

Shaping the Future Ocean Observing & Services Market – Maturing the Ocean Enterprise

23rd meeting of the UN Open-ended Informal Consultative Process on Oceans and the Law of the Sea

Panel: “New maritime technologies: the technologies, their uses and their contributions to sustainable development”

United Nations Headquarters, New York, June 6th, 2023

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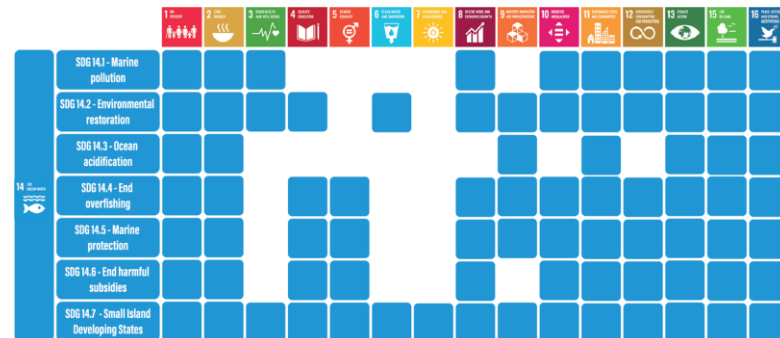


Better understanding the ocean and maintaining a healthy status is vital in the context of the SDGs.

Ocean observation data and services are **critical** for the growing **Blue Economy** and **society**.

- Ocean management – ecosystem services, sustainable fisheries and aquaculture, biodiversity protection
- Climate Change – forecasts, adaptation, investment in carbon storage
- Small-footprint transport and tourism
- Sustainable offshore energy

“Many Sustainable Development Goals (SDGs) may not be realized without achieving SDG 14 for a healthy ocean”

