Mr. Md. Sarwar Alam, Director (Media, IT and E&I) , BTRC, Bangladesh

Disaster Warnings and Communication Systems in Bangladesh
: Issues and Challenges
APT Workshop on Disaster Management/Communications (WDMC-5)

‘Network Resiliency against Disaster’
Disaster Warnings and Communication Systems in Bangladesh: Issues and Challenges

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Country Profile: Bangladesh

- A country located in South Asia
- Total population: 156 million
- Total Geographic Area: 147,570 sq.km
- Population density: 1050/sq.km
- Floodplains: 80% the total areas
- Located at fragile deltaic flood-plain
- Huge Catchment Area formed by the Ganges, the Brahmaputra and the Meghna river systems.
- Around 310 rivers (57 Trans boundary rivers)
- High-risk country to recurrent natural disasters - ranks 5th disaster-prone country in the world.
South Asia
Emerging Issues & Key Factors of Vulnerability

- Global Warming and Climate Change
- Geographical location
- Monsoon Climate (Huge rain, strong tidal & wind)
- Multiplicity of rivers & their unpredictable flows
- Shallow northern Bay of Bengal and Funneling to coastal area.
- Dominance of floodplains
- Raising sea-level of Bay of Bengal
- Under seismically active region
- High population density
- High level of poverty
- Impoverished Infrastructures
DROUGHT
Affects 8.3 million ha land
In 2006, reduced food grains by 1 million tons
Loss of grazing fields, dried ponds, water shortage
Affected 47% area & 53% population.

FLASH FLOOD
Damages standing crops
Damages infrastructures and facilities Unpredictable, uncertain

FLOOD
Inundates more areas, increases river erosion
Breaches embankments, damages infrastructures
Loss of crops, fisheries, livestock, biodiversity

SALINITY INTRUSION
Sea level rise, damage to Sundarbans watersheds
Damages crop lands
Spreading intrusion from 1.5 to 2.5 Mha (2007)
Lack of drinking water, burden to women & children Projected displacement: 6-8 m by 2050

CYCLONE with SEA SURGES
Remain to be the deadliest and most destructive hazard recurring event lingering aftermath, complex recovery Improved preparedness (CPP, shelters, embankments)

LANDSLIDE
Emerged recently as a major hazard triggered by heavy rainfall and hilly flash flow
Arsenic Contamination: 60 million people drink arsenic contaminated water.
<table>
<thead>
<tr>
<th>Year</th>
<th>Disaster</th>
<th>Death</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>Cyclone</td>
<td>500,000</td>
</tr>
<tr>
<td>1985</td>
<td>Cyclone</td>
<td>11069</td>
</tr>
<tr>
<td>1989</td>
<td>Tornado</td>
<td>1300</td>
</tr>
<tr>
<td>1988</td>
<td>Flood</td>
<td>1,708</td>
</tr>
<tr>
<td>1988</td>
<td>Cyclone</td>
<td>4,000</td>
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<td>1989</td>
<td>Drought</td>
<td>800</td>
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<tr>
<td>1991</td>
<td>Cyclone</td>
<td>138,882</td>
</tr>
<tr>
<td>1996</td>
<td>Tornado</td>
<td>545</td>
</tr>
<tr>
<td>1997</td>
<td>Cyclone</td>
<td>550</td>
</tr>
<tr>
<td>1997</td>
<td>Earthquakes</td>
<td>23</td>
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<tr>
<td>1998</td>
<td>Flood</td>
<td>918</td>
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<tr>
<td>2004</td>
<td>Flood</td>
<td>747</td>
</tr>
<tr>
<td>2007</td>
<td>Flood</td>
<td>800</td>
</tr>
<tr>
<td>2007</td>
<td>Landslide</td>
<td>128</td>
</tr>
<tr>
<td>2007</td>
<td>Cyclone(SIDR)</td>
<td>3,406</td>
</tr>
<tr>
<td>2009</td>
<td>Cyclone(Aila)</td>
<td>190</td>
</tr>
<tr>
<td>2012</td>
<td>Landslide</td>
<td>122</td>
</tr>
</tbody>
</table>
### Economic Losses Due to Floods in Three Decades

<table>
<thead>
<tr>
<th>Year</th>
<th>Economic Losses (US$)</th>
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<tbody>
<tr>
<td>1987 floods</td>
<td>1.0 billion</td>
</tr>
<tr>
<td>1988 floods</td>
<td>1.2 billion</td>
</tr>
<tr>
<td>1998 floods</td>
<td>2.8 billion</td>
</tr>
<tr>
<td>2004 floods</td>
<td>2.3 billion</td>
</tr>
<tr>
<td>2007 floods</td>
<td>1.1 billion</td>
</tr>
</tbody>
</table>

