Water quality forecasting in estuaries: insights from the Tagus estuary

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Image: The Danube Delta

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CONNECT coastal service – Tagus estuary

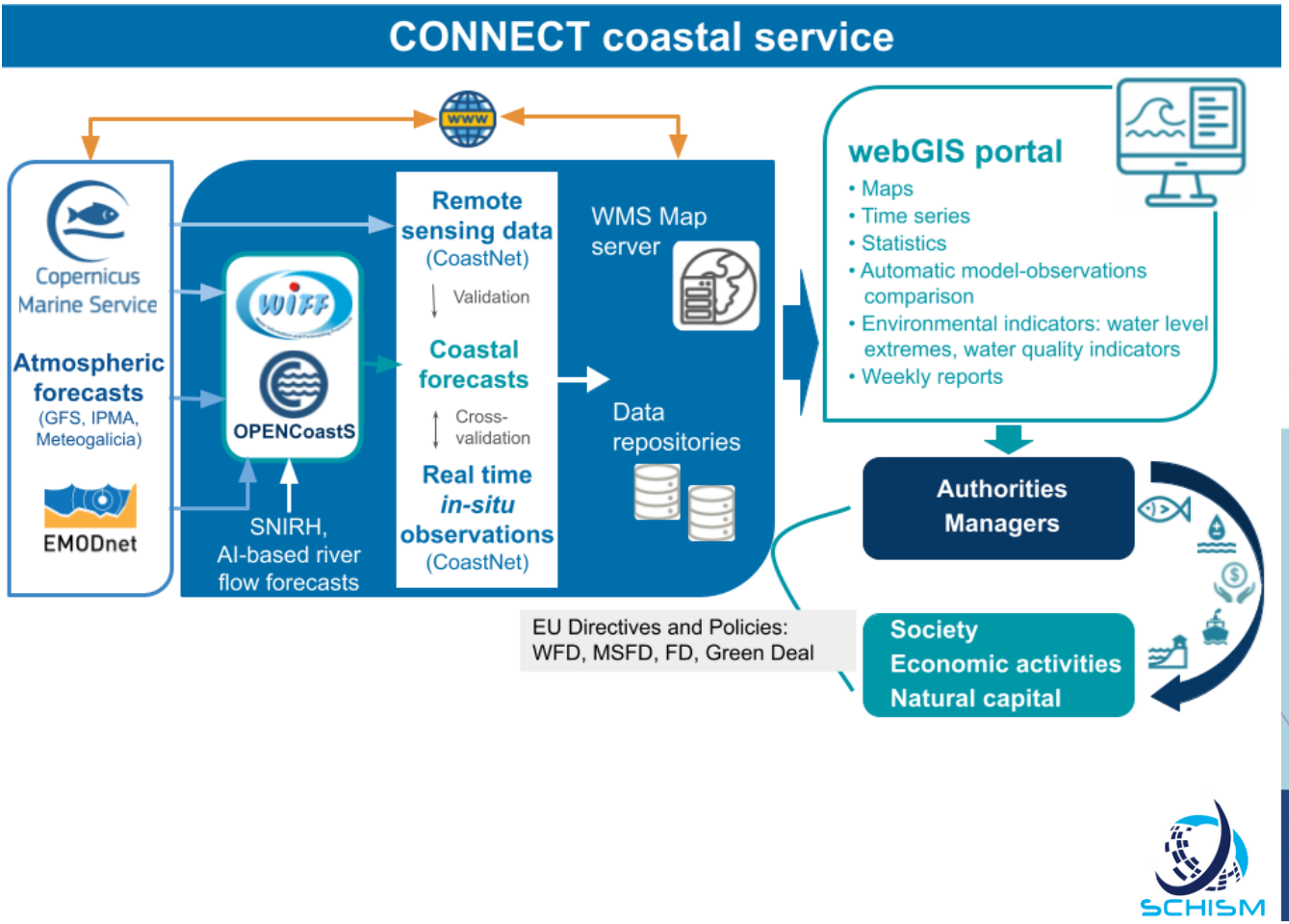
CONNECT delivers a local, high-resolution, coastal monitoring service that seamlessly integrates model-based forecasts and observations to provide physical and biogeochemical open data on Portuguese estuaries to:

- Support the evaluation of the ecological status of estuaries (WFD)
- Quantify land inputs to the adjacent coastal waters (MSFD)
- Anticipate inundation events (Floods Directive)

Use Case #1 – Tagus estuary:

