The IOC Ocean InfoHub Project

Developing technology to deliver FAIR marine data

Marine Environmental Data and Information Network (MEDIN) Open meeting

Lucy Scott

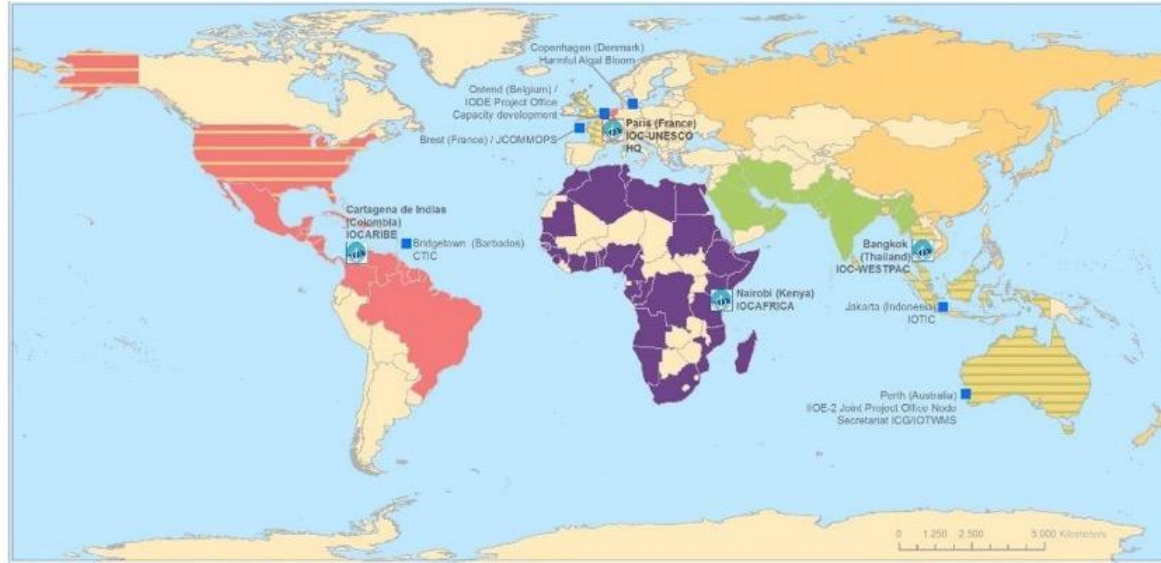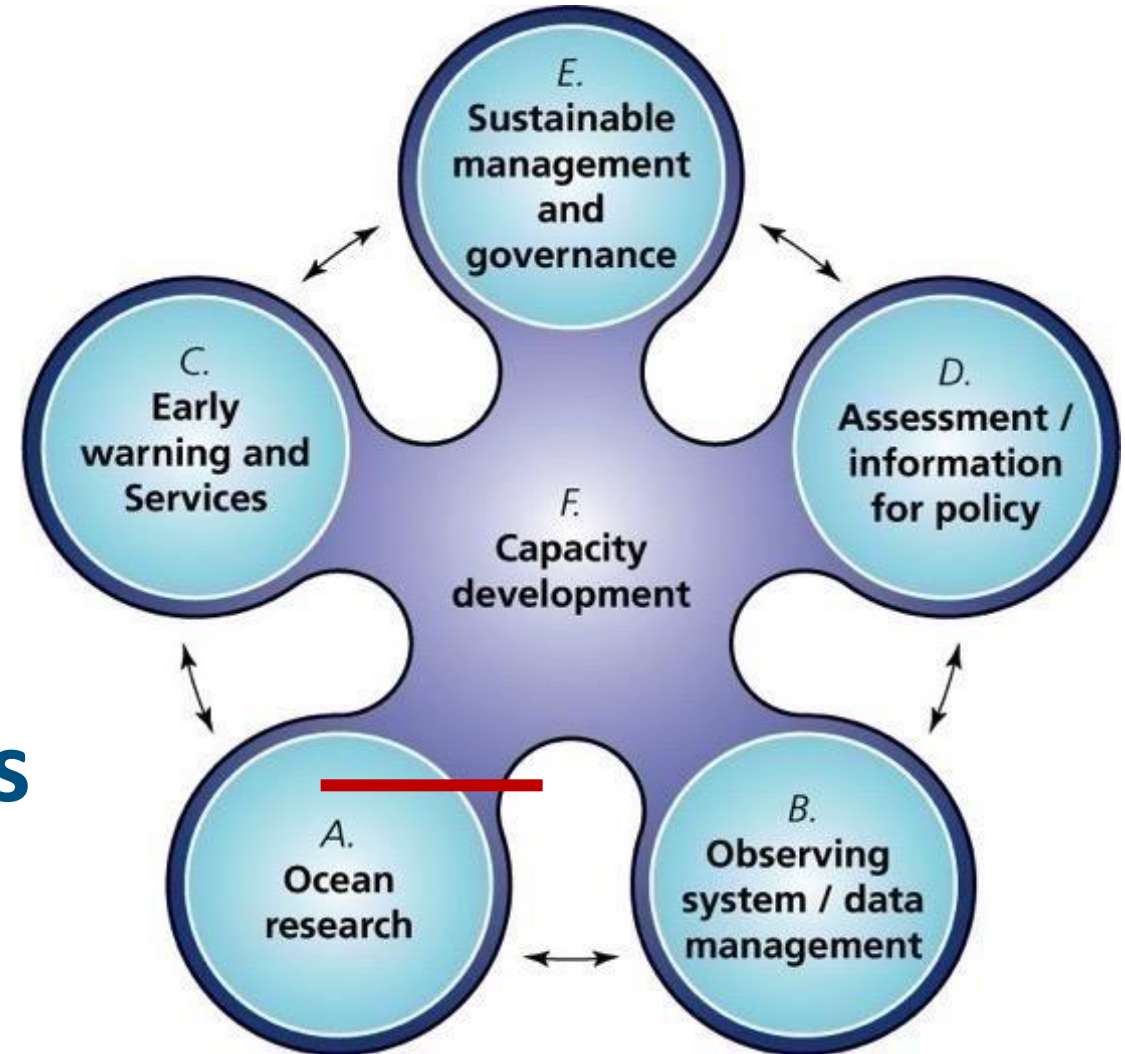IOC Project Office for IODE, Oostende, Belgium

