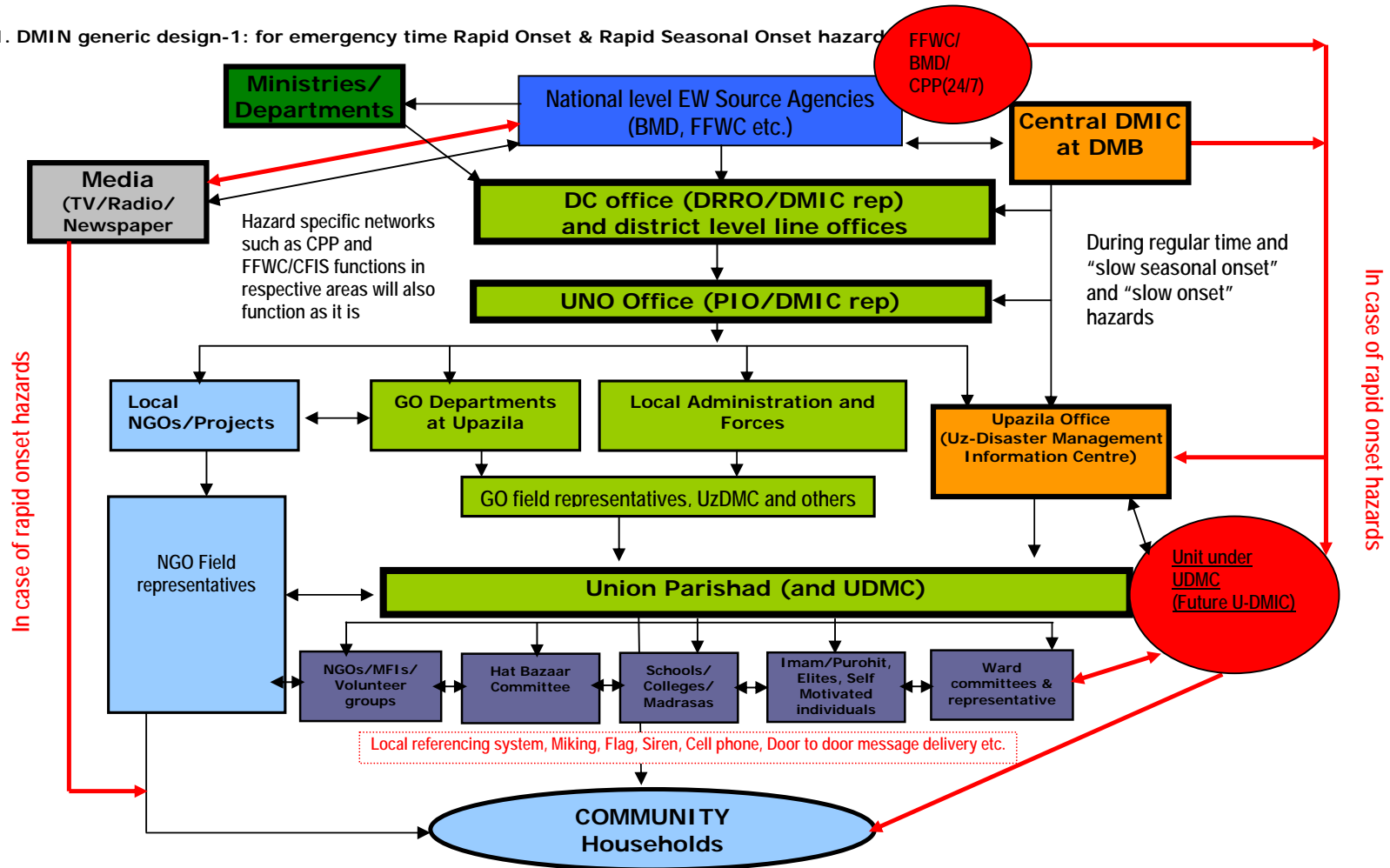
This particular parallel system with **red line** is not expected to nullify the formal system. Rather, this is a complementary system to the existing formal system which flows through the regular administrative system. This is just for a faster process of EW information sharing provision in favour of 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.