**Total:** US$ 8.4 billion
• Flood occurs in Bangladesh regularly
• Being low-lying country, average 22% area is flooded every year
• In case of severe flood, 68% area inundated
• 1954,'55,'74,'87, '88,'98, 2004 & 2007 floods were catastrophic
• About 50% of the country is within 6-7 m of MSL.
• About 68% of the country is vulnerable to flood.
• 25 to 30% of the area is inundated during normal flood
Bangladesh rivers receive runoff from a catchment of 1.72 million sq. km, around 12 times its land area.
Telecommunications and ICT infrastructures
Telecom & ICT Infrastructure

- 30000 BTS
- 20341 km Fiber Optic Network throughout the country
- BD has one Sub-marine cable and Terrestrial Cable
- 4500 Union Information and Services use ICT
- 14 Community Radio
- 24 TV Channels
Licensing Telecom Landscape in Bangladesh

Voice
- 58
- Mobile (06)
- PSTN National (03)
- PSTN Zonal (07)
- IPTSP Central (7)
- IPTSP NW (31)
- IPTSP Zonal (3)
- PSTN Rural (01)

Data
- 486
- BWA (02)
- ISP NW (123)
- ISP Central (98)
- ISP A (146)
- ISP Zonal (63)
- ISP B (24)

Gateway & Infr@
- 1045
- IIG (37)
- NTTN (2)
- ITC (6)
- FTTN (1)
- VSAT PH (05)
- VSAT P (12)
- VSAT U (46)
- VSP (881)

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99% population and around 93% geographical area are under telecom network.
**Telecom Penetration**

**Voice**
- PSTN Penetration 0.71%
  - PSTN Subscriber 1.08 Million
- Mobile penetration 75.81%
  - Mobile Subscriber 115.62 Million

**Data**
- Internet penetration 24%
  - More than 35.94 million data users is mobile
- 3.7% Fixed Internet User
- Mobile Internet User (96.3%)

**Telecom Penetration**
- Total Telecom Subscriber 116.72M
- 76.52%
Disaster & Impact

• Any kind of disaster can happen any time at any place without prior notice whether it is natural or manmade.

• As a result the whole telecommunication networks experience:

  • A huge stress during these events due to high traffic demands i.e. congestions
  • infrastructure disruption and damage by that natural calamities.
Results:

Damaged Network

• Damaged network. So caller can’t make any successful call.

Network Management by the respective operators.

• If the operators don’t have any special teams that monitor and control traffic 24/7 to ensure that networks handle as many calls as possible then downtime may increase caused by network and switch overload.

Network Congestion

• In extreme situation, even with excellent network management, networks and switches will, on rare occasion and usually for a short time period, become overloaded and calls may be blocked.
ICT plays a critical role

1. **PREPAREDNESS** – ICT/satellite provide reliable and rapid communication, observation and positioning tools.

2. **MITIGATION** – Location and hazard specific long term mitigation options could be shared for informed decision where application of ICTs is a useful tool. The presence of data and information is crucial to helping decision makers understand the root causes of a disaster.

3. **RESPONSE** – ICT can help sharing instant knowledge and information on the disaster location such as primary damage information, coordination.

4. **RECOVERY** – ICT provides support to the stakeholders with one stop information bank and connecting people and institution for recovery both livelihood and economic and rehabilitation or shelter construction at emergency situation.
Disaster Warnings and Emergency Communications

GENERATION
DISSEMINATION
PUBLIC MEDIA
MOBILE COMMUNICATION
Generation of Early Warnings

- Bangladesh Metrological Department (BMD)
- Flood Forecasting and Warning Centre (FFWC)
- Disaster Management Information centre (DMIC)
- SPARSO
- Cyclone Preparedness Program (CPP)

Committees under SoD usually generates warning or weather data and information and also ensure EW dissemination at all level
Public Information Dissemination, Emergency Response & Warnings

• Radio particularly Bangladesh Betar, Community & FM radio (17)
• TV: both satellite and terrestrial: 24 private and one state owned TV channels
• Mobile Phone: 6 operators with 116 million subscribers through IVR, CBS, SMS
• Mobile Internet: 35 million users through Robust Website of DMD, BMD & other relevant authorities, Internet, Social media, email, ISP: 281
Public Information Dissemination, Emergency Response & Warnings

- Daily Newspaper: about 350 in country
- Amateur Radio: 144 licensed operator
- VSAT service: 5 with HUB, 12 providers & 44 Users
- Maritime GMDSS: 6 organizations
- Public Mobile radio: 71 institutions in SBR & CB band
- Satellite: BMD & SPARSO using foreign Satellites (FY2, MTSAT, NOAA, MET Data).
Disaster Warnings and Communications System at Community Level

- Field Level Disaster Management Committees
- Cyclone Preparedness Program (CPP) Telecommunication Network
- CPP Volunteers using megaphones, hand sirens and public address system
- Hoisting of Signal Flags
- Microphones using by Religious Institutions, water vessels, street announcement
- Poll-fitted megaphone siren in 12 Costal districts
Pull Service System--IVR

- IVR is another technology using mobile phone
- Pre-recorded weather advisory & early warning.
- General public can access on 24/7 basis.
- A specific code

- Subscribers will get the updated weather forecasting report depending on his/her location and request.

