

Showcasing digital solutions for flood forecasting in India

India–Denmark Centre of Excellence for Smart Water Resources Management

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Why Early Warning Matters

The challenge is not only predicting water levels



Houses partially submerged by flood waters from the Ganges River in Patna earlier this month. Photograph: Sachin Kumar/AFP/Getty Images

Decision-makers need to know where flooding will occur, when it will arrive, and what will be affected.

- Faster-onset events
- Complex, data-intensive basins
- Growing demand for location-specific warnings

Earlier forecasts matter only when they lead to earlier action.

India–Denmark Cooperation on flood forecasting and GLOF modelling

Building capability through the Centre of Excellence

PHASE 1 · February 2026
Foundations

PHASE 2 · May 2026
Advanced Modelling

PHASE 3 · Aug–Sep 2026
Application and operational readiness

PA-01 · Flood forecasting with accurate inundation modelling

1D and 1D–2D modelling, data assimilation, calibration and impact-based forecasting

PA-02 · GLOF model studies

Earth Observation, breach scenarios, flood routing, sediment and boulder hazards

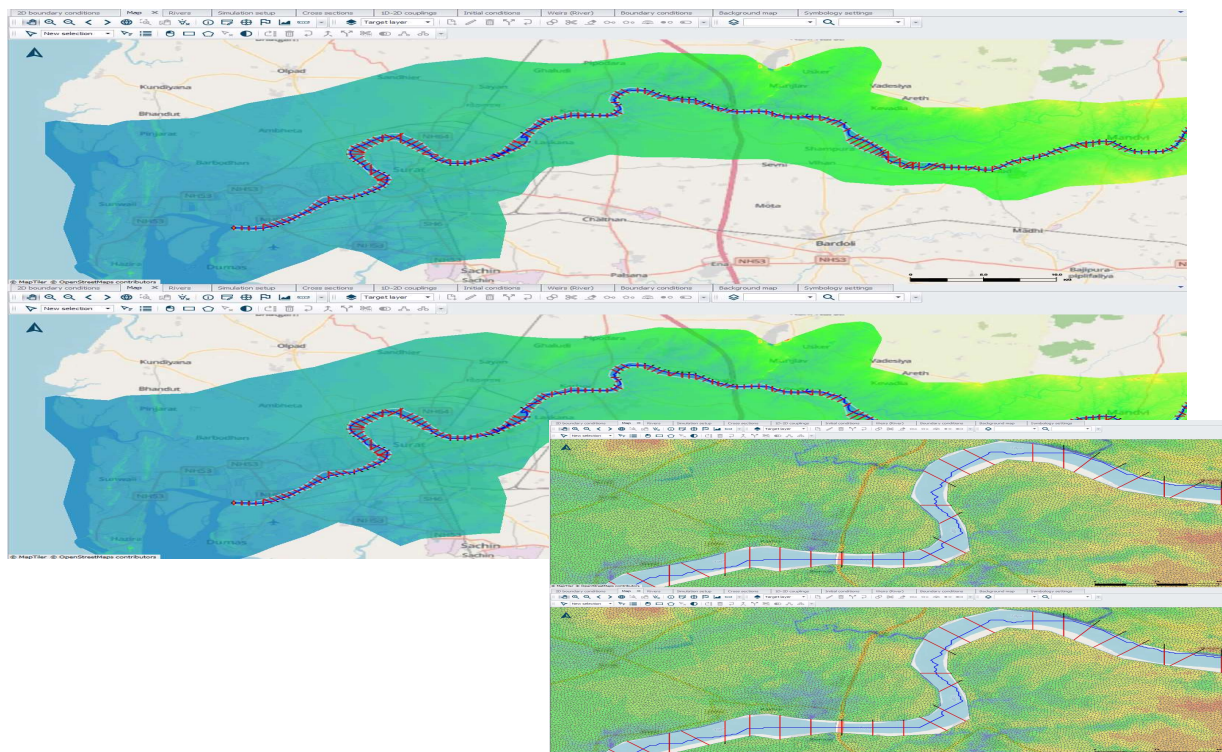
From software training to reproducible workflows and strengthened national capability



Delivered under the Centre of Excellence for Smart Water Resources Management Central Water Commission and DHI during Phase 3 training in Delhi, India

PA-01 · Flood forecasting with accurate inundation modelling

Tapi and Godavari basins: from water-level forecasts to impact-based decision support



Tapi Basin MIKE+ Model

Coupled 1D–2D modelling translates river forecasts into actionable information on flood extent, depth, velocity and timing.