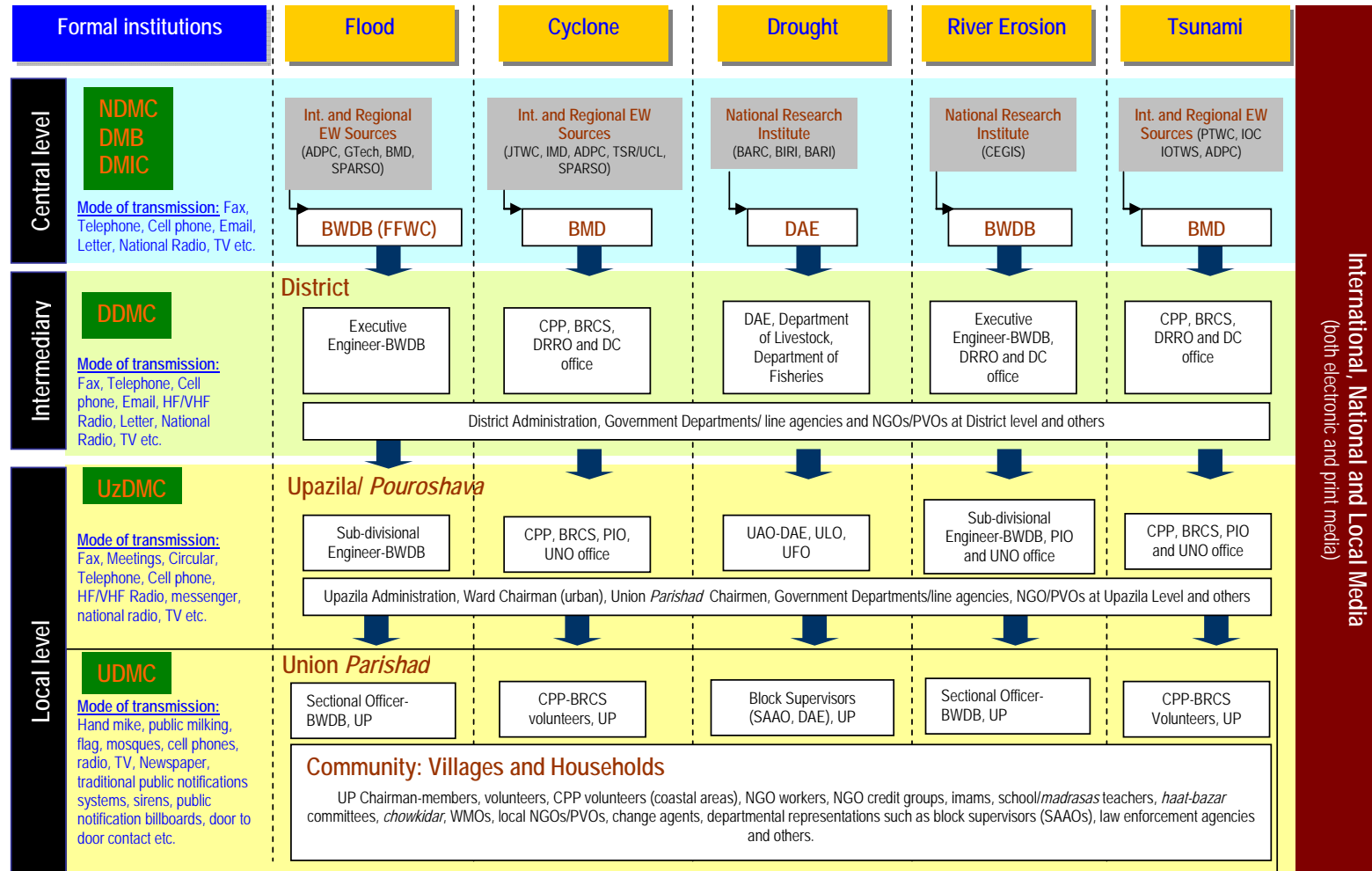
The two generic designs are graphically laid out in the following section for a greater clarity.