Teletalk is routing this service to other 5 telcom operators to cover the whole country.
Interactive Voice Response Service (IVR)

- Dial 10941 from any mobile
- 1 For Sea going fishermen
- 2 For River port warning
- 3 For Daily Weather Bulletin
- 4 For Cyclone Warning
- 5 For Flood Forecast
- 6 For back to the main menu

From Any Mobile

10941
Disaster Management Bureau has tested successfully a pilot project on Early Warning dissemination through Cell Broadcasting System (CBS)

In this project two massage formats consists of maximum 20 characters have developed. One is for flood at Sirajgonj and other is for cyclone at Cox’s Bazar

It is planned to expand CBS at 14 coastal districts of Bangladesh and ultimately all over the country.

IVR has pilot tested through Teletalk for disaster information and daily weather bulletin. Finally all mobile operators has come with this initiatives.
CBS Cyclone Warning at Cox’sbazar

GrameenPhone/TeleTalk

CS03,025-030KPH,S10F

CS – Cyclonic Storm
(N~wY©So)

SC-Super Cyclone
(mycvi
mvB‡Kν‡Zi Zxe®Zv m¤úœœ cÔPÛ
mgvwy`³K N~wY©So| 10 bs
gnvwec` ms‡K‡Zi ‡¬†I cÔ‡hvR˘)

CH-Cyclone with hurricane
speed (nvwi‡Kb Zxe®Zv
m¤úœœ cÔœj N~wY©So| 9bs
gnvwec` ms‡K‡Zi ‡¬†I cÔ‡hvR˘)

03 – 03 bs "vbwq mZK© ms‡KZ

025 – 030 KPH (evZv‡mi
MwZ‡eM N›Uvq 25 †_‡K 30
wKtwgt e„wÍ cv‡”Q)

S – Strom Surge (R‡jv”Q †vm)

10F– "vfweK †Rvq‡ii †P‡q 10 dzU
D”PZvq R‡jv”Q †vm mi m¤vebv
Av‡Q]
GrameenPhone/TeleTalk

WADL042CM,+ 032CM,24H
WADL042CM,- 032CM,24H

W - Water level (cvwb D"PZv)
A - Above (Dci)
DL - Danger Level (wec`mxgvi)
CM - Centimeter (‡mtwgt)
+ Increasing (evovi m¤¢vebv)
- Decreasing (Kgvi m¤¢vebv)

24 H - Next 24 Hour (cieZx© 24 N›Uvq)

** hgybv b`xi cvwb wmivRMÄ
c‡qt›U wec`mxgvi 42‡mtwgt
Dci w`‡q cÖevwnZ n‡”Q |

** AvMvgx 24 N›Uvq hgybv b`xi
cvwb wmivRMÄ c‡qt›U
32‡mtwg e„wÍ A_ ev Kgvi
m¤¢ebv Av‡Q |
Early Warning Dissemination through SMS

* SMS (Short Message Service) Mainly coordination with in Govt. Chairman and Member Secretary of District Disaster, Upazilla and Union Disaster Management Committee

• Communication to first responders responsible for evacuation and localized warnings.

• Communication to Mass Media for public warning.

• As ‘Govt Info’ (Toll Free) to everyone in the affected area.
Amateurs Radio

• There are now 144 Amateur Radio. More are offing.

• Mainly disaster-prone Coastal belt.

• In disaster time it can be an effective way to communicate at remote disaster prone areas.
Community Radio for Disaster Management

- Bangladesh government allows different organization to use community radio.
- By using community radio government can carrying out their rescue operations.
- Making communication and coordination with affected site. Because most of the disaster prone areas are extremely remote or costal belt area.
- 14 Community Radio operating mainly in disaster-prone regions.
Major Organizations in Disaster Communications

- Dept. of Mass Communication, BTV, Radio, PID, DFP, DoE, SPARSO, FFWC
- Disaster Management Information center of DDM
- Comprehensive Disaster management Prog(CDMP)
- Cyclone Preparedness Program (CPP)
- NARRI, NIRAPOD, Disaster Forum-various NGOs
- Bangladesh Disaster Knowledge Network
- UISC,FRIC.
Early warning system through Risk Assessment & Prediction Model
MoDMR has established the following with WB support:

- Sector specific risk assessment guidelines and mapping for earthquakes for major cities and urban areas.
- Sector specific risk assessment guidelines and mapping for Tsunami in 13 costal districts.
- Multi hazard Risk Vulnerability Assessment (MRVA) Modeling and Mapping Cell.
- River bank erosion prediction model & community based prediction dissemination system for Padma & Jamuna river basins.
2. Risk assessment of ‘Drought’ & its early warning system are designed.
3. Inundation Risk Map using existing data on digital elevation models prepared for entire coastal region.
5. Risk assessment of flash flood in Haor by CDMP & CEGIS.
7. Fresh water source mapping in the coastal belt - DPHE
Initiatives and Steps Forward
Responsibilities of BTRC as per SoD

- Allocation of dedicated Frequency on emergency basis
- Keep alternative communication arrangement
- Establish wireless link with all inhabited islands
- Establish networks with all mobile phone operators
- Prepare a sectoral risk mitigation & preparedness plan
- Ensure of warning signals through mobile phone, IVR, CBS, internet, emails, fax, etc.
- **MoPT**: Establish Communication link with Indian Ocean Tsunami Warning system
- Make link with Global Telecommunication system
Ensuring Telecommunications at Every Cyclone Shelter

• Government have to ensure telecommunication facilities for every Cyclone/ Flood shelter center because these are used for multiple purpose like relief center, medical center , Public call office & also emergency communication points.

• Government can provide at least one phone to all disaster shelter center for communication and partnership program with mobile/ Phone company may reduce the operation cost.
Satellite for EW & ECS

- UN_SPIDER (United Nations Platform for Space-based information for Disaster Management and Emergency response) implementation of its TAM report can change scenario.
  * Satellite based communications, image, remote sensing & Geospatial data -- most effective for accurate EW & ECS.
- Capacity to use Space technology exists in BMB, SPARSO, CEGIS, FFWC, IWM etc. Seismic, flood, cyclone even nor’wester related proper early warnings can be possible.
Initiative to Launch Own Satellite

- **Project:** “Preparatory Functions and Supervision in Launching a Communication and Broadcasting Satellite”.
- **Consultancy Firm:** The USA based Space Partnership International (SPI)
- **Technical Survey including Radio frequency Survey** – completed
- **Coverage area, Primary & Secondary Service Area** are being finalized.
The Commercial Mobile Alert System (CMAS) provide by any commercial company will collect weather related information from government metrological & disaster related organizations & sending it as emergency alerts to mobile devices.
Some Priority Issues for Resilient Communications

• Toll Free Number for the concerned institutions.
• Increase the use of community radio
• Increased use of Internet/Email.
• Telecommunication Infrastructure should be disaster resistant.
• Private operators should link with DMIC for transferring message/warning signals.
Some Priority Issues for Resilient Communications (Cont...)

• HF/VHF/UF frequency bands be reserved for emergency communications.
• Call Priority system could be an effective one during disaster time.
• Improving lead time of flood forecast (72hrs from 10days)
• Automated Weather Station (Field Server)
Challenges

• Own satellite
• Services Integration.
• Coordination between different departments of the government.
• Sustainability of the system.
Challenges for Emergency Communications

• Improvement of early warning system
• Absence of an agreed regional cooperation framework on rainfall & water flow data sharing
• Absence of Tornado, nor’wester and landslide forecasting system.
• Absence of high speed Internet services and continuous electricity supply.
Challenges (Cont.....)

Hazard wise common guideline for public awareness raising campaign

Expansion of the operation areas of the Cyclone Preparedness Programs

• Expansion of disaster management information networks.

• Strengthening linkage with regional and international organizations involved in DRR in line with HFA

• Establishment of Pole Fitted Megaphone Siren in the disaster prone areas
Challenges (Continued):

- VTS (Vessel Tracking System) GPS based VTS planned in costal and deep sea area.
- Expansion of Amateur Radio for resilient communications
- Preparedness for early warning identification of immediate needs and responding accordingly.
- Unavailability of Geo-spatial data and accurate data for Digital Elevation Model
Step forward for Resilient Network

- Dedicated frequency: 1800 MHz frequency band with 5 GHz to keep preserve for AFD to meet disaster
- Mobile BTS (more than 150) with special SIM (free of cost)
- Army Cantonment to provide backbone connectivity
- Maritime service: 18, HF & VHF bands to reserve for emergency
- Distress Call: 2182 KHz and 156.800MHz to reserve for safety services
- All gateway operators to keep reserve 10 % extra Bandwidth capacity of their Fiber-Cable for disaster.
The effort will continue to connect the unconnected.........