



## **XIAMEN DECLARATION The Statement from DITTO Summit 2023**

*from 9-12 November 2023 in Xiamen, China organized  
by  
Fujian Ocean Innovation Centre  
&  
State Key Laboratory of Marine Environmental Science (Xiamen University)  
&  
UN Ocean Decade DITTO Programme*

Experts, stakeholders, and policymakers assembled at the International Digital Twins of the Ocean Summit (DITTO Summit 2023) in Nov 2023 in Xiamen, China, with 450 attendees from 19 countries. The four-day Summit explored progress in the development of digital twins of the ocean, considered their requirements for infrastructure, encouraged the enrollment of the young generation, described emerging and potential applications, and defined a path forward.

The participants of the DITTO Summit 2023 gathered here to advance our commitment to the sustainable exploration and stewardship of the ocean. The health of our planet is intrinsically linked to that of the ocean, and we commit to taking collective action to safeguard it. With a consensus of recognising the urgent need to develop novel digital technologies to help better understand and conserve the ocean, we together declare the following:

- **Technology Development:** We acknowledge the transformative potential of digital twins in enhancing our understanding of the ocean. We recognise that they can serve as invaluable tools for enabling evidence-based decision-making for a sustainable ocean.
- **Ocean Observations and Models:** We underscore the foundational importance of sustained and shared ocean observations to provide near real time input to digital twins. High resolution modular ocean models are fundamental building block of digital twins. Efficient data learning and data fusion methods are essential for effective twin systems.
- **Collaboration and Partnerships:** We emphasise the importance of the users of ocean information, and encourage collaboration to address the complex challenges facing our oceans. We encourage the establishment of partnerships and networks that foster knowledge exchange, interdisciplinary research, and innovation in the field of digital twins.
- **Sharing and Accessibility:** We underscore the importance of developing interoperability amongst existing and future data and information repositories supporting digital twin applications in accordance with the

Decade Data and Information Strategy. We commit to promoting transparent and responsible digital practices, ensuring that relevant tools, data and information are made FAIR – findable, accessible, interoperable and re-usable, while respecting privacy, security, and ethical considerations.

- **Engaging the Young Generation:** We emphasise the critical importance of Early Career Ocean Professionals (ECOP). We recognize their unique perspectives, skills, and enthusiasm, and we commit to engaging and empowering them, creating opportunities for their active involvement in DITTO.
- **Capacity Building:** We recognise the need to build capacity and ensure digital twin technologies are available to all. We support approaches that are open and widely usable, and advocate for educational programs, training initiatives, and knowledge-sharing platforms that enhance digital literacy and promote the dissemination of best practices.
- **Trust and Quality:** We understand that the quality and re-usability of underpinning data and information is needed to support the effective use of digital twins. This is a significant scientific and technological challenge for all digital tools, including digital twins. We prioritize research and development efforts, invest in testing methodologies, and promote transparency in shared data and information.
- **Ocean Governance:** We call upon governments, international organisations, and stakeholders to strengthen ocean governance frameworks and policies that support the integration of digital twin technology into sustainable ocean management practices. We stress the need for regulatory frameworks that foster innovation while safeguarding the environment and the interests of all ocean stakeholders.
- **Ocean Decade Collaboration:** We align our efforts with the United Nations Decade of Ocean Science for Sustainable Development (2021-2030). We commit to actively contributing to the Ocean Decade's objectives and goals, leveraging digital twin technology for the benefit of present and future generations.

We will collaborate across disciplines to develop digital twins, fostering innovation in support of the UN Decade goals. We agree on the need to engage the young, and provide them with opportunities to contribute their insights and expertise.

We plan to invest in research and development, promote interdisciplinary collaboration, and establish partnerships, to advance the use of ocean digital twins. We will share best practice, develop standards and organise workshops and capacity-building initiatives to empower the global community and ensure their active participation in shaping the future of sustainable ocean practices.

We pledge our unwavering commitment to supporting the science required for an equitable and sustainable planet for present and future generations, supported by digital twin approaches.