Use of SBT and ICT in DRM in Bangladesh

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Country Profile: Bangladesh

- Total Geographic Area: 147,570 km²
- Total population: 142.319 million
- Population density: 1174/km²
- Population density in Coastal areas: 1000/km²
- Total Urban Population: 42 million
- Population in Dhaka (mega city): 15 million
- Floodplains: 80% of total areas
- Located at fragile deltaic flood-plain
- Around 300 rivers (57 Trans boundary rivers)
- High-risk to recurrent natural disasters
BD Hazard Profile

DROUGHT
Affects 8.3 million ha land
In 2006, reduced food grains by 1 million tons
Loss of grazing fields, dried ponds, water shortage

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 drinking water, burden to women & children
Projected displacement: 6-8 m by 2050

CYCLONE
Remain to be the deadliest and most destructive hazard
Recurring event Lingering aftermath, complex recovery
Improved preparedness (CPP, shelters, embankments)
Major Hazards in Bangladesh

• Flood and Flash Flood
• Cyclone and Storm Surge
• River Bank Erosion
• Tornado
• Landslide
• Drought
• Earthquake
• Lightening
## Vulnerability Profile

<table>
<thead>
<tr>
<th>Hazards</th>
<th>Flood</th>
<th>Flash Flood</th>
<th>Drought</th>
<th>Cyclone salinity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vulnerable land area (%)</td>
<td>61.09</td>
<td>23.09</td>
<td>45.89</td>
<td>31.99</td>
</tr>
<tr>
<td>Vulnerable population (%)</td>
<td>71.47</td>
<td>26.75</td>
<td>45.73</td>
<td>26.71</td>
</tr>
</tbody>
</table>

One of the most densely populated countries

Persistent rural poverty

Fast urbanization with growing urban poor
## Major Disasters in Bangladesh

<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>1988</td>
<td>Flood</td>
<td>1,708</td>
</tr>
<tr>
<td>1988</td>
<td>Cyclone</td>
<td>4,000</td>
</tr>
<tr>
<td>1989</td>
<td>Drought</td>
<td>800</td>
</tr>
<tr>
<td>1991</td>
<td>Cyclone(SIDR)</td>
<td>3,406</td>
</tr>
<tr>
<td>1991</td>
<td>Cyclone(Aila)</td>
<td>190</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>1998</td>
<td>Flood</td>
<td>918</td>
</tr>
<tr>
<td>2004</td>
<td>Flood</td>
<td>747</td>
</tr>
<tr>
<td>2007</td>
<td>Flood</td>
<td>800</td>
</tr>
<tr>
<td>2009</td>
<td>Lightening</td>
<td>222</td>
</tr>
</tbody>
</table>
## Major Earthquakes Affecting Bangladesh

<table>
<thead>
<tr>
<th>Date</th>
<th>Name of Earthquake</th>
<th>Magnitude (Richter)</th>
<th>Intensity at Dhaka (EMS)</th>
<th>Epicentral Distance from Dhaka (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 January, 1869</td>
<td>Cachar Earthquake</td>
<td>7.5</td>
<td>V</td>
<td>250</td>
</tr>
<tr>
<td>14 July, 1885</td>
<td>Bengal Earthquake</td>
<td>7.0</td>
<td>VII</td>
<td>170</td>
</tr>
<tr>
<td>12 June, 1897</td>
<td>Great Indian Earthquake</td>
<td>8.7*</td>
<td>VIII+</td>
<td>230</td>
</tr>
<tr>
<td>8 July, 1918</td>
<td>Srimongal Earthquake</td>
<td>7.6</td>
<td>VI</td>
<td>150</td>
</tr>
<tr>
<td>2 July, 1930</td>
<td>Dhubri Earthquake</td>
<td>7.1</td>
<td>V+</td>
<td>250</td>
</tr>
<tr>
<td>15 January, 1934</td>
<td>Bihar-Nepal Earthquake</td>
<td>8.3</td>
<td>IV</td>
<td>510</td>
</tr>
<tr>
<td>15 August, 1950</td>
<td>Assam Earthquake</td>
<td>8.5</td>
<td>IV</td>
<td>780</td>
</tr>
</tbody>
</table>
## Economic Losses Due to Floods Cyclones in Three Decades