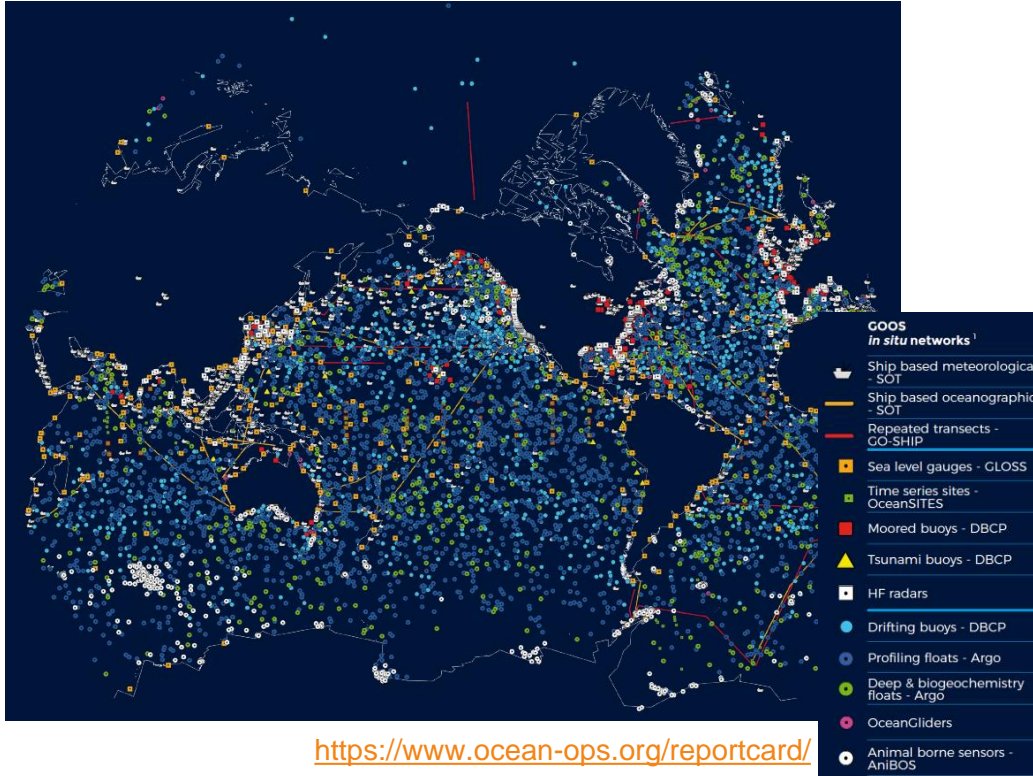


Joachim Claudet et al. 2019,

<https://doi.org/10.1016/j.oneear.2019.10.012>

DIALOGUES WITH INDUSTRY

Global Ocean Observing System



<https://www.ocean-ops.org/reportcard/>

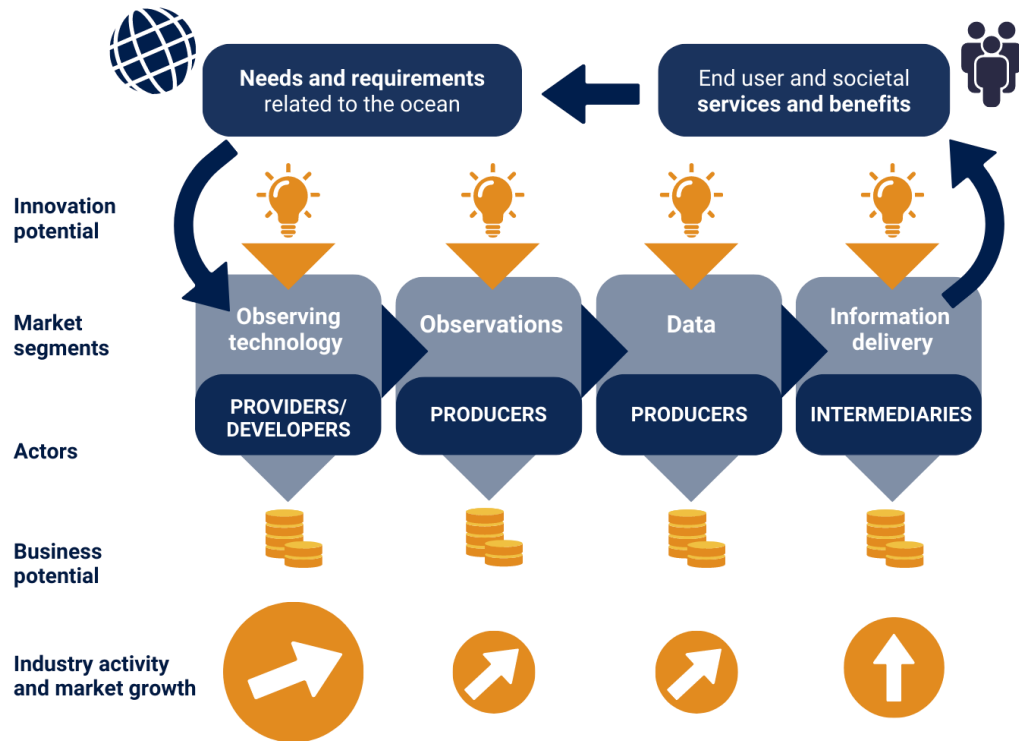
- **84** countries, **8,700+** observing platforms, **13** global networks
- Ocean and marine metrological EOVs and ECVs, incl. biological and ecological obs.
- **GOOS is the infrastructure that coordinates the global system**
- **Key infrastructure delivering data for services across weather, climate, hazard warnings and ocean health**

“Weather forecasting systems will run off the rails if they don’t have the surface pressure information over the ocean to constrain them,” Lars Peter Riishojgaard, Director WMO.

