

CALL FOR ACTION

***International
mobilization to
advance ocean
prediction capabilities
for the benefit of
society***

**One Ocean Science Congress
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SUMMARY

Innovations in Ocean prediction systems and services, including improved models and data assimilation capabilities and the use of artificial intelligence and digital twinning, offer evidence-based solutions for Ocean protection and sustainable development. Implementing these systems at a global scale and ensuring their benefits are available and adapted to all is a significant challenge. We call for a strong international mobilization of all ocean prediction stakeholders to put state-of-the-art science and technology at the service of society to address the critical challenges facing our Ocean. This global mobilization will also promote knowledge transfer, capacity building, and inclusive participation ensuring no one is left behind in the ocean prediction revolution.

International mobilization to advance ocean prediction capabilities

The Ocean and its ecosystems transcend national boundaries, requiring international cooperation to observe the world's Ocean at a global scale and to use Ocean prediction to monitor the present, understand the past, and explore the future for the benefit of society.

The international Ocean prediction science community is now united in its commitment to support the health of the Ocean and the wellbeing of coastal and island communities around the world. By advancing Ocean prediction capabilities, the community delivers the evidence based and decision-support tools required for informed decision-making in diverse sectors such as climate resilience, biodiversity protection, pollution control, sustainable blue economy, maritime and rescue operations. Advancing ocean prediction directly supports the achievement of United Nations Sustainable Development Goal 14: "Life Below Water".

Ocean prediction tools, including reanalysis and forecasting systems, are essential to enable evidence-based decision-making and further support the sustainable stewardship of ocean resources, the protection of marine biodiversity, and the development of effective climate change mitigation and adaptation policies.

Urgent action is needed to protect the Ocean and its ecosystems (for example coral reefs) impacted by climate change and human activities, where impacts are felt most strongly in the coastal zones, the Arctic, and the deep Ocean. Innovations in Ocean prediction systems and services, including improved models and data assimilation capabilities and the use of artificial intelligence and digital twinning, offer new solutions for Ocean protection and sustainable development, but implementing these systems at a global scale and ensuring their benefits are available and adapted to all remains a significant challenge.

The international ocean prediction science community has achieved significant progress in this direction over the past decades. It is mature, united and prepared to address the related scientific and technical challenges identified at the [OceanPredict24 Symposium](#).

Strong international cooperation and mobilization of all ocean prediction stakeholders is essential to put state-of-the-art science and technology at the service of society to address the critical issues facing our Ocean.

These challenges include:

- Enhancing the integration of models representing ocean and sea ice physics, biogeochemistry, biology, surface waves, and the atmosphere,
- advancing the prediction of coastal and polar areas,
- advancing and expanding ocean biogeochemistry, marine life and ecosystem prediction,
- developing further marine pollution modelling, including marine debris, chemicals and oil spill,
- filling gaps in the global ocean observing network, including implementing and sustaining the OneArgo array and preparing the required future satellite oceanography missions,
- developing and using tools to design and assess the impact of observing systems,
- developing higher resolution sub-mesoscale models and data assimilation,
- extending the forecast horizon up to 1 month, and extending seasonal, decadal prediction and climate projection to the marine ecosystems,
- enhancing the intelligence of ocean prediction products by providing uncertainties and probabilistic forecasts,
- developing artificial intelligence modelling and data assimilation methods,
- harnessing digital twins to enhance the interaction between ocean prediction centres and users' communities, including the co-design of "what-if" scenario tools to support planning for climate resilience, restoration, and ocean-based economies

At the mid-term of the United Nations Decade of Ocean Science for Sustainable Development, ocean prediction stakeholders commit to strengthening international cooperation and mobilization through the following coordinated actions:

- ✓ OceanPredict and UN Ocean Decade programmes (e.g. ForeSea, CoastPredict, Ocean Observing Codesign, Marine Life 2030, DITTO, Ocean Practices) and other relevant partners **to design innovative and reliable evidence-based decision-making tools** taking full advantage of the use of machine learning and digital twins, while ensuring inclusivity, transparency, and regional engagement in the design and use of these tools.
- ✓ OceanPrediction DCC, in collaboration with Ocean Data Sharing DCO and Ocean Observing DCO **to define common architectures, standards, and best practices**, advancing towards an integrated Digital Ecosystem, so that these forecasting services and decision-making tools are state-of-the-art, duly verified and fully accessible,
- ✓ GOOS, space agencies, GEO Blue Planet, the Marine Biodiversity Observation Network (MBON), WMO, and other relevant partners, **to improve links between scientific and operational communities across the value chain from observations to operational centres to final users**, including with the weather forecasting community,
- ✓ The climate communities (e.g., WCRP, CLIVAR, ESMO, CMIP, and other relevant partners), and the ocean prediction communities, **to co-design robust, fit-for-purpose ocean numerical models, ocean climate indicators and information** that support climate adaptation strategies, sustainable development and a carbon-neutral ocean economy.

This global mobilization will also promote knowledge transfer, capacity building, and inclusive participation - particularly with Small Island Developing States, Least Developed Countries, and other regions most vulnerable to climate impacts - ensuring no one is left behind in the ocean prediction revolution.