Disaster risk reduction and Flood Early warning Systems

DSTE - Second Webinar of Climate Change Webinar Series

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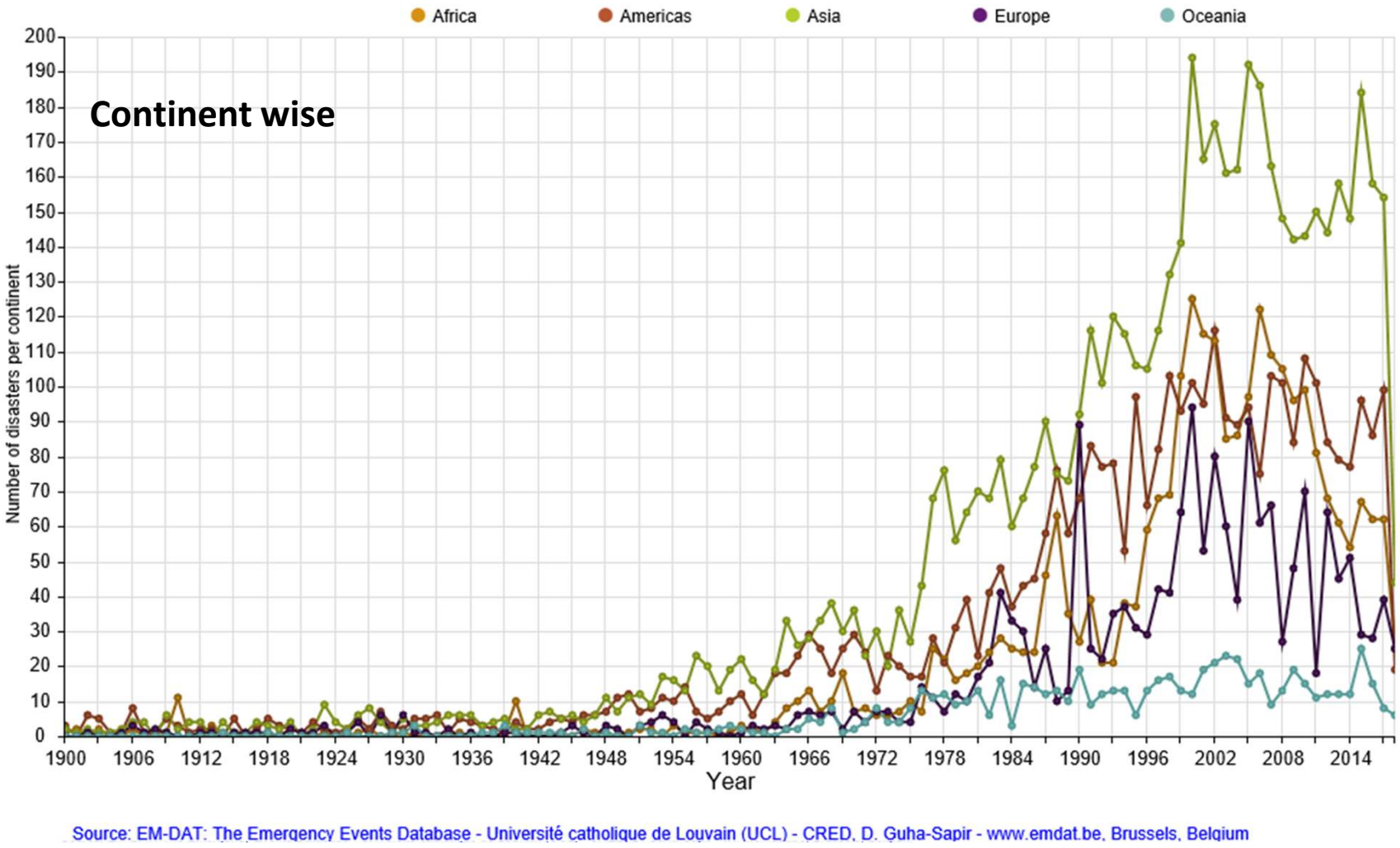
Disaster

Disaster, as defined by the United Nations, is a ***"serious disruption of the functioning of a community or society, which involve widespread human, material, economic or environmental impacts that exceed the ability of the affected community or society to cope using its own resources"***

- DISASTERS OCCUR WHEN - A Community's risk mitigation measures fails
- Disasters are the consequence of inappropriately managed risk.
- Serious disruption, occurring over a relatively short time
- Consequences: Loss of life, economy and environment