*Good basis for further development and expansion in line with the needs!
Sustained funding? Enhanced mandate?*

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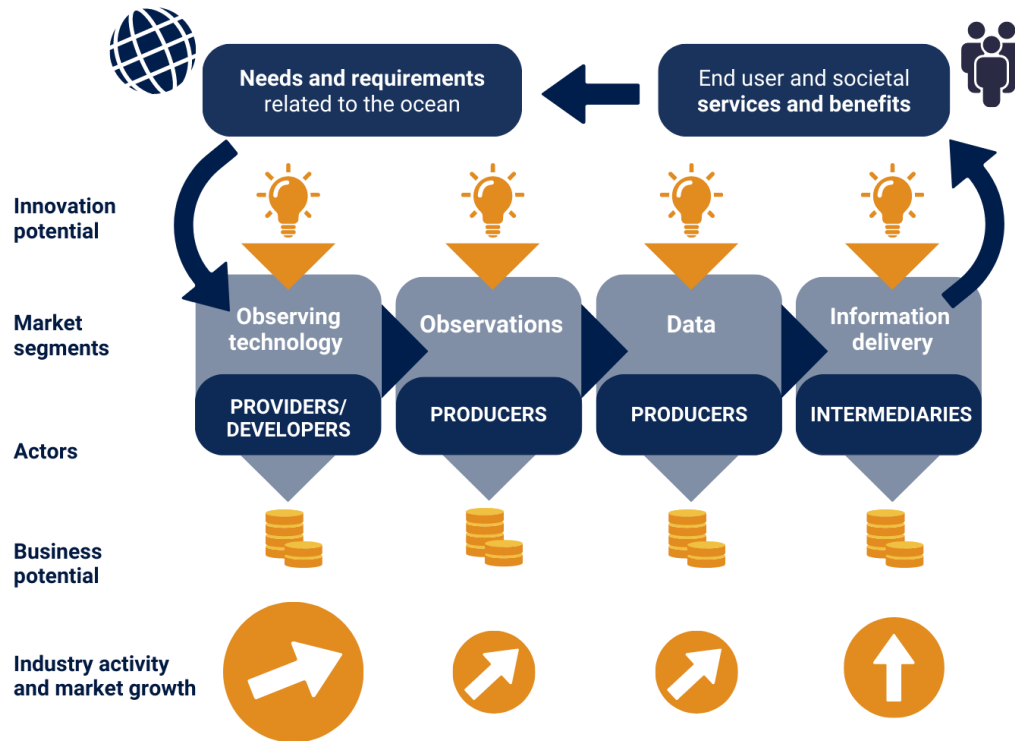
Market Components & Challenges



- No consistent view of **technology needs**
- Lack of visibility of **market potential**; **fragmented** market with small unit numbers
- Lack of visibility of **R&D efforts** in academia; limited **partnering** with industry; **duplication** of development work
- Interaction of **new commercial services** with established operations
- High **unit costs** and no universal standards; **variable** manufacturing/calibration **quality**
- **System resilience** with limited suppliers serving other markets

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Market Components & Benefits



A mature market across the value chain would:

- Have more **clarity** and **planning capacity**; **growth** and more industrial **engagement**
- Show enhanced manufacturing **efficiency**
- Foster demand for technological/service and spur faster **innovation**
- Lead to a **drop in cost** for data and more **targeted** products
- Enhance the **data flow** and enable **information products**
- Increase in **sustained ocean observing** system capacity globally

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Maturing the Ocean Enterprise

The **Ocean Enterprise** / The **New Blue Economy** are emerging and hold significant economic potential.

Maturing Ocean Observing from *ancillary* to *critical*.

Through **collaborations, partnerships, communication initiatives...**

...across the technology supply chain

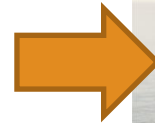
...towards new public-private partnerships

...addressing ambitious projects

Dialogues with Industry, a significant opportunity to **connect** the public, private and academic sector **stakeholders** in the GOOS.

4 active and vibrant **Dialogues between industry, academia and government** between Sept. 2022 and Jan. 2023.

Develop **actionable recommendations** for intersectoral **collaboration** to **meet the future needs** of science, society and the Blue Economy by evolving and expanding the OOS and information service delivery.