<table>
<thead>
<tr>
<th>Year</th>
<th>Damage (in billion US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1987 floods</td>
<td>US$ 1.0 billion</td>
</tr>
<tr>
<td>1988 floods</td>
<td>US$ 1.2 billion</td>
</tr>
<tr>
<td>1998 floods</td>
<td>US$ 2.8 billion</td>
</tr>
<tr>
<td>2004 floods</td>
<td>US$ 2.3 billion</td>
</tr>
<tr>
<td>2007 floods</td>
<td>US$ 1.1 billion</td>
</tr>
<tr>
<td>2007 Cyclone (Sidr)</td>
<td>US$ 2.1 billion</td>
</tr>
<tr>
<td>2009 Cyclone (AILA)</td>
<td>US$ 1.1 billion</td>
</tr>
</tbody>
</table>

**Total:** US$ 11.6 billion
Due to impact of climate change the potential impact area is increasing with increasing of population at risk.

Communities are facing modified risks due to change in intensity and frequency of the hazards.

Difficulty in monitoring upcoming hazards.

Use of space-based technology could contribute to ensuring a wider provision of relevant information for disaster risk reduction, strengthen early warning systems and monitor disaster’s impact to provide effective emergency response.
Use of Space-based Info: Present Status

Space-based information and products are in progressing stage for DRR in Bangladesh

DRR institutional structure is well established

Working level Capacity exists SPARRSO, SOB, BMD, FFWC, CEGIS, IWM and DDM

Cyclone prediction: Proven and effective example of using space based information

Flood Forecasting: Space based information is using for local flood modeling

Spatial databases exist with projects

Capacity assessed for DRR TAM carried out by UN-SPIDER in 2011
TAM Recommendations

The recommendations focus on the challenges and opportunities in the following specific areas:

• Policy and coordination,
• Capacity building and awareness raising,
• Information management and sharing,
• Data and access
• Emergency communication
Follow up Action Taken

• Multi-hazard Risk Vulnerability Assessment Modeling and Mapping (MRVA) Cell has been established at DDM in 2013

• Nation wide multi-hazard risk vulnerability assessment is undertaken by engaging an international consulting firm

• Damage and Need Assessment (DNA) Cell has been established at DDM in 2013

• Online DNA tool is developed and trained field level key staffs

• Applying Remote Sensing in River Basin Management Project has been piloted supported by JAXA/ADB in the two flood prone villages
Follow up Action Taken…. 

• Inter-active Voice Response Service (IVR) is introduced for timely dissemination of Early Warning/Forecasting from any mobile phone

• 50 academic and sector professionals were trained in space technology for Flood Risk Assessment and DNA supported by UN-SPIDER in 2013 and 2014

• National seminar on “Space Technology Application for Monitoring Earth Resources, Disaster and Climate Change Impacts has been organized at national level

• SOP has been drafted for the implementation of TAM recommendations

• National Disaster Management Policy is framed out with provision for the use of SBT and ICT in DRM in 2015
Multi-hazard Risk and Vulnerability Assessment (MRVA)
# Hazard Assessment at a Glance

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Return Period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10</td>
</tr>
<tr>
<td>Flood</td>
<td>√</td>
</tr>
<tr>
<td>Cyclone &amp; Storm Surge</td>
<td>√</td>
</tr>
<tr>
<td>Earthquake</td>
<td>√</td>
</tr>
<tr>
<td>Landslide</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Tsunami</td>
<td>√</td>
</tr>
<tr>
<td>Drought</td>
<td>√</td>
</tr>
<tr>
<td>Technological</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Health</td>
<td>Not Applicable</td>
</tr>
</tbody>
</table>
Storm Surge Risk Assessment

An area of 20,745 km$^2$ will be inundated by more than 1m water depth in the changing climate.
Improvement of Early Warning and Dissemination Systems
Develop strategies and programs for flood risk reduction by applying SBT and ICT

