

EGU25-8962, updated on 20 Jan 2026

<https://doi.org/10.5194/egusphere-egu25-8962>

EGU General Assembly 2025

© Author(s) 2026. This work is distributed under the Creative Commons Attribution 4.0 License.



Computational services for coastal observatories: the building blocks in support of coastal resilience

Anabela Oliveira

National Laboratory for Civil Engineering (LNEC), Scientific Instrumentation and Information Technologies Centre, Information Technology Division, Lisbon, Portugal (aoliveira@lnec.pt, rjmartins@lnec.pt, gjesus@lnec.pt, zmardani@lnec.pt)

Coastal observatories integrate operational numerical modelling and data to produce targeted tools for coastal early warning and risk management. They explore the usage of computational services and web-based tools to produce timely and interactive products in support of coastal management, building the foundation for Digital Twins from the ocean to the river basin (Rodrigues et al., 2021). Examples of computational services in this context include OPENCoastS (Oliveira et al., 2020) and SURF (Trotta et al., 2021), for on-demand predictions, and WebGIS platform applications, customized to meet user requirements.

In Copernicus Marine Service National Collaboration Programme's project CONNECT, a multi-purpose coastal service was established for two sites, based on coastal observatories technology (Rodrigues et al., 2021), merging high-resolution model predictions from OPENCoastS deployments and data from the national infrastructure CoastNet (Figure 1). By providing both pre-configured products (such as maps, automatic quality assessments and indicator results) and the capacity for users to build products on-the-fly (such as probing results as time series and building tailored dashboards with user selected information), the CONNECT service is one of the first core coastal Digital Twins applicable for flooding and coastal pollution management (Figure 2).

