COASTAL VULNERABILITY DUE TO SEA-LEVEL RISE HAZARDS IN THE BANGLADESH DELTA: BAND-AID


LIVELIHOOD RESILIENCE, RESEARCH, AND PRACTICE

BONN, 26 JUNE, 2015

Partner:
Bonn University, Germany
Ohio State Univ., US
IRD, France
Inst. For Water Modelling, Dhaka, BD
University of Cologne, Germany
Curtin University, Perth, AUS
LEGOS, Toulouse, France
Univ. of Rajshai, Rajshahi, BD
Ganges–Brahmaputra-Meghna Delta (Bay of Bengal, Bangladesh) is the largest Delta and one of the most densely population regions in the world.
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- Bangladesh is prone to transboundary monsoonal flooding, storm surges, and climate change induced sea-level rise. Land subsidence caused by tectonics, sediment load and ground water extraction have exacerbate the risks for Bangladesh’s coastal vulnerability.

- Objectives: (1) establish a satellite geodetic observational system to quantify sea-level rise and land motion in the Delta, and to project relative sea-level rise to 2100 and beyond, at fine regional scales, and (2) to quantify the human interaction and social sciences that govern coastal vulnerability in Bangladesh.
20th century global mean sea level rise

Tide gauge trend ~1.6-1.8 mm/year

Trend = +3.26 mm/year
Sea level rise is not uniform

Jason-1 Sea level trend

Mean: 3 mm/a
Sea level rise is not uniform

Mean: 3 mm/a

BoB: 6 mm/a
Bangladesh

Assessment of SLR (~6 mm/y) and physical/social implications
What are the issues addressed in Band-Aid

- Floodings, surges and cyclones
- Salinization
- Tides and coastal morphology
- Sea level rise
- Vertical land motion
- Sedimentation

Himalaya and upstream monsoonal changes

Bangladesh

Assessment of SLR (~6 mm/y) and physical/social implications

Land use (agriculture, shrimp farming, reservoir construction)
Tidal river management
Coastal embankment strategies
Currently, sea level rise is accelerating along many coast of South Asia. A part of this is natural variability; i.e. it will not continue. But what part?
Sea level Projections


Project Band-Aid, 26 June 2016, UNU
Sea level budget in the Bay of Bengal (2002–2014) from GRACE and altimetry

J. Kusche¹, B. Uebbing¹, R. Rietbroek¹, C.K. Shum², Z.H. Khan³

<table>
<thead>
<tr>
<th>Contribution</th>
<th>Trend [mm/a]</th>
<th>Acceleration [mm/a²]</th>
<th>SLC 2050 - 2005 [m]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mass (GRACE+altimetry)</td>
<td>1.17 ± 0.06</td>
<td>0.0738 ± 0.0203</td>
<td>0.20</td>
</tr>
<tr>
<td>Antarctica</td>
<td>0.28 ± 0.02</td>
<td>0.0135 ± 0.0062</td>
<td>0.04</td>
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<tr>
<td>Greenland</td>
<td>0.84 ± 0.01</td>
<td>0.0331 ± 0.0026</td>
<td>0.10</td>
</tr>
<tr>
<td>Hydrology</td>
<td>−0.31 ± 0.05</td>
<td>0.0342 ± 0.0169</td>
<td>0.06</td>
</tr>
<tr>
<td>Glaciers</td>
<td>0.36 ± 0.02</td>
<td>−</td>
<td>0.02</td>
</tr>
<tr>
<td>Steric (CMIP5, MPI-M)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RCP2.6</td>
<td>3.08 ± 0.70</td>
<td>−0.0353</td>
<td>0.07</td>
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<tr>
<td>RCP4.5</td>
<td>3.08 ± 0.70</td>
<td>0.0112</td>
<td>0.16</td>
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<tr>
<td>RCP8.5</td>
<td>3.08 ± 0.70</td>
<td>0.0261</td>
<td>0.19</td>
</tr>
</tbody>
</table>
Land subsidence is as important as sea level rise. Long-term monitoring (vertical control, tide gauge, geodetic network) very important!
Bangladesh is a polder country, strong tides and morphology changes. Long-term terrestrial monitoring along the coast is difficult and expensive.
Bangladesh is a polder country, strong tides and morphology changes. Long-term terrestrial monitoring along the coast is difficult and expensive. Band-Aid: Integrate satellite data into terrestrial monitoring systems!
Regional sea level rise

1st project meeting, Dhaka 2014

Tide gauge station installed by Band-Aid
Connecting satellite and tide gauge measurements

S. Calmant (IRD)

Measuring sea level with a GPS float for calibrating satellite measurements

Project Band-Aid, 26 June 2016, UNU
• Close cooperation with local partners (IWM, others)
• Capacity building (e.g. training workshop 8/2015)
• Seek to engage in long-term collaboration