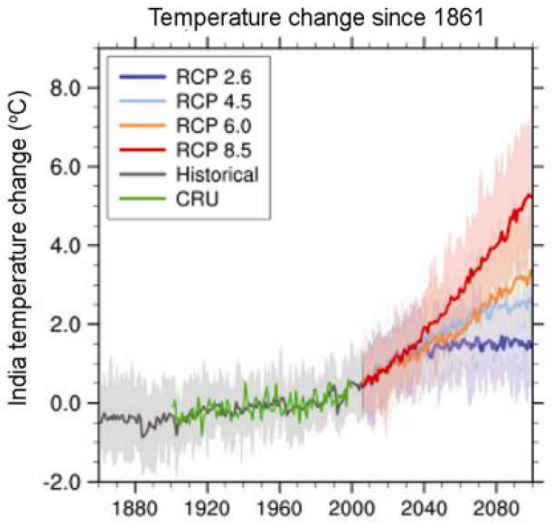
Total number of Natural Disasters

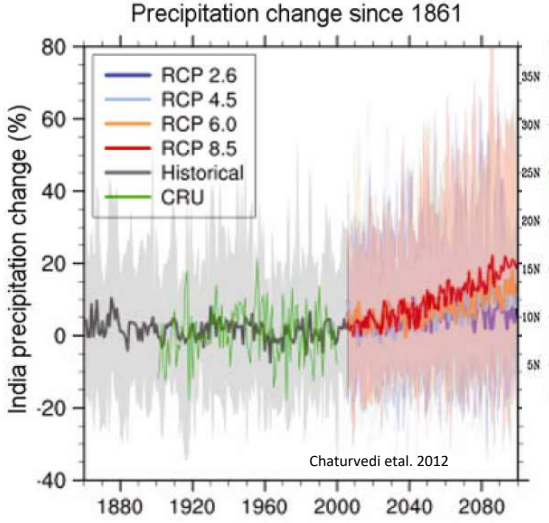


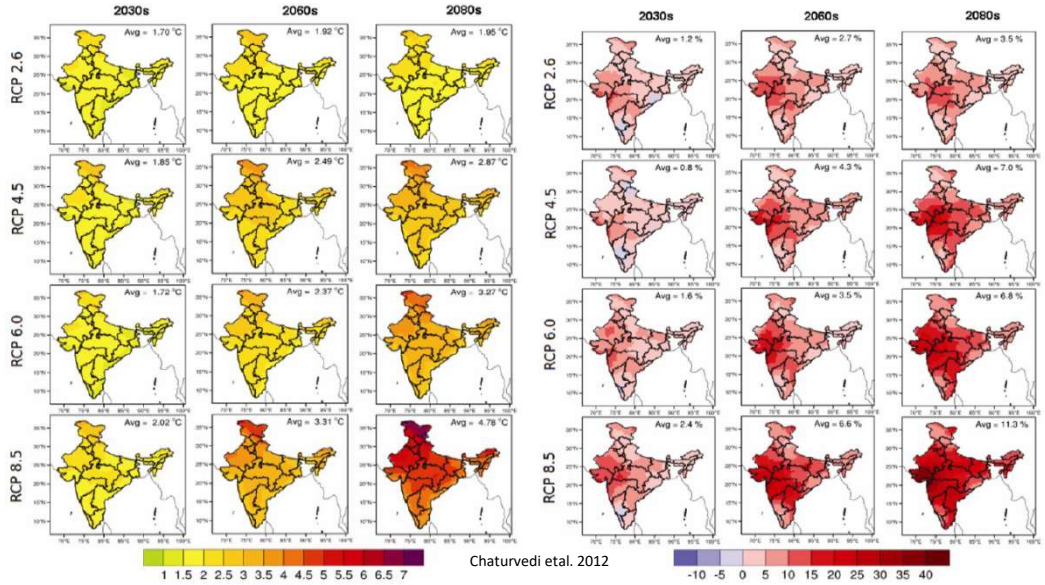
Source: EM-DAT: The Emergency Events Database - Université catholique de Louvain (UCL) - CRED, D. Guha-Sapir - www.emdat.be, Brussels, Belgium

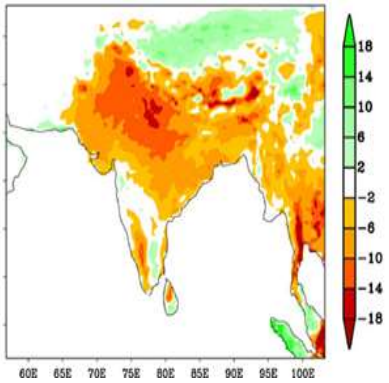
90 % of events, 70 % of causalities and 75 % of economic losses are related to hydro-meteorological hazards