Figure 4-1. 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 4-2. DMIN generic design-2: for regular time operation of slow and slow-seasonal onset hazards.



Source: Adapted and updated from ADPC: Oct., 2008, ADPC: July, 2009.

Chapter 5. Post-evaluation and Readiness

After completion of the pilot field testing the EW information flow and community readiness was tested through a post-evaluation methodology titled as Communication Ready Certification (CRC) process. The communication ready certification exercise is actually the last set of activities of the DMIN project and through evaluation attempts to find out answers of following few set of questions from the upazilas and unions where the DMIN pilot testing exercises were carried out. Such set of questions are asked on issues as: communities readiness to receive EW from the sources, capacities of the local agents and volunteer groups to receive EW, existence of adequate institutions, availability of adequate tools/equipments for communication and dissemination, community ownership and so forth.

5.1 Criteria to evaluate communication readiness

Keeping the above questions in mind, a methodology was developed by the DMIN pilot testing team that looked into the various spheres of communication readiness using seven key criteria outlined in the table below along with what methodological tools used to evaluate in the process.

Table 5-1. Synoptic overview of CRC criteria and its description with tools used to evaluate.

SL #	Criteria	Description of the criteria	Tools used for evaluation
1	Existence of voluntary groups in the community	It is often seen that existence of voluntary groups in terms of DMCs or other forms of voluntary ground within the community is essential for community based early warning system as well as foundational for rapid dissemination of the early warning upto household level.	FGD, Interviews
2	Local referencing system is in place (Flood: flood marker/reference point; Cyclone: flag system)	Often from national level the early warning information available is of generic nature of relatively higher levels for the area. The local references and interpretations of those can be done through establishing local referencing points such as flood markers of dissemination points of flag hoisting for cyclone. This criterion is an essential element to make the early warning more specific and useful for respective communities.	FGD, Observation
3	Availability of basic early warning dissemination related communication equipments and logistics	It was seen that the availability of various types of early warning dissemination and public addressing systems are very important the last-mile communication systems. Such equipments are mikes, radios, wireless, dhol etc. Along this line the needed basic level of logistics including some sort of minimal financial/resource availability for maintaining such public addressing is also a required element of readiness.	Interview, FGD
4	Training and capacity building exercise of the volunteers and stakeholders	A regular training and capacity building exercise or refresher programs for volunteers and committees is an essential characteristic for a successful mobilization of a group in early warning dissemination.	Training sessions, FGD
5	Community interest and ownership for establishing	Interest and ownership of the community towards establishing and maintaining an effective local	FGD, Picture

SL #	Criteria	Description of the criteria	Tools used for evaluation
	early warning/forecasting	level/community based early warning systems is extremely important. This is particularly indicative of the sustainability of the system in a community.	
6	Women participation in early warning communication and related activities	In rural communities, the participation is women in various phases of early warning system were found very crucial for linking the early warning upto household level. In this line this particular element of women participation in early warning communication and related activities was taken as a indicative criterion.	Interview, FGD, Picture
7	General populations' awareness and continued learning about the warning system	A central element of readiness of any community towards hazard preparedness and early warning is the general populations' awareness toward it. Higher the awareness level, higher the readiness level.	Observation, Mock-drill, FGD

5.2 Findings and lessons learned from CRC evaluation

In this section, the findings and lessons learned from the CRC evaluation is reported described one by one on the CRC criteria. A hazard-wise summarized matrix of the evaluation result using high-medium-low status of respective criterion is also outlined in this section.