3 March 2022

The Intergovernmental Oceanographic Commission

- Functionally autonomous part of UNESCO, founded 1960, 150 Member States
- Scope: international cooperation and coordination of ocean research, services and capacity building
- Aim: improvement of ocean management, sustainable development, protection of the marine environment, support to decision-making processes of Member States
- Recognized through UNCLOS as a competent international organization in the fields of Marine Scientific Research (Part XIII) and Transfer of Marine Technology (TMT) (Part XIV)
- May act as a joint specialized mechanism of the organizations of the United Nations system that have agreed to use the IOC for discharging certain of their responsibilities in the fields of marine sciences and ocean services (Statutes, article 11.3)
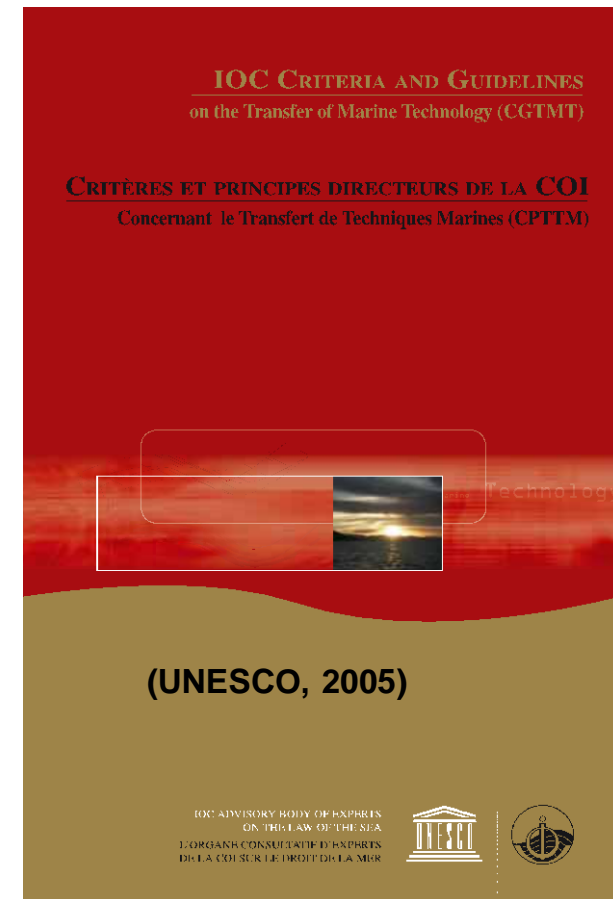
IOC regions