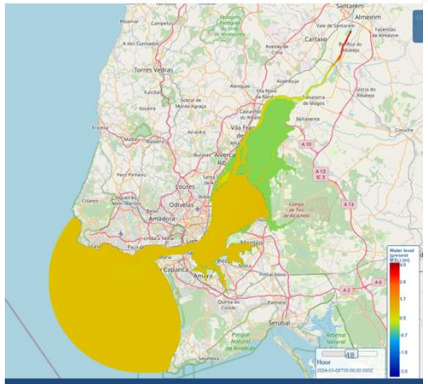
- High ecological and economical importance
- Supports several uses that may degrade water quality
- Estuarine margins are prone to inundation, which is exacerbated by sea level rise

Technology and models



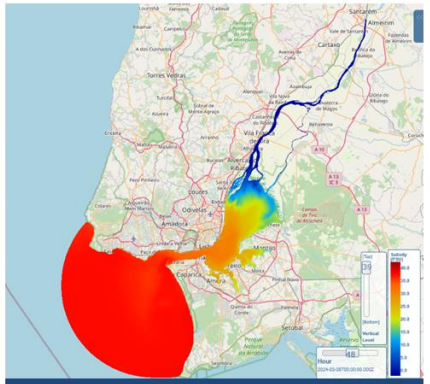
Tagus estuary

Inundation: 2D barotropic model, waves-currents interaction



Water levels, Velocity,
Waves (Significant wave height, Mean period, Direction)