5.2.1 Existence of voluntary groups in the community

Prior to the pilot testing exercise, in general in all the pilot areas, it was found that the Upazila Disaster Management Committee (UzDMC) and Union Disaster Management Committee (UDMC) are formed. But in almost all the pilot areas in cyclone, riverine flood or riverbank erosion prone areas these are not fully functional. The UzDMCs are holding meetings with the support from PIO and the respective UNOs offices but the UDMCs are found to be very irregular and lacked a great deal of active functioning. In the cyclone/storm surge prone pilot areas it was a relatively better situation but still was not effective to its fullest potential. However, after the pilot testing through active interactions these groups are made more functional and the piloting team has found that through regular training and capacity building exercises these groups can be easily revitalized. In all the pilot upazilas the voluntary groups are revitalized by the pilot testing activities and effective consultation at respective local levels. In the cyclone prone areas CPP has already well formed volunteer groups but demonstration mock drill gave them another chance to show their mobility in a more effectively at actual ground level.



5.2.2 Local referencing systems

For riverine flood areas the local referencing system using local flood markers were established effectively in active collaboration with the local people and local voluntary committees. UDMCs showed a great deal of interest. Both in Chowhali, Sirajgonj and in Fulchari, Gaibandha the local DMC representatives have taken leadership in establishing the local flood reference points relevant for their communities. The local referencing systems were established on the locally situated infra-structures and with active involvement with local participation.



In the cyclone prone areas, the locally understandable flag hoisting system introduced by CPP is strengthened and the practice is being reiterated.

In all the pilot upazilas, the practitioners and the officials are also quite interested to establish the locally useful flood or cyclone reference points. It was found that the local DMCs with their own assignment delineation can find out respective people to maintain some sort of local reference in the crisis months. For example, the local DMCs with the help of local NGOs, Ansar-VDP or haat bazaar committees are found interested to maintain the flood markers for few critical months when the flood related early warning information is quite needed for their respective communities.

5.2.3 Training and capacity building

The training and capacity building exercises are very important in all the layers including the volunteers and DMC members at all level. During the pilot testing it was found that there is a great demand for this. A simple round of training and capacity building exercise actually elevates the expertise, refreshes people and practitioners memories substantially. The training exercises need to be locally based more hand-on and demonstrative with the needed early warning information with interpretations.



5.2.4 Availability of basic EW communication equipments and logistics

For the early warning information communication at local level the availability of public addressing equipments is a crucial factor or readiness. In many cases, it was seen from the past experiences that the although the warning information have sent from the central or district level but often do not go down to the community and household level in a rapid manner. Information flow remains stagnant due to unavailability of the adequate public addressing communication equipment at ground. For rapid onset hazards like cyclone this type of rapidness is very much a desire for community readiness. Thereby availability of megaphones, locally prepared mikes, traditional methods as drums (i.e. dhol/sorod) etc. as well as sirens from the mosques and temples or from the police stations or voluntary groups are quite important.



During the pilot testing exercises, such rapid notification and early warning communications are identified in the communities and attempt has been made to engage those existing available modes of rapid public notification at last mile in an effective manner. Existing

facilities that are already available in the communities such as use of mosque milkes, temple bells etc. and other modes of indigenous communication methods such as drums (i.e. *dhol/sorod*) or locally available modes such as beating CI sheets etc. are used and demonstrated for effective information sharing upto household levels. Beside these, the use of cell phones as dissemination tool is also set as a redundant system.

However, it was found particularly in the cyclone prone areas that CPP has some available public addressing electronic material such as megaphones but CPP also face a problem of maintenance of these equipment as well as availability of these in a sufficient number at local level. This is clearly due to unavailability of regular logistical and financial support to maintain these last mile communication technologies. The picture below shows that without battery support often these megaphones remain useless which needs regular maintenance and demonstrative use.