IOC global functions

IOC CRITERIA AND GUIDELINES
on the Transfer of Marine Technology (CGTMT)

CRITÈRES ET PRINCIPES DIRECTEURS DE LA COI
Concernant le Transfert de Techniques Marines (CPTTM)

(UNESCO, 2005)

IOC ADVISORY BODY OF EXPERTS
ON THE LAW OF THE SEA
L'ORGANE CONSULTATIF D'EXPERTS
DE LA COI SUR LE DROIT DE LA MER

Target 14.A: Increase scientific knowledge, develop research capacity and transfer of marine technology, taking into account the Intergovernmental Oceanographic Commission Criteria and Guidelines on the Transfer of Marine Technology**, in order to improve ocean health and to enhance the contribution of marine biodiversity to the development of developing countries, in particular small island developing States and least developed countries.**

UNESCO/IOC services supporting access to data and information

1. Online data sharing platforms:

- International Oceanographic Data and information Exchange (IODE)
- Ocean InfoHub Project (OIH) and Ocean Data and Information System (ODIS)
- Ocean Biodiversity Information System (OBIS)
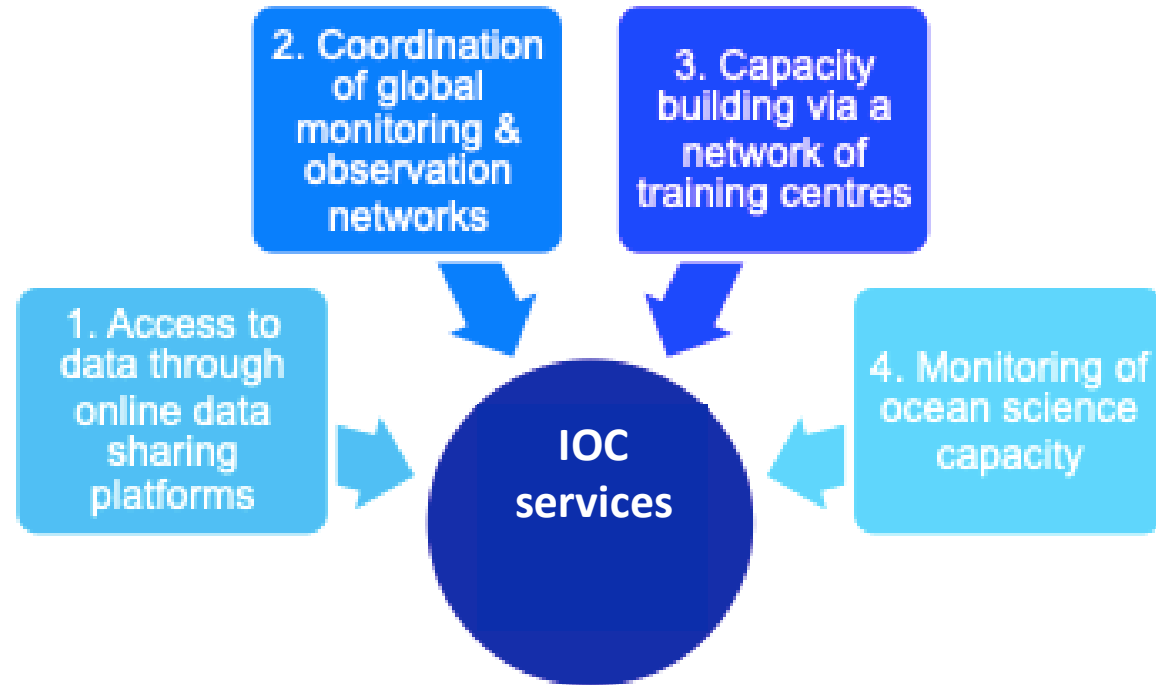
2. Monitoring and observation networks:

- Global Ocean Observing System (GOOS)
- Harmful Algal Information System (HAIS)
- Global Ocean Acidification Observing Network (GOA-ON) and ocean acidification data portal

3. Capacity development
- Regular Assessment of CD needs
- OceanTeacher Global Academy (OTGA)
- IOC Regional Network of Training and Research Centres

4. Monitoring ocean science capacity

- Global Ocean Science Report (GOSR)