Instrument provision

Supply and development of sensors and platforms

Multi-sectoral ocean architecture

Integrating new observing networks and business models

User driven ocean information services

Core and downstream services

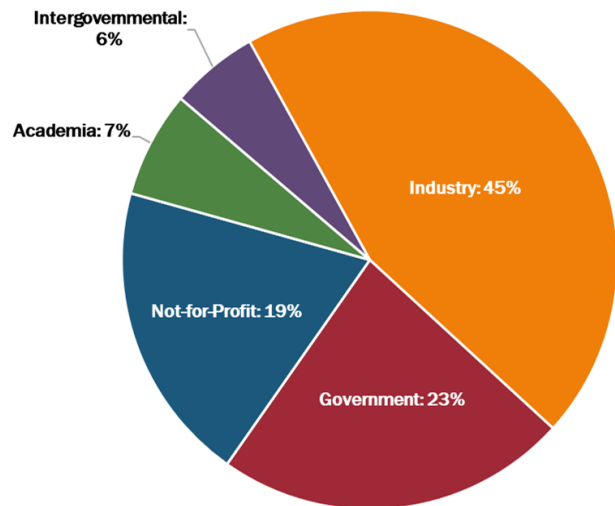
Looking ahead

New technology for the Ocean Decade

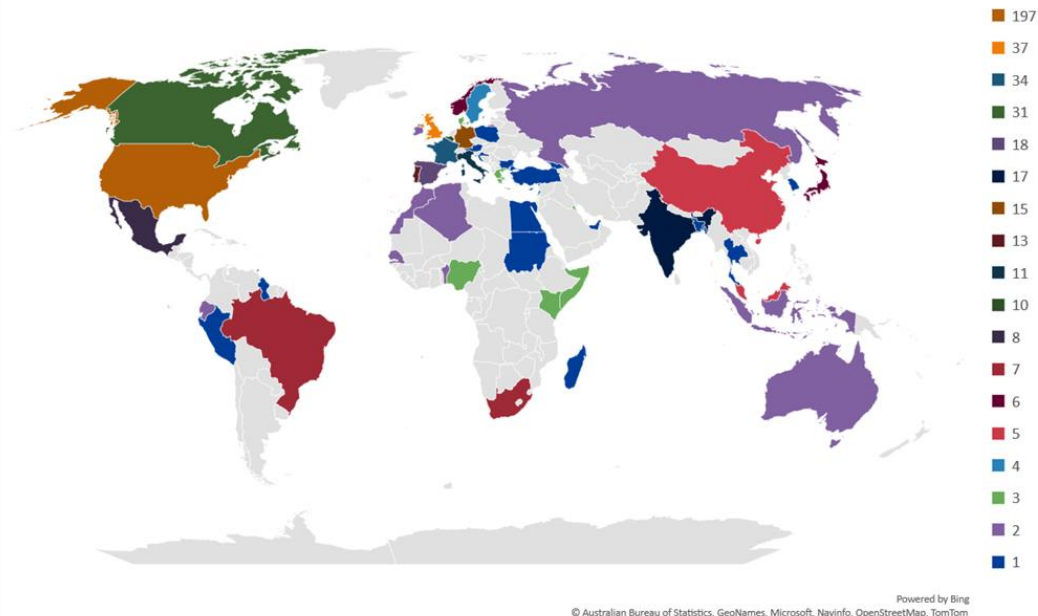
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Participant Demographics

Dialogues 1-4: Panelist Sector (n=87)



Dialogues 1-4: Observer Location (n=492)



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Initial Synthesis

Focus Areas

1 Improving the market

2 Societal/
Governmental
change

3 Collaboration to
grow

4 Market elements
shaping the future

Categories

- Market size and aggregation
- Risk
- Bringing in new actors

- Data and mission as a service
- Ocean information perception

- Standards
- Intermediaries
- Data access
- Blue tech clusters, incubators, and accelerators