Another issue for the isolated islands and more remote communities is the availability of the right kind of equipments for reaching out. In this respect, often the cell phone remains as the only form of electronic communication technology. But if high frequency radio or high frequency siren systems with solar or sustainable power system is introduced then it would more effective for them. It was found in the remote areas that the solar energy systems have started to be introduced in the ferry *ghat* and other areas (shown in pictures below) which could be an encouraging point to think of. Similarly for the remote sea going fishers the broadening of the cell phone network as well as community radio systems with necessary regulations (and check-balance system) should be improved as well.



5.2.5 Community interest and ownership

In order to establish the community based early warning system in an effective way that goes upto household level the major challenge is to make the community interested about it for a sustainable time. In this regard, the community ownership into the process is essential indicator of communication readiness.

In course of the pilot testing such attempts to build on community owned early warning system was adopted. UDMCs, local leaders and public representatives are engaged with the system and discussed the need of it. In the pilot areas the local leaders have showed their interest significantly and gradually started to own the process as in each pilot testing activities their participation was ensured. During the local referencing period, planning the training and capacity building sessions or meeting community people the local leaders and UDMC members took the lead and unfolded the pilot testing related activities.



One of the key lessons learned from the exercise, is that the local UDMCs should be fully engaged in all process of the establishment of community based early warning system whether it is for riverine flood, cyclone or riverbank erosion. People have their own ways to established things, external people can just make an interface between the early warning sources providers and people and educate them what technicalities needs to be known for technical aspects of the early warning information in a facilitating mode but the UDMCs and the local agents are the key to establish the process and own it for sustainable use within the communities.

In the above pictures it is shown that how the local UDMC members and leaders are carrying out early warning related activities and awareness programs by themselves after a little training from the project team.

5.2.6 Women's participation

Participation of the women is essential to see the preparedness of a household as well as community. This perspective was adopted during the pilot testing and involvement of women in all activities of the pilot testing was ensured. It was found that women play a very key role in overall disaster preparedness of the households both within households as well as inter-household information sharing and validation. Women in cyclone, flood and erosion all the areas showed interest to know more about the early warning in a very simple way such as when a flood would come or how long it will stay.

Women remained eloquent of their preparedness measures as response to the early warning. They have pointed out that if the early warning comes from the mosques or temples, local UP representatives, NGO workers, health workers and discussed through the court-yard meetings or gatherings then this is more useful for them.



5.2.7 General populations' awareness and continuous learning

During the pilot testing, the mock drills are proved to be a very good way of keeping general people's awareness for the community based early warning system in both cyclone and flood prone areas. The mass participation in huge number in the pilot testing mock drills and simulation exercises are very much welcomed by the respective communities and people suggested that it was very useful in understanding the roles and responsibilities of each stakeholder in early warning information sharing in the community and household level.



Mock drills are useful tools to simulate each phase of the early warning systems as well as to clarify who does what on which conditions. This kind of demonstrative process enables general population into a continued learning process which is extremely important to keep momentum of early warning based community preparedness at very community level as well as penetrates the household level.

In addition to that, during the pilot testing it was found that rural people often show a great deal of interest on the billboard based easy understandable pictorial information sharing. When these demonstration boards are placed locally where people can have open access to these information and these are introduced -conveyed- interpreted through the local agents then these are proved to a good tools for continued information, education and learning at community levels.



Chapter 6. Recommendations and Way ahead

The major recommendations (both generic and hazard-wise recommendations) and issues for the way ahead that emerged from the project are sequentially outlined below:

- **Establishment of a “Parallel system” of EW down to union level:** The project recommended that EW information particularly for the rapid onset hazards should be channelized through a “parallel system” from national to directly to union levels. At this point, besides the regular official channels through the district and Upazila Administration a parallel system is not present but both the demand and necessity is huge and it is crucial for a rapid notification of both flood and cyclones. At this point, cyclone EW dissemination has a system upto upazila but for flood the dissemination system not fully developed. Some experimental experiences suggested that this can be effectively pushed in future.
- **Strengthening capacity of the UDMCs for EW:** It emerged from the studies and pilot testing, that at the Union Disaster Management Committees (UDMCs) in most of the areas are not effectively functioning and they lack capacities to operationalize EW disseminations upto household level. It can be recommended that the UDMC’s should be made more active in EW dissemination.
- **Minimum needed resource arrangement for UDMCs:** A process of minimal resource mobilization to the UDMCs for EW dissemination purposes can be thought of. This is a point to be explored further but at this point the some portion of the VGF, VGD etc. related funds can be channelized to UDMCs for improved last mile early warning dissemination.
- **Engagement of existing and social institutions in EW dissemination:** For the EW dissemination purposes, various volunteers, agents, educational institutions, religious entities, *haat-bazaar* committees and other social institutions and their representatives can be innovatively used. This is true for all three piloted hazards. At this point, CPP has their own volunteer systems for cyclone but in flood prone areas this can be developed further along with further strengthening of various existing local and social institutions.
- **Tapping into potentials of the MFIs and NGOs for local EW dissemination:** Various 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. This is often crucial for household level EW dissemination as well as women’s participation.
- **Volunteer coordination at local level:** Volunteering coordination at ground level is another issue which needs a systematic mechanism for coordination. This is an area where national standards and local activation can be further improved. It was found in the study that various NGOs, projects, programs have their own volunteer and working often for similar kind of EW activities. A well coordinated approach through an overseeing role of DMCs (UzDMC and UDMCs) could be a fruitful way.
- **Improvement of “hazard-livelihoods-geography specific” EW systems:** Capacity building and enhancement of “hazard-livelihoods-geography specific” early warning system needs to be developed further. In this line, more localized products should be developed from national level. FFWC/BWDB can be capacitated for this purpose. “Local reference systems” for flood with respect to the nearest flood forecast point of FFWC should be followed.

- **Revision of the SOD and introduction of SOP with EW focus:** The present “Standing Order (SOD)” should be further updated or refined considering the community level EW issues. EW section incorporation is needed. Particularly for the role assignment and accountability of the institutions at community level and specifically to hazards needs to be clearly mentioned in SOD. It would allow the agencies to have a clear mandate what to do for local level EW. 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 at national level as well as for the agencies at ground.
- **Community level flood forecast information sharing:** For flood “flag system” and a simple “informational sharing board” can be encouraged that may include the forecast information for the local forecast point of FFWC. This helps public notification and awareness systems. However, a national standard is needed. A system is proposed from this study and this can be further enhanced and implemented nationally in any future initiatives.
- **Local interpretations of the EW information:** For the local interpretation of the flood/cyclone forecast information the information content can be further developed from centrally. However, if that is not possible for all the communities who have essentially different contexts then the community can 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 facilitating roles in this.
- **Newly emerging cell phone based EW information sharing:** The presently available (under testing), “SMS based flood early warning” information needs further elaboration. This is a good start but there is a need for further research, detailed testing and piloting to see its full affectivity in the country. A detailed analytical study and piloting (taking stock of existing piloting work of DMB-CDMP) can be commissioned in future phases.
- **Future expansion of flood forecasting for other river systems:** Flood forecasting for other major river-systems (other than the Jamuna) needs to be further strengthened for nation wide development of the community based flood early forecasting.
- **Further Strengthening the capacity of CPP:** For cyclone, the CPP system (in areas where this is established) is catalyzing the cyclone EW 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, regular training and resource mobilization are crucial.
- **New cyclone warning categories:** The proposed new cyclone early warning categories are not yet functional at community level. Plans are there for such future operationalization. However, it is recommended (taking community responses into account), the new categories are needed but needs to be incorporated with the system in “a crateful way” as people have already have perceived their ideas and understanding according to the existing categories and flagging systems in place.
- **Expansion of cyclone EW facilities for offshore and sea areas:** 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.