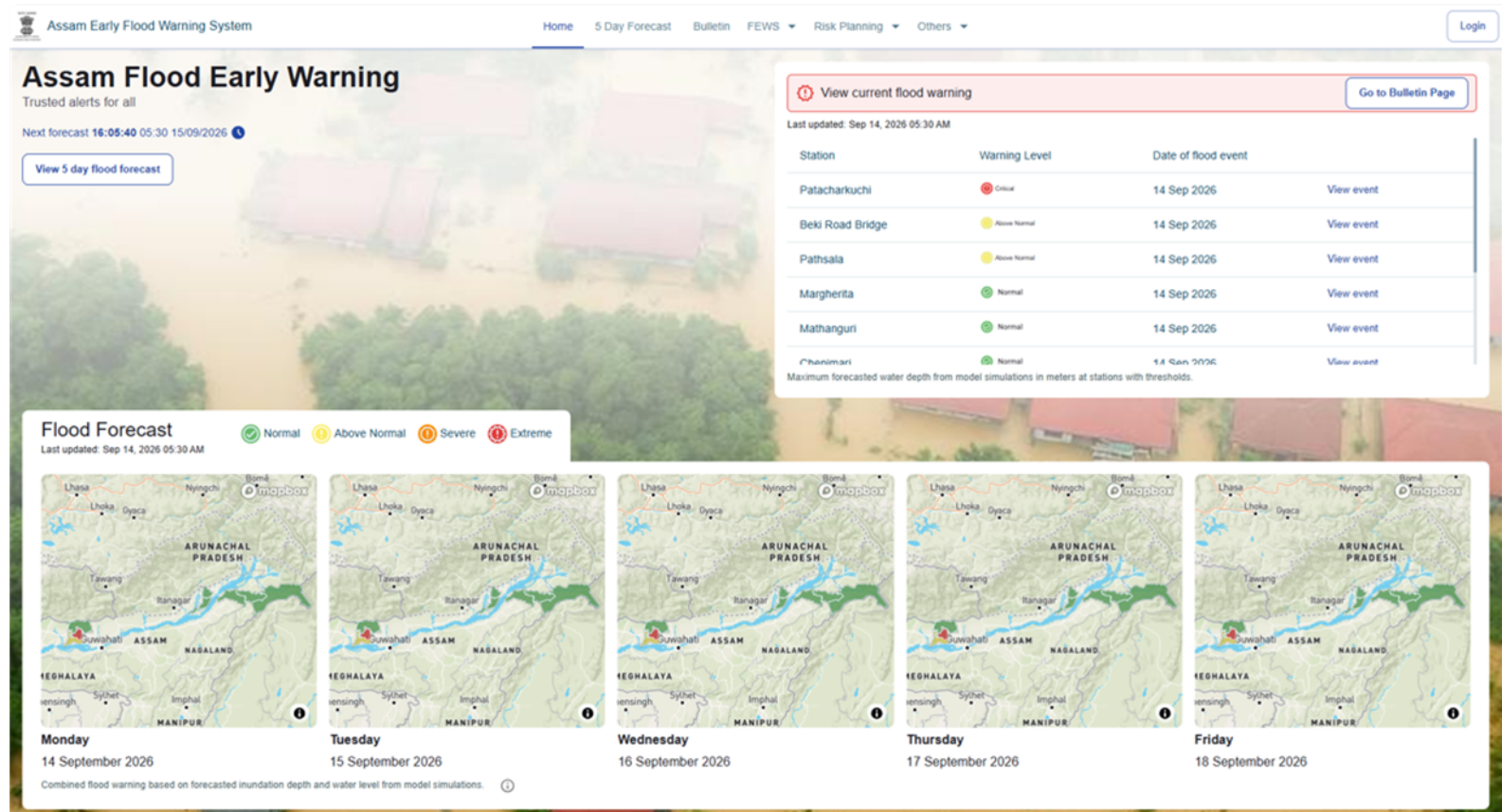
Digital Modelling Workflow

- **Model development:** MIKE+ 1D and coupled 1D–2D models
- **Forecast improvement:** Data assimilation and model diagnostics
- **Model reliability:** Calibration, refinement and quality control
- **Infrastructure representation:** Reservoirs and control structures
- **Decision support:** Inundation extent, depth and arrival time.

Strengthened flood-modelling workflows for the Tapi and Godavari basins, supporting more accurate forecasts and progress towards operational, impact-based warning.

Digital flood forecasting in practice: Assam Flood Early Warning

Assam shows what is possible



Assam Flood Early Warning System Dashboard

PA-02 · GLOF Model Studies

South Lhonak Lake: from glacier hazard to downstream risk assessment



Main challenge and context:

South Lhonak Lake expanded rapidly over the past decades, increasing the potential risk of a Glacial Lake Outburst Flood (GLOF). In October 2023, a major GLOF caused severe flooding and infrastructure damage along the Teesta River, highlighting the need for robust hazard assessment and early warning systems.