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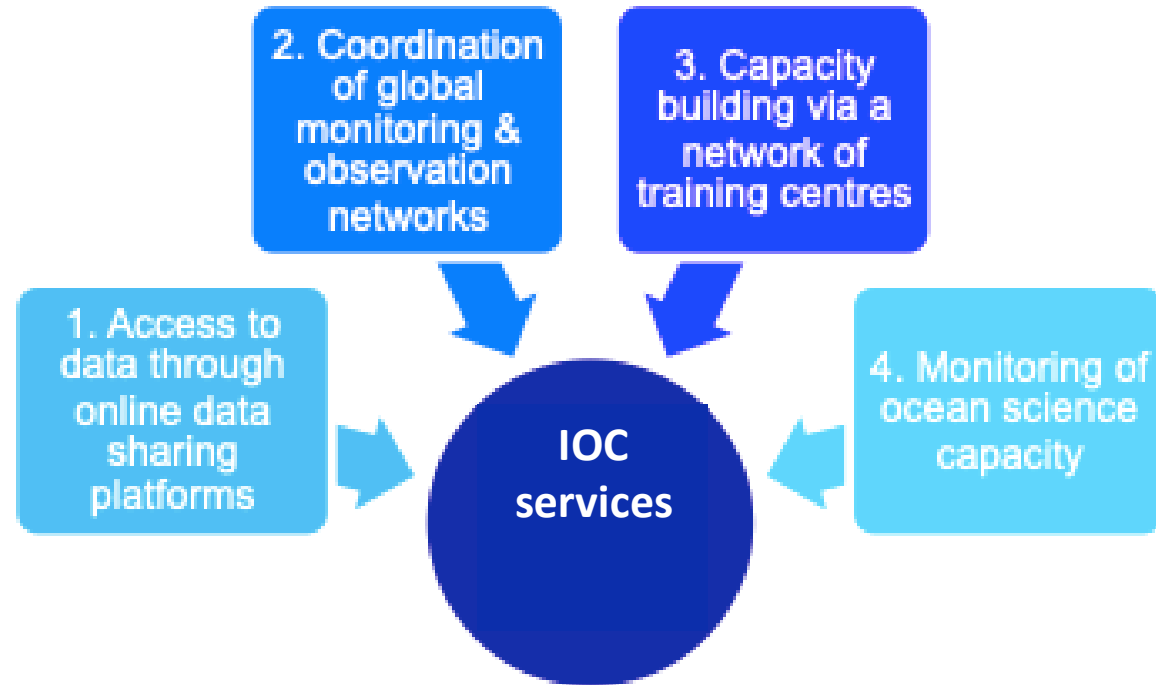
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- Global Ocean Science Report (GOSR)

2. Coordination of global monitoring & observation networks

3. Capacity building via a network of training centres

1. Access to data through online data sharing platforms

IOC services

4. Monitoring of ocean science capacity

FAIR principles

SCIENTIFIC DATA

OPEN

Comment: The FAIR Guiding Principles for scientific data management and stewardship

Mark D. Wilkinson *et al.*[#]

There is an urgent need to improve the infrastructure supporting the reuse of scholarly data. A diverse set of stakeholders—representing academia, industry, funding agencies, and scholarly publishers—have come together to design and jointly endorse a concise and measureable set of principles that we refer to as the FAIR Data Principles. The intent is that these may act as a guideline for those wishing to enhance the reusability of their data holdings. Distinct from peer initiatives that focus on the human scholar, the FAIR Principles put specific emphasis on enhancing the ability of machines to automatically find and use the data, in addition to supporting its reuse by individuals. This Comment is the first formal publication of the FAIR Principles, and includes the rationale behind them, and some exemplar implementations in the community.

FAIR principles

1. Findable
2. Accessible
3. Interoperable
4. Reusable

Further reading https://www.go-fair.org/fair-principles/

The Ocean InfoHub (OIH) Project

The Ocean InfoHub (OIH) Project aims to improve global and equitable access to ocean information, (meta)data and knowledge products for management and sustainable development.

The project will leverage a digital exchange architecture to power an openly accessible web platform supporting communication and interoperability between distributed and independent digital systems.

The project is funded by the Government of Flanders (Kingdom of Belgium) for three years (commenced April 2020)

The OIH Project has supported the development of the Ocean Data and Information System Architecture (ODIS-Arch), reusing common data exchange conventions such as schema.org, to allow existing and emerging ocean data and information systems, from any stakeholder, to begin interoperating with one another and solutions such as OIH.