- **In-time availability of riverbank erosion prediction information at local level:** For riverbank erosion, the present system of river bank erosion prediction in the Jamuna has a good result. This system needs to be made available at local level in time each year to at least local BWDB, local administration, local NGOs and respective communities.
- **Wide availability of riverbank erosion prediction information:** Local level demarcation data for riverbank erosion (in understandable and interpretable format) should be widely available which can be easily accessed by the district and Upazlia level at least with adequate resolution of spatial output in all risk areas. Local BWDB offices should have adequate capacity for demarcation of the risk zones in respective areas.
- **Possible joint dissemination of flood and riverbank erosion information to DMCs:** The local level erosion preparedness measures can be linked up with the local level flood preparedness mechanisms through DMCs and local communities particularly in the riverine areas. This recommendation has emerged from several sources and this can be tested or studied further in future.
- **Stepping up awareness and educational initiatives on EW information:** Early warning related awareness and educational programs needs to be developed in a gradual manner but should also be frequently carried out as part of the regular refresher.

Bibliography

- ADPC 2008a.** Project Inception Report. CDMP Component 5b (BGD/01/004-CDMP/EC/5b/PC-1)-Design, Test and Demonstrate a DMIN Down to Household Level. Asian Disaster Preparedness Center (ADPC), February, 2008. Bangkok.
- ADPC 2008b.** Supplement to Inception Report. CDMP Component 5b (BGD/01/004-CDMP/EC/5b/PC-1)-Design, Test and Demonstrate a DMIN Down to Household Level. Asian Disaster Preparedness Center (ADPC), October, 2008. Bangkok.
- ADPC 2008c.** Disaster Management Information Link Report. Asian Disaster Preparedness Center (ADPC), October, 2009. Bangkok.
- ADPC, 2009a.** Report on Communication Mapping and Planning at Community Levels. Asian Disaster Preparedness Center, June, 2009. Bangkok.
- ADPC, 2009b.** Report on Communication Ready Certification. Asian Disaster Preparedness Center, October, 2009. Bangkok.
- ADPC, 2009c.** Report on Pilot Testing of Community based Early Warning Systems. Asian Disaster Preparedness Center, November, 2009. Bangkok.
- BDPC and CEGIS 2008.** Report on Mock Demonstration at Lalmonirhat: Community Based all Hazards Early Warning Dissemination System Development in the Pilot Areas, Dhaka.
- BDPC, 2003.** Community Needs Assessment: Floods Vulnerability and Risk Reduction through Community-based Flood Information Systems (CFIS). Bangladesh Disaster Preparedness Centre in association with CEGIS and RTI Inc. Dhaka.
- BDPC. 2006.** Brief Final Report on Improved Dissemination of Flood Forecasting and Warning, Dhaka.
- BDPC. 2009.** Activity Report January-February on Adaptation to the Impact of Climate Change through Community based Flood Warning System, Dhaka.
- BWDB-CEGIS, 2009.** Prediction of River Bank Erosion along the Jamuna, the Ganges and the Padma Rivers in 2009. Dhaka.
- CDMP 2006.** Disaster Management Information Network Portal Specification, January 31, 2006. Dhaka.
- CEGIS and BDPC. 2008.** Final Report on Community Based All Hazards Early Warning Dissemination System Development Project in the Pilot Areas in Lalmonirhat, Volume- I, Local Disaster Risk Reduction Fund (LDRRF): Dhaka.
- UNOPS, 2006a.** CDMP DMIC ICT Strategy (SSA 05-17049, UNOPS Project No. BGD/01/004, May 31, 2006, Bangkok.
- UNOPS, 2006b.** CDMP DMIC Needs Assessment SSA 05-17049, UNOPS Project No. BGD/01/004, June 8, 2006, Bangkok.
- Urban and Rural Planning Discipline (URPD) Khulna University 2008.** Developing an Effective community Based all Hazards Early Warning Dissemination System (EWDS) consideration Local Community's Disaster Vulnerability: A pilot Study on Assassuni Upzila of Satkhira District, Dhaka.