Climatology

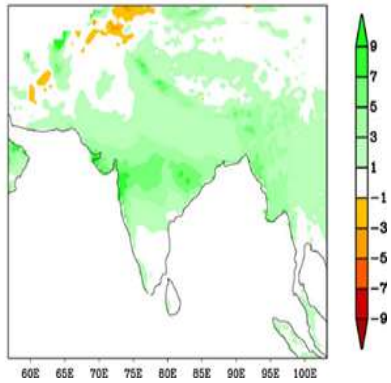








Projected future change in number of rainy days (rainfall >2.5 mm) during monsoon season (JJAS).



Projected change in the intensity (mm/day) of rainfall on a rainy day.

Krishna Kumar et al., 2009

Significant evidences and analysis on increasing extremes in future on India wide / homogeneous scale

Projected Change in Climate over India

- **A warmer India:** on avg. 27 more hot days (>45^{o}) each year and around 1.3 more consecutive hot days (heat waves) events each year for next 30 years.
- **Higher Annual rainfall with more heavy rainfall days**: minus 10% to 30% with around 4 – 18 more days of very high rainfall in near future.
- **More Dry Days:** Rainfall is projected to concentrate over lesser number of days.
- **Increased Lightnings are expected**
- **Regional sea level changes** have been estimated at close to 2.0 mm/yr over North Indian Ocean and 4 mm/yr over the Bay of Bengal region.
  - **Tide gauge trends**: All coastal cities shows increasing historical trends with Kolkata showing the maximum.
- **15-20% increase in storm surges** with 100 year return levels projected for East coast.
- **Intensity of cyclones** have seen an increase historically as well as projected to increase in future.
- **Rapid Warming of Arabian Sea:** high SSTs are showing itself wrt to higher cyclonic activity over this region.

THE STATE OF THE WORLD: UNPREPARED

- 200 nations and 7 billion people are investing over 6 trillion dollars each year in urban development and billions in education.
- Each year, approximately 700-900 events cause economic losses in Billions with large tolls in mortality and morbidity
- Traditionally our response to the disaster have been limited to post disaster recovery and relief
- Paradigm shift from Post disaster response to Preparedness and prevention through risk assessment and risk reduction
- Technology driven Decision Support System for DRM