OIH links IOC databases

The OIH will first work with global IOC-associated online resources – including:

- OceanExpert : *People*

- AquaDocs : *Documents and Publications*

- The GOOS/IODE Ocean Best Practices System (OBPS)

- Data: the Ocean Biodiversity Information System (OBIS)

- Data: the World Ocean Database (WOD)

- extended by partnerships with EurOcean, Marinetraining.eu, EMODNET, and other sources in the IOC ODIS Catalogue of Sources (ODIScat).

Three pilot regions

1. African region,

2. Latin America and Caribbean region, and the

3. Pacific Small Island Developing States

OIH will benefit marine and coastal stakeholders across the globe, but its initial focus will be on responding to requests for data products and services from three regions: Africa, Latin America and the Caribbean, and the Pacific Small Island Developing States.

Co-development with partners from these regions.

Initial data types

- The initial priorities for the Project are to develop communities of practice for the three pilot regions, and ODIS-Arch specifications for six priority themes:

- (i) Experts and institutions/organizations,

- (ii) Documents,

- (iii) Spatial data and maps,

- (iv) Research vessels,

- (v) Education and training opportunities,

- (vi) Projects.

Data categories in ODIS-Cat

Bibliographic infobases (catalogues and repositories)	Code lists and vocabularies	Data catalogues	Data products (model output, forecasting, climatologies,...)
Data systems/portals (allowing downloading of datasets)	Education and training materials	Information on platforms (buoys, sensors, floats, gliders, satellites,...)	Information on experts and organizations
Information on projects	Information on vessels	Journals (open source and commercial)	Manuals, guidelines, standards and best practices
Maps and atlases (geospatial products)	Multimedia content	Real-time observing systems	Software (ocean related)

OIH SERVICES – global demonstration
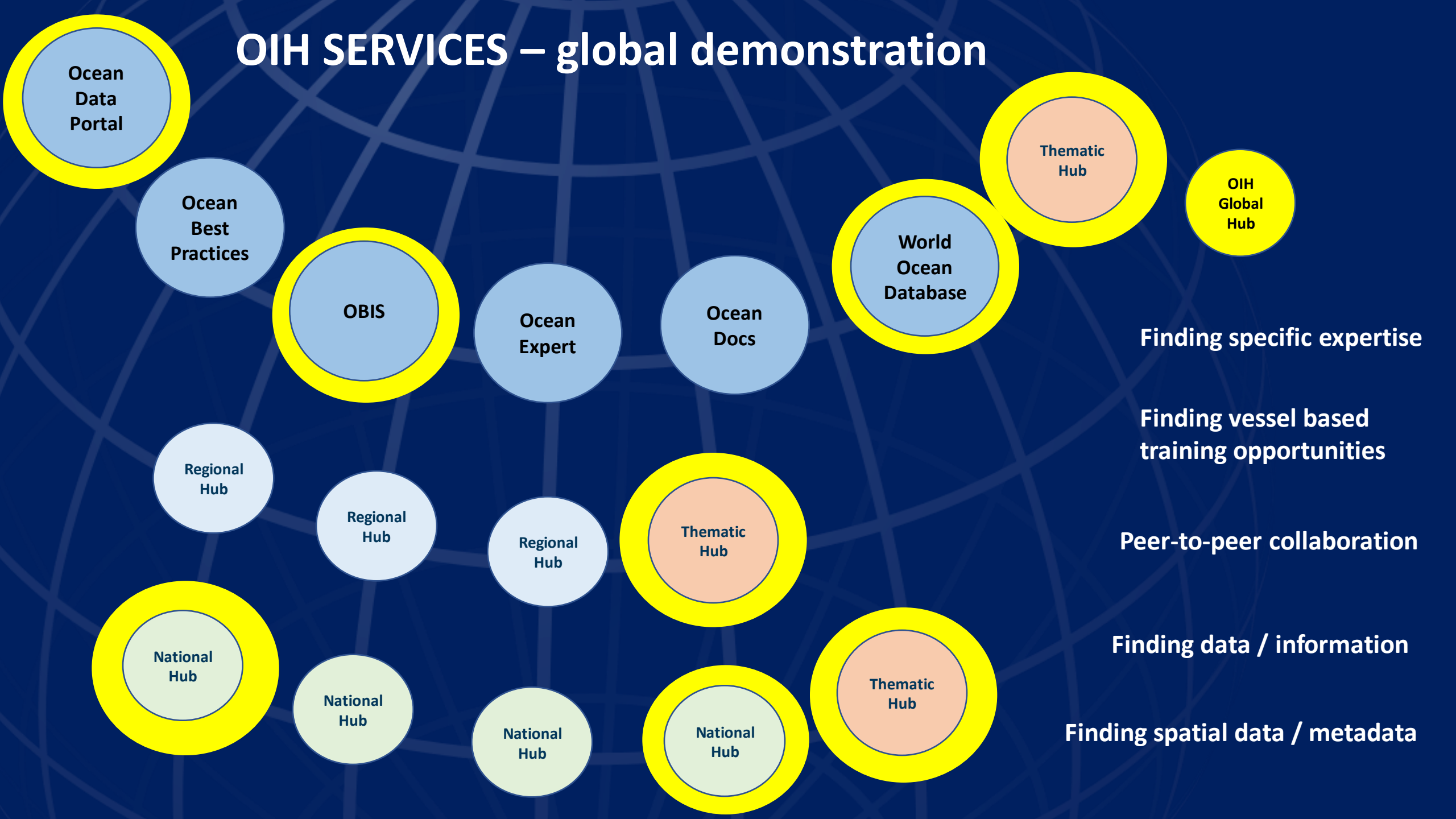
Ocean Data Portal

