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Written Statement to the 2022 UN Ocean Conference



Digital Twin of the Ocean – Future Proofing Ocean Sustainable Development

The ocean economy is growing and the pressures on our seas and the ocean, including from overexploitation, pollution and climate change, have asserted significant stresses on the marine system. Digital twins are rich, virtual representations of objects and systems, in this case the ocean system, or a part of it. They allow us to track how and why the things we care about are changing and simulate what their futures could be, including by exploring ‘what if?’ scenarios. They can provide critical knowledge to plan and guide human activities and sustainable development in the ocean and coastal spaces to safeguard a healthy ocean and support a sustainable green-blue economy and sustainable development.

Digital twins depend upon:

- an integrated, and sustainable, ocean observing system;
- predictive processes or data-driven models with which users can interact, to support their needs;
- well-managed, accessible and interoperable data and software;
- knowledge exchange interface and visualisation capabilities.

The connection between a digital twin and its real-world counterpart requires a well-formulated interface between the digital twin, environmental and societal data, and the user. User interaction is an essential function embedded in the design of digital twins, to ensure maximum information value for investment in ocean observations. This may include user driven development of visualisation, user-driven data transformation and data-science tools or predictive modelling.

The UN General Assembly proclaimed 2021-2030 the UN Decade of Ocean Science for Sustainable Development. One of the 10 UN Ocean Decade Challenges calls on the ocean community to develop a digital representation of the ocean. The UN Ocean Decade’s Digital Twins of the Ocean (DITTO) Programme responded to this challenge and aims to establish the international framework to support the coordinated development of interoperable digital twins across the ocean community.

We call upon nations, scientists, funders and stakeholders to collaborate to:

- develop a unified vision on digital twins of the ocean, contribute to their development, and explore their utility through e.g. regional or thematic demonstrators;
- anchor the design and priorities of digital twins in the questions and challenges faced by users of ocean information in particular marine spatial planning and sustainable ocean development;
- promote engagement of natural and social scientists, engineers, civil society, private sectors, creative industries, citizens and governments who are essential in the co-design, application and refinement of digital twins;
- support the curation and sharing of ocean data as a core component of ocean observation programmes (whether from government, industry, academia or civil society);
- support data initiatives designed to maximise the information value from investment in observations to help unlock the full potential of digital twins;
- develop a framework for governance, standards, best practice and coordinated testing during the development of digital twins;
- co-design with ocean observing programs such as GOOS the evolution of ocean observing systems and their sustained resourcing.
- infuse new technology and innovation from artificial intelligence and machine learning to advance, connect, and improve predictive system and data-model fusion capabilities.
- engage and collaborate with state of the art visualisation and data exploitation capabilities.
- enable education and training in all aspects relating to digital twins of the ocean across disciplines, communities and regions, leaving no one behind;
- engage Early Career Ocean Professionals throughout digital twin development;
- prioritise communication and raise awareness of the utility and application of mature digital twins with the public and in the field of marine policy.

The scale of effort to support the delivery of ocean information required to understand the climate system, address negative impacts of human activities, improve large-scale marine ecosystem management and guide the development of a more sustainable ocean economy, is beyond the capabilities of any single nation. Global trans-basin investment and coordination are required across the value chain to ensure fit-for-purpose Digital Twins of the Ocean.

Information about the DITTO Programme can be found at <https://ditto-oceandecade.org/>