Flood Early warning system

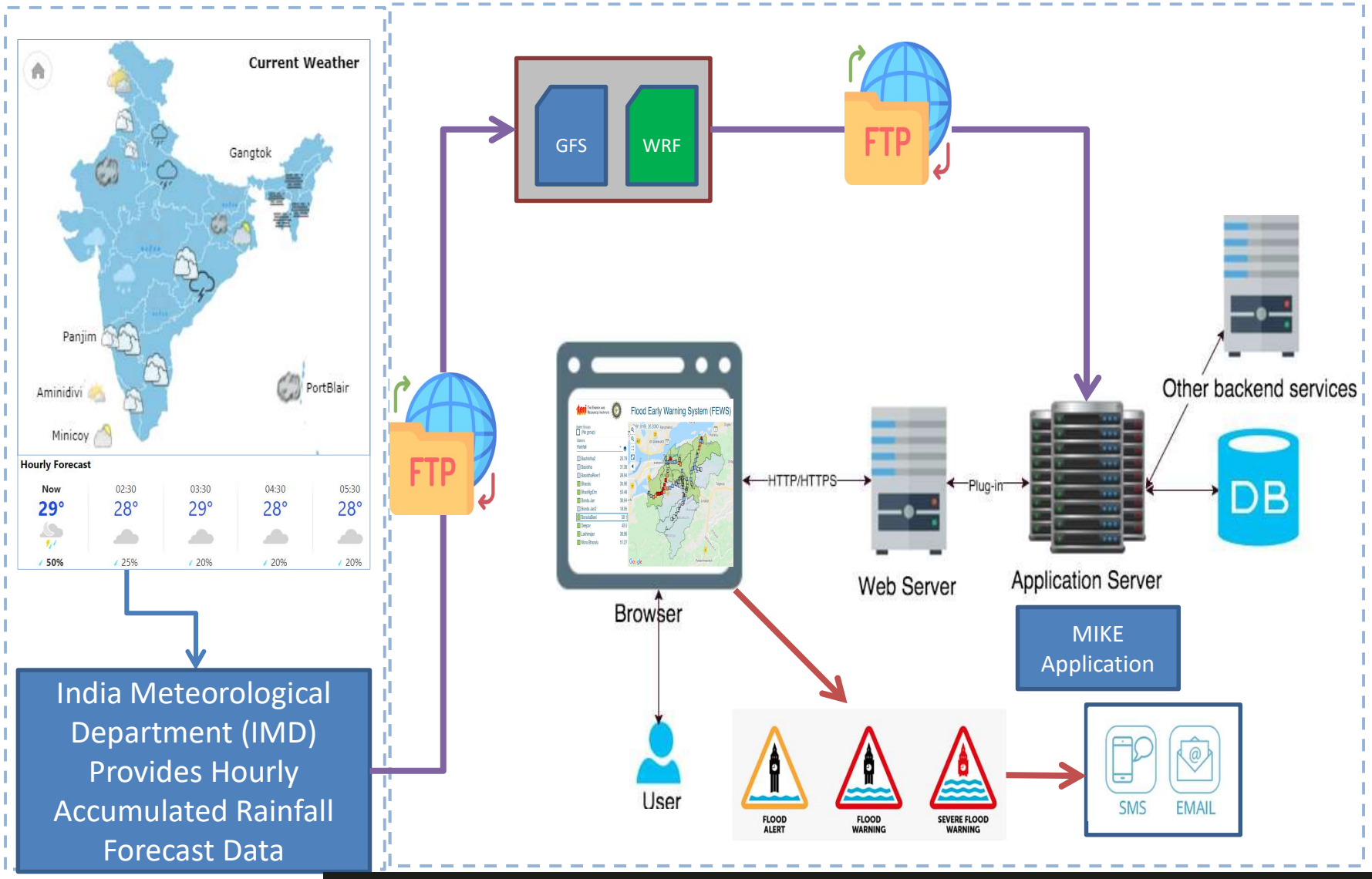
Flood Early warning system

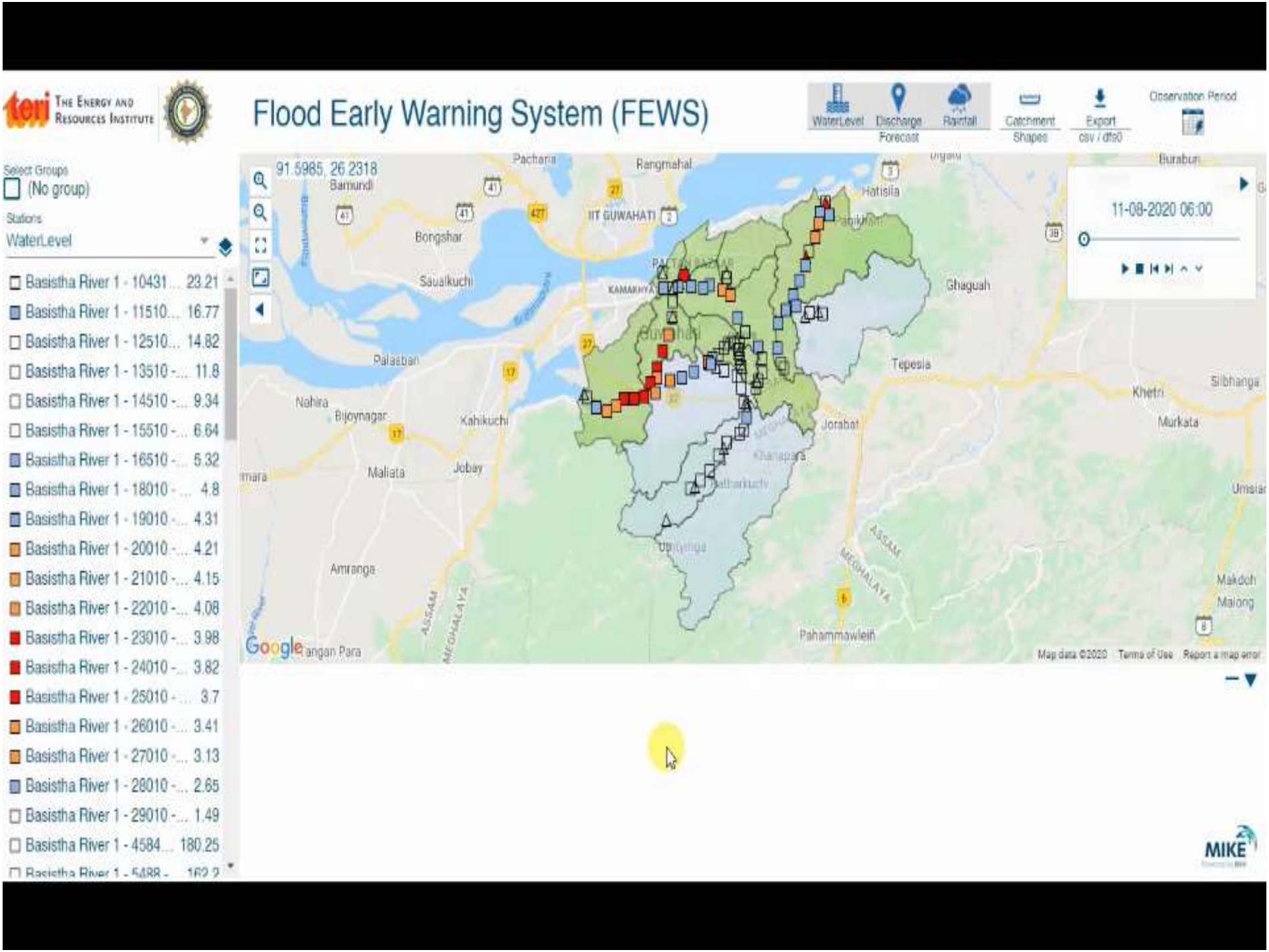
- Early warning systems are an important component of disaster risk management strategies.
- The main purpose of early warning systems is to issue warnings when a flood is imminent or already occurring.
- Early warning systems for floods comprise four inter-related elements:
  1. Assessments and knowledge of flood risks in the area,
  2. Hazard monitoring (forecasts) and warning service,
  3. Flood risk dissemination and communication service, and
  4. Community response capabilities