Ocean Best Practices

OBIS

Ocean Expert

Ocean Docs

World Ocean Database

Thematic Hub

OIH Global Hub

Regional Hub

Regional Hub

Regional Hub

Thematic Hub

National Hub

National Hub

National Hub

National Hub

Thematic Hub

Finding specific expertise

Finding vessel based training opportunities

Peer-to-peer collaboration

Finding data / information

Finding spatial data / metadata

ODIS-architecture Proof-of-concept

OIH Global Hub

Thematic Hub (MarineTraining.eu)

Ocean Best Practices

OBIS

Ocean Expert

Aqua Docs

World Ocean Database

Regional hub Africa (IOCAfrica)

Regional hub LAC (CHM-TMT)

Regional hub PSIDS SPC

Regional hub PSIDS SPREP

Thematic Hub (CORDIO MASPAWIO)

Marine Institute (IE)

National Hub

National Hub

National Hub
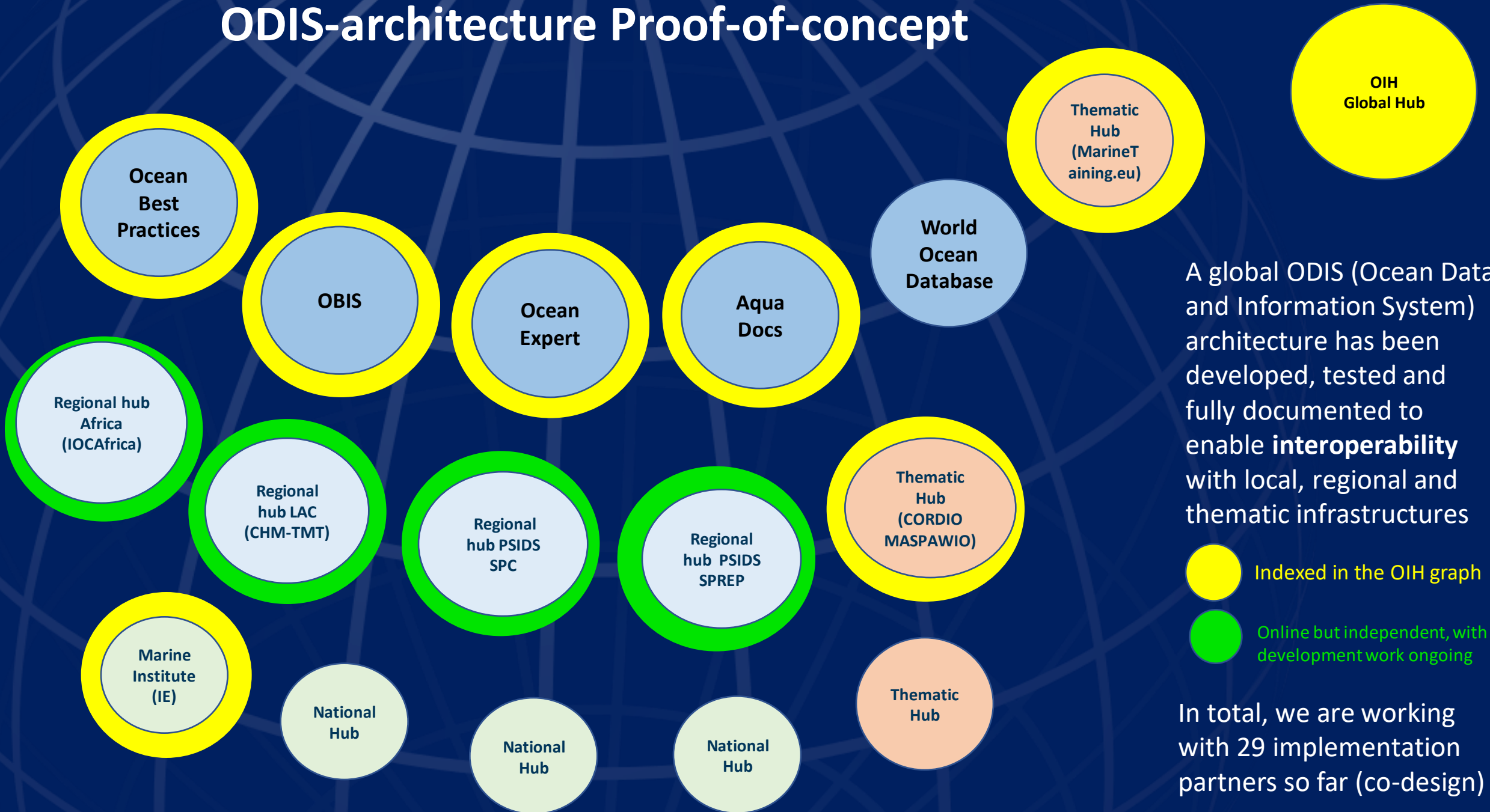
Thematic Hub

A global ODIS (Ocean Data and Information System) architecture has been developed, tested and fully documented to enable **interoperability** with local, regional and thematic infrastructures

Indexed in the OIH graph

Online but independent, with development work ongoing

In total, we are working with 29 implementation partners so far (co-design)

Overview of project status

A reference implementation of the global hub server side architecture demonstrates the facility to search across the existing nine working implementations.
https://oceans.collaborium.io/index.html

We are also developing a front-end web portal that dynamically builds content based on the (meta)data shared by early implementers of the ODIS-Architecture. This portal will have a high profile on the OIH web site home page.

Building partnerships and including more nodes

- IOC/OTGA/OIH Training course: Implementing the Ocean Data and Information System (ODIS) architecture. 25-29 October 2021 [online]
- https://classroom.oceanteacher.org/course/view.php?id=722

During this course, participants are shown how to link their systems into ODIS and to make them a more visible and actionable part of the ocean's digital ecosystem.