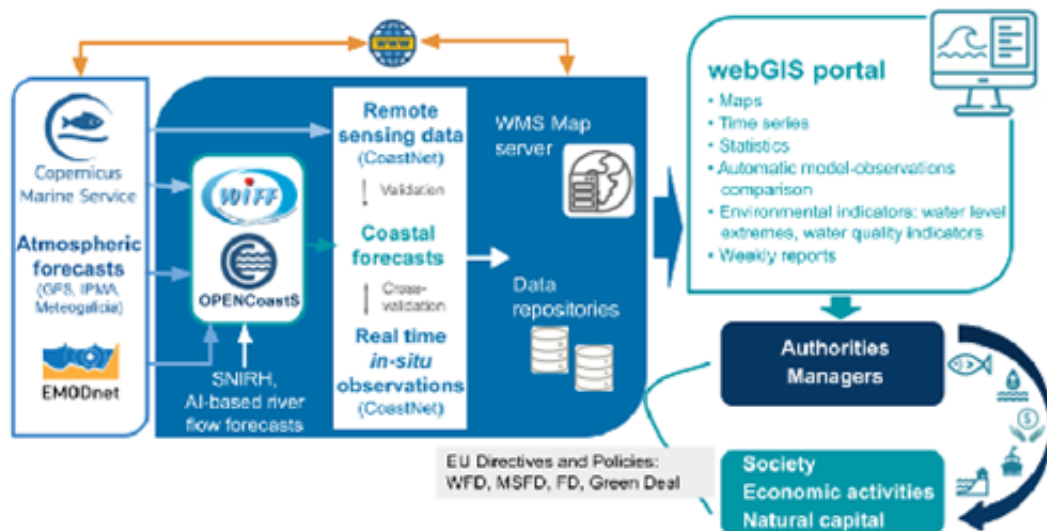


Figure 1 – CONNECT's coastal service architecture

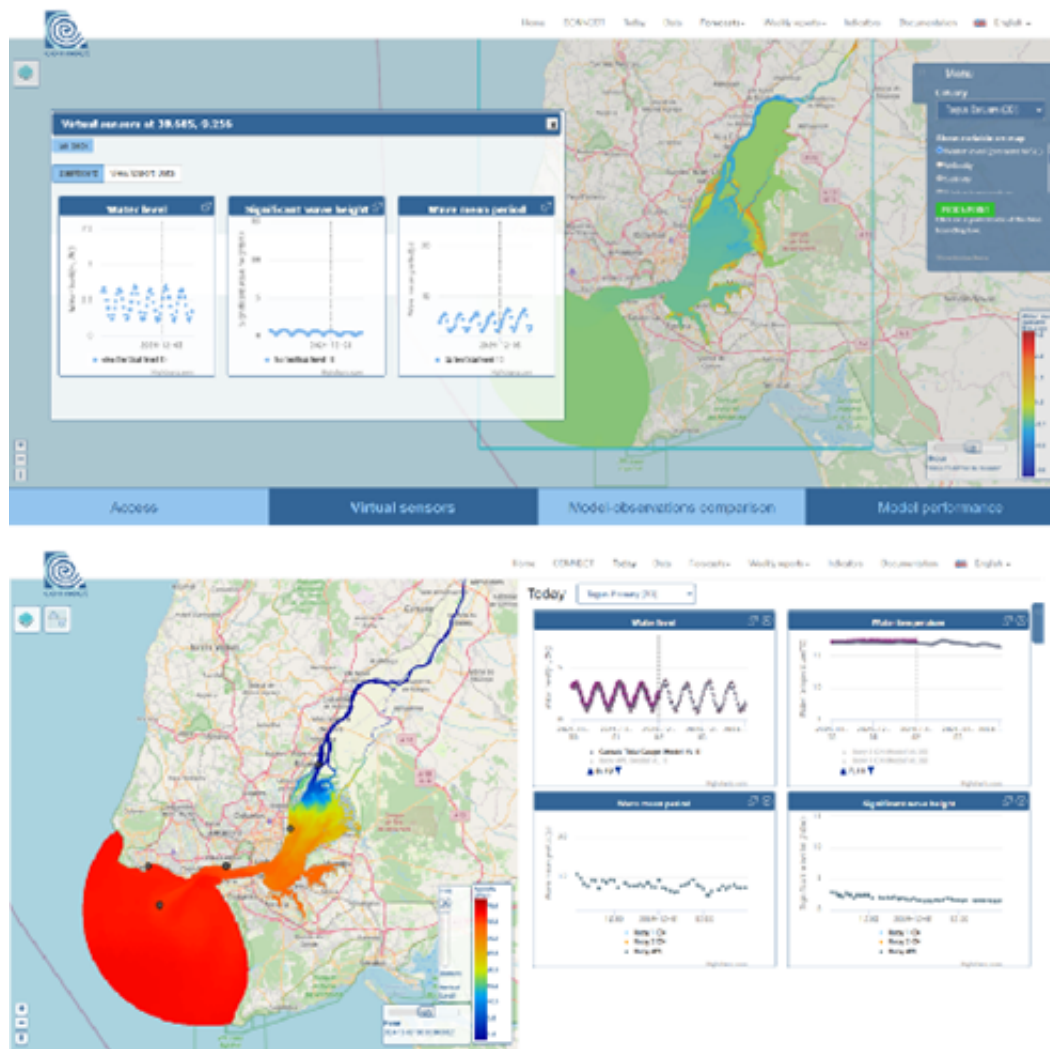


Figure 2 – Sample user services in the Tagus estuary: Virtual sensors and configurable dashboard.

Computational services are also applied to the construction of the river predictions (Jesus et al., in review). Particularly suited for dam-controlled river basins, a deep learning service was used to predict river flows at the upstream boundary of CONNECT sites, based on Multilayer Perceptron algorithms, potentially reducing severe phase errors during extreme events in the estuary than conventional persistence approaches. An on-demand platform is being built to allow users to setup their own AI model, with multiple choices for deep learning algorithms, input and output data, and training and validation periods. These tools will be validated in two sites in Africa, addressing co-creation challenges with local communities, and in two sites in Portugal, to address urban-driven contamination and shellfish farm needs.

References

- Rodrigues M., Martins R., Rogeiro J., Fortunato A.B., Oliveira A., Cravo A., Jacob J., Rosa A., Azevedo A., Freire P., 2021. A Web-Based Observatory for Biogeochemical Assessment in Coastal Regions. *Journal of Environmental Informatics*, 38(1), 1-15, <https://doi.org/10.3808/jei.202100450>
- Oliveira A., Fortunato A.B., Rogeiro J., Teixeira J., Azevedo A., Lavaud L., Bertin X., Gomes J., David M., Pina J., Rodrigues M., Lopes P., 2019. OPENCoastS: An open-access service for the automatic generation of coastal forecast systems, *Environmental Modelling & Software*, 124, 104585, <https://doi.org/10.1016/j.envsoft.2019.104585>.
- Trotta F., Federico I., Pinardi N., Coppini G., Causio S., Jansen E., Iovino D., Masina S., 2021. A Relocatable Ocean Modeling Platform for Downscaling to Shelf-Coastal Areas to Support Disaster Risk Reduction, *Frontiers in Marine Science*, 8, pp. 317.
- Jesus, G., Mardani, Z., Alves, E., Oliveira, A. Under review, Deep Learning-Based River Flow Forecasting with MLPs: Comparative exploratory analysis applied to the Tejo and the Mondego rivers, *Sensors*.