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Global storm surge forecasts for climate resilience and maritime optimisation

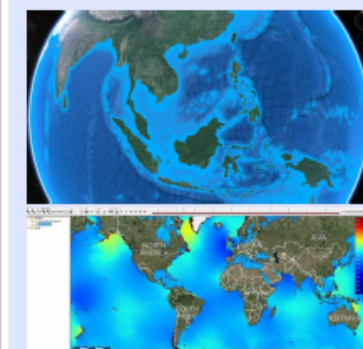
Project Overview

Three pilot services for DestinE:

- **Core service:**
Global storm surge, tide and currents forecasting
- **Downstream Service One:** Compound flood forecasting in the Philippines
- **Downstream Service Two:** Global shipping routes optimization

The core service:

- Provide **global** hydrodynamic forecast
- Forced by **Extremes DT** (daily forecast)
- Backend deploy in **DEDL**
- Service running on **DESP**



Global Tide and Surge Model (GTSM) grid in Southeast Asia (upper panel); storm surge forecasting in Global Storm surge forecasting system (lower panel)

1 Downstream Service One:

Compound flood forecasting in the Philippines

Pilot areas: (1) Metro Manila, (2) Naga City, Camarines Sur and (3) Roxas City, Capiz

User engagement key messages (11 June 2025)

Greatest challenges in current forecasts:

- lack of local detail, forecast accuracy, insufficient lead-time
- Primary opportunities for forecasting assistance:
- Pre-disaster risk assessment, supporting evacuation decisions, class/work suspensions

Useful forecast tools:

- Alerts and thresholds, flood maps, risk zones, population exposure

Local Users in the Philippines



Philippine Atmospheric Geophysical and Astronomical Services Administration (**PAGASA**)

- National meteorological agency
- Responsible for flood forecasting and early warning dissemination system



Philippine Red Cross

- Welfare and humanitarian services
- Disaster response and relief during natural and man-made disasters



START Network

- Rapid and anticipatory funding during for disasters
- Locally-led humanitarian action, building local capacity



Nationwide Operational Assessment of Hazards (**Project NOAA**)

- Hazard data and mapping, including floods, storm surges and landslides
- Community-level risk information for policymakers and local governments

Approach:

Step 1: Develop service design from user engagement and confirm requirements

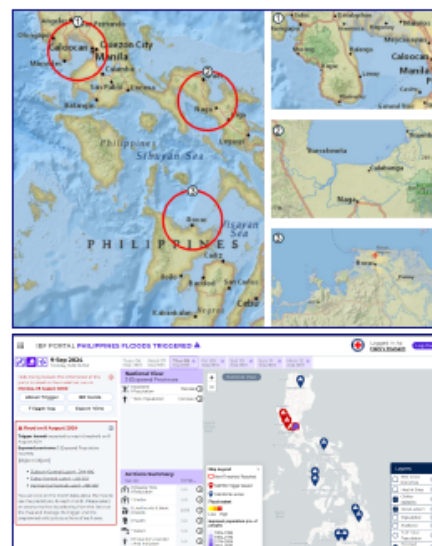
Step 2: Modelling tasks

- Coastal hydrodynamics of the Philippines
- Hydrology of catchment areas for the 3 sites
- Flood extent based on surge and river discharge

Step 3: Forecasting engine

- Flood forecasting based on Extremes DT
- Deploy on Destination Earth Data Lake (DEDL)
- Threshold-based warning and visualization (IBF)
- Service running on Destination Earth Service Platform (DESP)

Step 4: Forecast validation/verification



Three compound flood forecasting focal areas in Philippines (upper panel); Red cross impact-based forecasting portal (lower panel)

2 Downstream Service Two:

Global shipping routes optimization

User Engagement key messages (12 June 2025)

End-user groups:

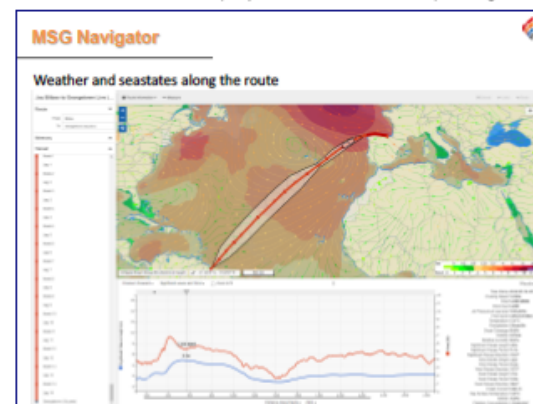
- Nautical professionals, vessel owners, port authorities and marine pilots

Useful information from core service

- tidal currents, wind-driven surface currents, wind speed and direction (Extremes DT)

Purpose of forecast

- **Passage planning:** when to leave and arrive, adhering to traffic lane regulations, speed through water, avoiding hazards, save fuel, reduce carbon emission
 - **Real-time route optimization:** Monitoring and alerting is active during journey
 - **Voyage efficiency/emission reduction**
 - **Historical analysis and post-incident reconstruction**
- Next steps
- Develop service design and confirm requirements
 - Run global tide and surge model (GTSM) forced by Extremes DT and deploy to Made Smart Group Navigator



MSG Navigator: global shipping routes optimization portal