Please join us https://oceaninfohub.org

The International Ocean Data Conference

During the conference several recommendations were made jointly by the global ocean data and information management community:

- need for increased efforts in standardisation, best practices and harmonization as well as wider application of FAIR and CARE principles

- increase the widest community engagement including citizen science, indigenous knowledge and improving data literacy

- need to increase efforts in global data and information system interoperability and networking to achieve a global ocean digital commons and data ecosystem, also achieving interconnection and integration of data systems (digital twins) from different disciplines and sectors (including private sector) related to the ocean

- foster integrated multi-hazard warning systems within Earth System Observation, Research, and Prediction programmes, not only aiming at ocean health, but manifesting the 7 Decade's societal outcomes underlining the qualities of the ocean and of the people.

The International Ocean Data Conference

- In the context of the UN Ocean Decade, the global ocean data and marine value chain community will collectively enable a 'living' ocean digital ecosystem:

- data provenance should be fully traceable via a common set of metadata enriched with thematic/sector/uptake relevant tagging information e.g., relevance to EOVs, SDGs;

- the ocean digital ecosystem should be fully machine searchable and actionable, meaning that when data or metadata are updated, it will be automatically streamlined and available throughout the data pipeline and via the global digital commons;

- To achieve this harmonisation of standards making data fit for multiple use, there is a need for globally distributed networks of information and science-based quality requirements co-developed by the marine data community.

- We urge the ocean science community to engage with IODE, GOOS and other agencies and the UN Ocean Decade to maintain ongoing dialogue.