Digital Modeling Framework:

- **Breach scenarios**

Trigger mechanisms, breach development and release volumes

- **Flood routing (MIKE+)**

Water levels, flow velocities and arrival times

- **Sediment impacts**

Erosion, transport and deposition patterns

- **Boulder hazards**

Mobility screening and downstream risk assessment

- **Uncertainty analysis**

Sensitivity testing and transparent assumptions

PA-02 · GLOF Risk Assessment and Impact Modelling

Digital tools for flood, sediment and boulder transport along the Teesta River



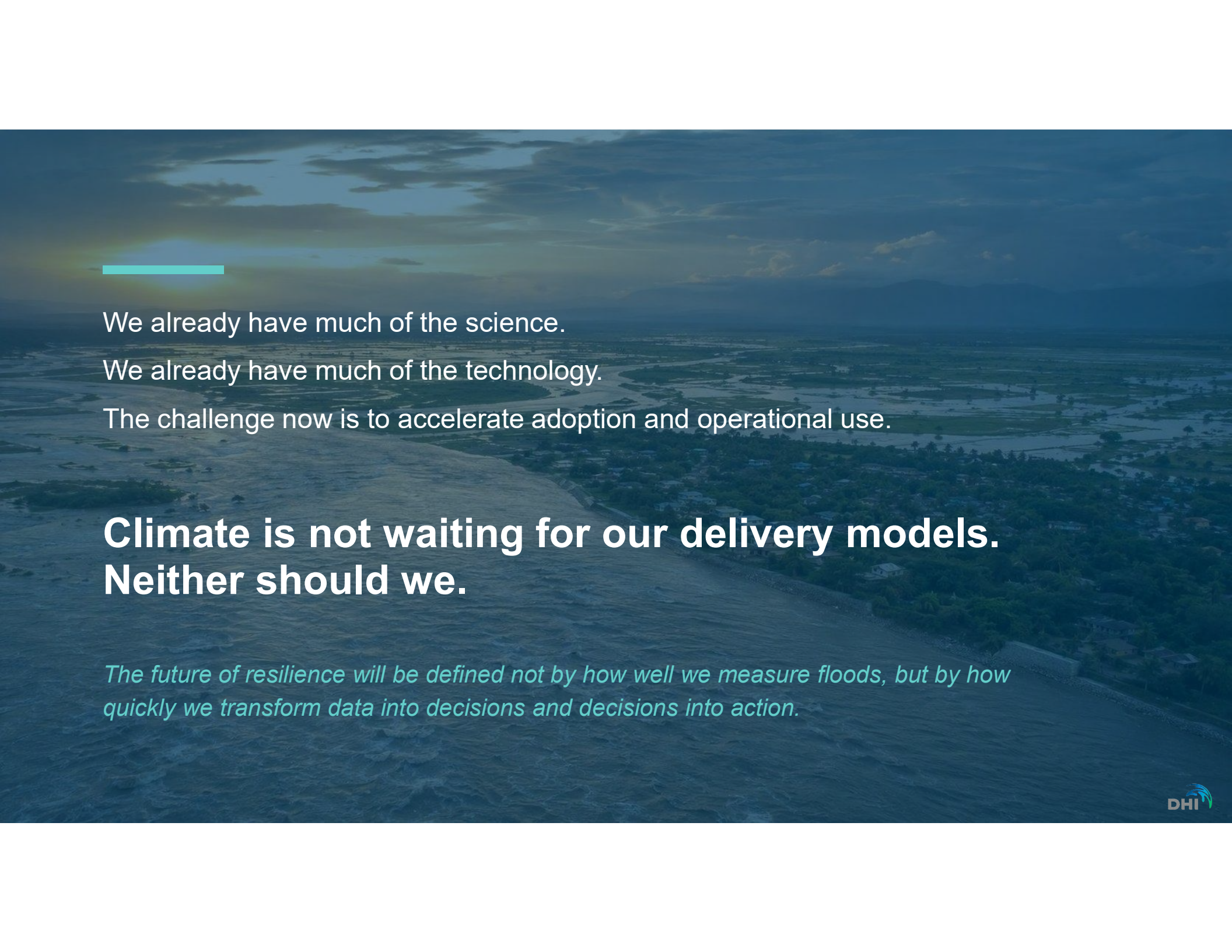
Observed GLOF impacts near Teesta III Hydropower Project following the October 2023 South Lhonak Lake outburst.

Integrated modelling supports rapid GLOF impact assessment for early warning and resilient infrastructure planning.

Flood, sediment and boulder analyses identify hazard zones, estimate arrival times, and assess downstream risks.

KEY OUTCOMES

- Developed and tested **GLOF breach scenarios**
- Modelled **flood depth, velocity** and **arrival time** using MI KE+
- Assessed **sediment erosion, transport** and **deposition**
- Screened **boulder mobility** and **downstream hazard zones**
- Evaluated **uncertainty** through sensitivity analysis

An aerial photograph of a coastal region during a flood. A wide river flows from the foreground towards the background, with water levels significantly higher than normal. The surrounding land is a mix of green vegetation and small, dark-roofed houses. The sky is overcast with grey clouds, and the overall lighting is dim, suggesting dusk or dawn. A small teal horizontal bar is positioned above the first line of text.

We already have much of the science.

We already have much of the technology.

The challenge now is to accelerate adoption and operational use.

**Climate is not waiting for our delivery models.
Neither should we.**

The future of resilience will be defined not by how well we measure floods, but by how quickly we transform data into decisions and decisions into action.