Improve existing flood risk management systems in target area with EO satellite data including GSMaP

Develop methodology to make detailed flood hazard map and forecasting/warning in local level

Meet demand of end users by increasing lead-time
Implementation Mechanism
Applying Remote Sensing Technology in River Basin Management
5-day Flood Inundation Forecast
SMS Early Warning Dissemination System Flow

1. Provide list of pilot Thanas
2. Map pilot Unions to specific cells
3. Generate list of MSISDNs in pilot Unions
4. Update in case of any change in cell plan
5. Fetch MSISDN list
6. SMS Early Warning Dissemination System Flow
   - Union Keyword <warning Message>
   - SMS Center
   - Broadcast to citizens
   - Update in case of any change in cell plan

- SMS Application
- Fetch MSISDN list
- Broadcast to citizens
- Update in case of any change in cell plan
Interactive Voice Response Service (IVR)

- Dial 1 0 9 4 1 / 1090 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
Development of Database
GIS-RS Based Building Inventory Database

- **Image of a part of Dhaka City after Geo-referencing**
- **Physical Features after digitization**
- **Chittagong: 183,000**
- **Sylhet: 52,000**
- **Dhaka: 327,000**

**Major Structural Types of Buildings in Dhaka, Chittagong and Sylhet**

- **Total Buildings:**
  - Dhaka: 326,825
  - Chittagong: 182,277
  - Sylhet: 52,175

- **Buildings Distribution:**
  - RC: Dhaka 55,913, Chittagong 43,965, Sylhet 1,3660
  - LC: Dhaka 33,993, Chittagong 3,190, Sylhet 2,300
  - IC: Dhaka 8,047, Chittagong 40,710, Sylhet 827
  - BF: Dhaka 140,078, Chittagong 79,175, Sylhet 30,896
  - TSL+DAL: Dhaka 55,487, Chittagong 36,962, Sylhet 463
  - Others: Dhaka 634
**Online Shelter Database**

![Image of Cyclone Shelter Information Database](image)

**Shelter Information**

- **Shelter:** Dabir Char Model GPS
- **Union:** Lebukhali
- **Upazila/P.S.:** Dumki
- **District:** Patuakhali

**Details: Dabir Char Model GPS**

<table>
<thead>
<tr>
<th>Name</th>
<th>Desc</th>
<th>Name</th>
<th>Desc</th>
<th>Name</th>
<th>Desc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shelter ID</td>
<td>1001221A</td>
<td>Upazila S.N</td>
<td>2</td>
<td>Shelter Condition</td>
<td>PEDP-11</td>
</tr>
<tr>
<td>Shelter Name</td>
<td>Dabir Char Model GPS</td>
<td>GeoCode</td>
<td>17813473856</td>
<td>District</td>
<td>Patuakhali</td>
</tr>
<tr>
<td>Upazila</td>
<td>Dumki</td>
<td>Union</td>
<td>Lebukhali</td>
<td>Village</td>
<td>Dumki</td>
</tr>
<tr>
<td>Location</td>
<td>Latitude: 23.45678</td>
<td>Longitude: 90.12345</td>
<td>Map Image</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Challenges

• Launch own satellite (Bangabandhu-1 Satellite)

• Effective use of space information during emergency response and post-disaster damage and need assessment (PDNA)

• Further Strengthen Early Warning by providing timely access to the space-based information and technologies

• Enhance existing local capacity
Way Forward

• Building network and platform with international/regional data and technology providers
• Capacity development for both EO and end users departments
• NSDI to avoid duplication and redundancy
• Incorporation of space technology for DRR-CCA to policy and plan
Conclusion

• Space Science and Remote Sensing Technology is still development stage in Bangladesh, but a considerable progress has achieved in developing structure and setting of tools and equipments

• The association of DDM/MoDMR to the international missions can help integrating DM programmes to the global systems

• International educational institutions could help by carrying out disaster related research, by offering higher education and training for Bangladeshi students and professionals, and

• Lastly, Space information should be easily available for developing countries like Bangladesh and distributed in such a format that everybody could use without much effort and technical knowledge.
Thanks for attention