Early warning system

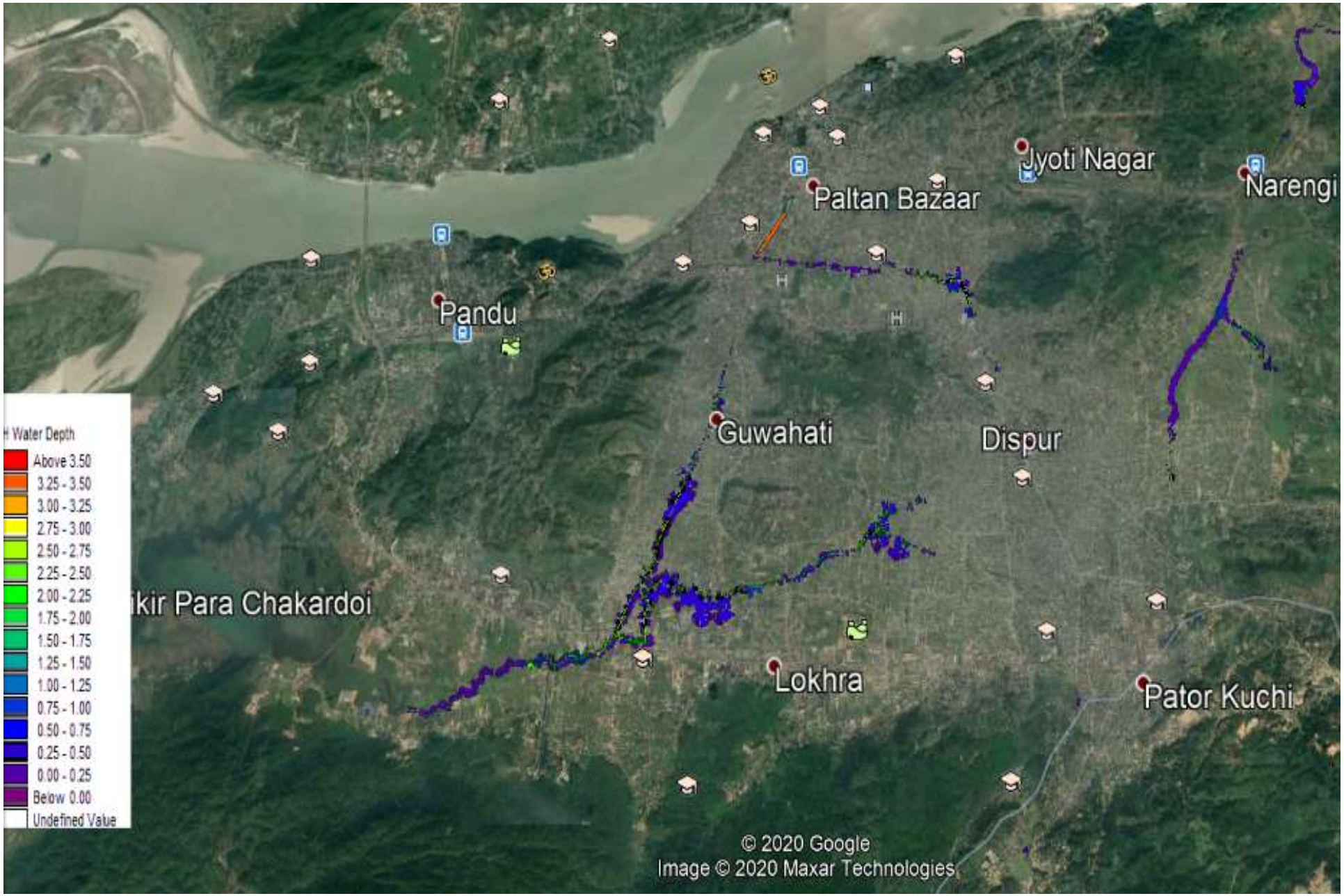
Advancements in hydro-meteorological forecasting and climate modelling