Water quality: 3D baroclinic model, coupled circulation-biogeochemistry

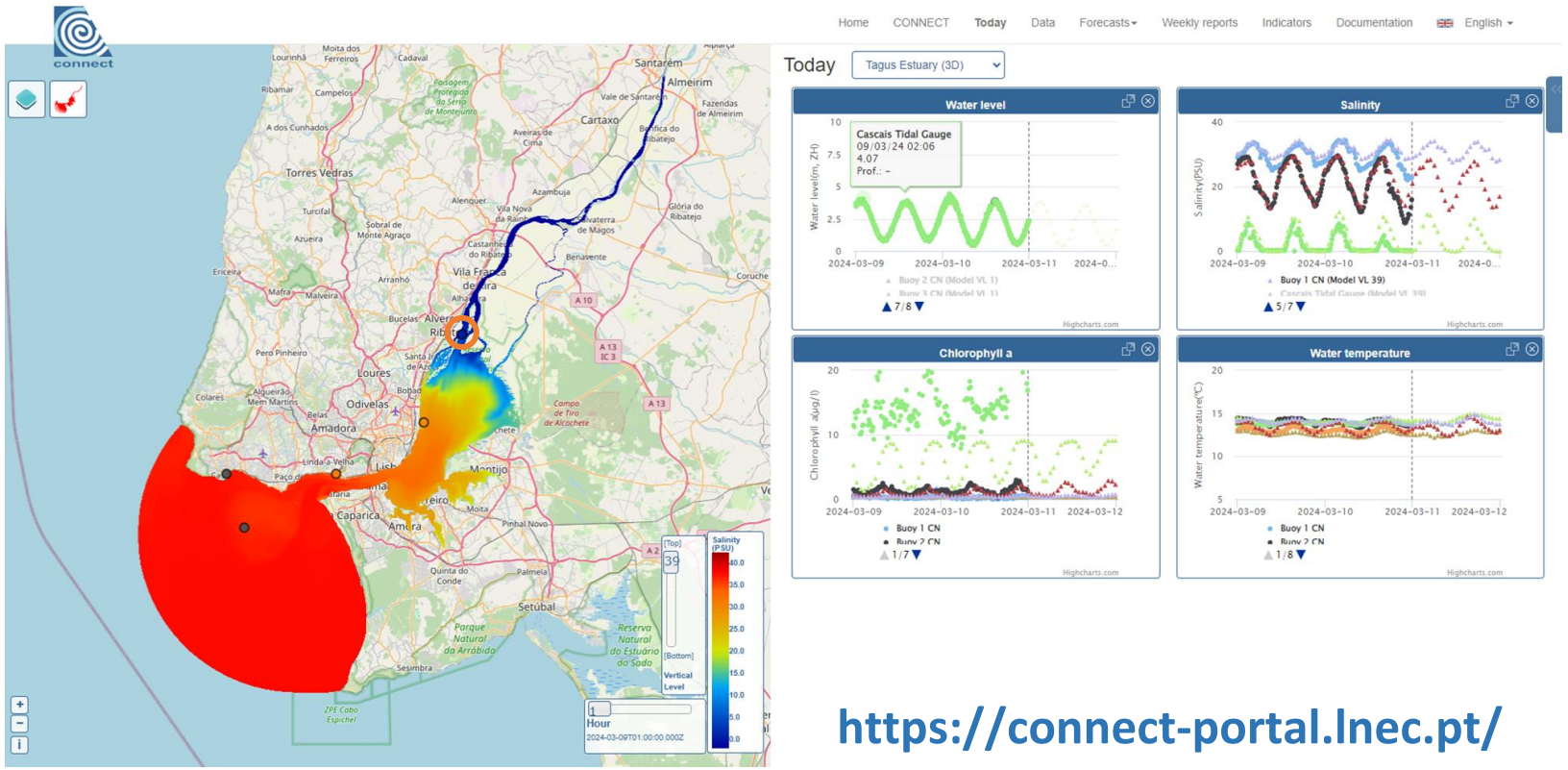


Water levels, Velocity, Salinity, Temperature, Ammonium, Nitrate, Phosphate, Silicate, Dissolved oxygen, Chlorophyll-a

In-situ observation network

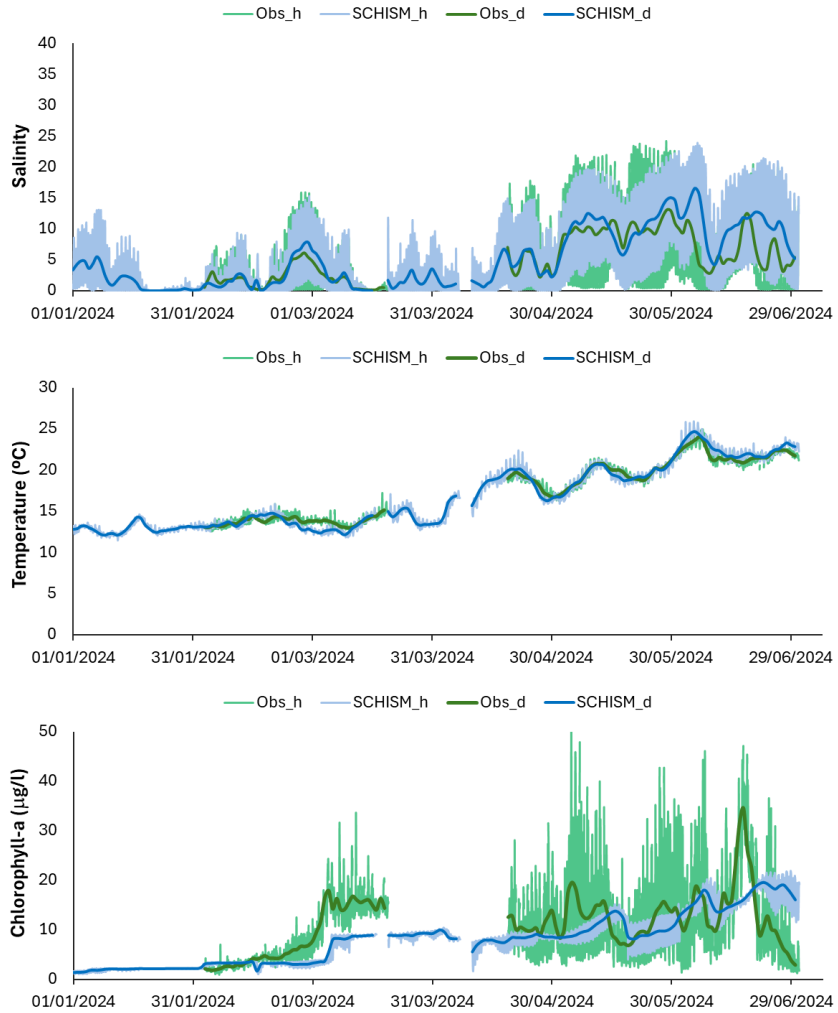
Salinity, Temperature, pH, Dissolved oxygen, Chlorophyll-a, Turbidity

Circulation and water quality forecasts



https://connect-portal.lnec.pt/

Forecasts: Buoy 3, January-June, 2024



Lessons learned, needs & perspectives

- The CONNECT coastal service provides continuous knowledge about the status of the estuarine and coastal waters
- Combining multiple sources of data (models, in-situ and satellite observations) shows advantages
- Local models can provide useful inputs to regional models
- River boundary conditions are an important source of uncertainty –> lack of reliable forecasts for river flows, temperature and biogeochemical variables at most riverine boundaries
  - AI models are being tested to predict river flows
- Scarcity of NRT observations in many estuaries to continuously assess and improve models' performance (e.g., through data assimilation)