System Architecture




TERI The Energy and Resources Institute
Flood Early Warning System (FEWS)
WaterLevel
Discharge
Rainfall
Forecast
Catchment
Shapes
Export
csv / dfs0
Observation Period
Select Groups
(No group)
Stations
WaterLevel
Basistha River 1 - 10431... 23.21
Basistha River 1 - 11510... 16.77
Basistha River 1 - 12510... 14.82
Basistha River 1 - 13510 -... 11.8
Basistha River 1 - 14510 -... 9.34
Basistha River 1 - 15510 -... 6.64
Basistha River 1 - 16510 -... 5.32
Basistha River 1 - 18010 - ... 4.8
Basistha River 1 - 19010 -... 4.31
Basistha River 1 - 20010 -... 4.21
Basistha River 1 - 21010 -... 4.15
Basistha River 1 - 22010 -... 4.08
Basistha River 1 - 23010 -... 3.98
Basistha River 1 - 24010 -... 3.82
Basistha River 1 - 25010 -... 3.7
Basistha River 1 - 26010 -... 3.41
Basistha River 1 - 27010 -... 3.13
Basistha River 1 - 28010 -... 2.65
Basistha River 1 - 29010 -... 1.49
Basistha River 1 - 4584... 180.25
91.5985, 26.2318
11-08-2020 06:00
Barnundi
Pacharia
Rangmahal
IIT GUWAHATI
Borgshar
Saualkuchi
Palasbari
Nahira
Bijoynagar
Kahikuchi
Maliata
Jobay
Amranga
Hatisila
Ghaguah
Tepesia
Jorabat
Khetri
Silbhanga
Murkata
Umsia
Makdoh
Maiong
Pahammawlieh
ASSAM
MEGHALAYA
Google
Map data ©2020
Terms of Use
Report a map error
MIKE

Flood Map


Water Depth
Above 3.50
3.25 - 3.50
3.00 - 3.25
2.75 - 3.00
2.50 - 2.75
2.25 - 2.50
2.00 - 2.25
1.75 - 2.00
1.50 - 1.75
1.25 - 1.50
1.00 - 1.25
0.75 - 1.00
0.50 - 0.75
0.25 - 0.50
0.00 - 0.25
Below 0.00
Undefined Value
Jyoti Nagar
Narengi
Paltan Bazaar
Pandu
Guwahati
Dispur
Lokhra
Pator Kuchi
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Modelling Software

Hydrological and Hydrodynamic Model	Weather Forecast	MIS and Web
• MIKE 21 • MIKE Hydro river • MIKE Flood • SWMM • HecRAS • HecHMS	• WRF • GFS • Satellite • Real time AWS/ARG	• Server • Automation • WebSQL • WebGIS

Model input data Requirement

Topography
- DEM, Contour, UAV, Survey

River Cross section
- River Profile survey

Discharge
- River Discharge observation, water lavel

Rainfall
- Station observation, Gridded, and forecast

Surface and soil properties
- LULC and soil data

Structures
- Hydrological structure
- Storm water drain

Meteorological Information
- Temp, ET

Thank You!