- Workforce
- Technology transfer
- Emerging technology

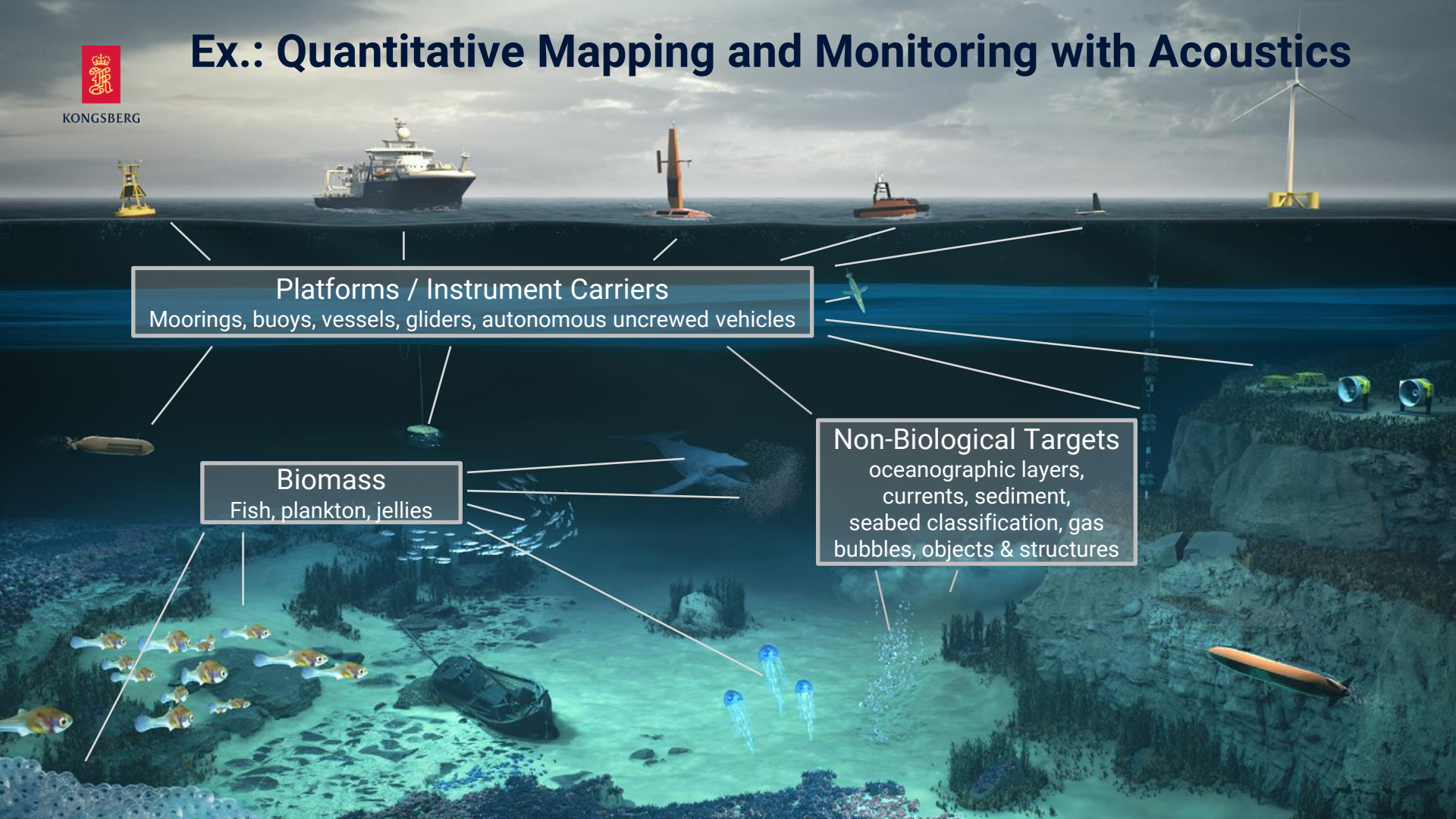
- **Standards** (hardware, software) and **best practices** are essential elements of an established Ocean Enterprise industry; **lack of their use** identified as a **barrier**.
- With **broadband communications** at global coverage on the horizon a disruptive improvement for data collection is expected.
- **AI/Machine Learning** can be used for the characterization of big data and understanding complex relationships; **comprehensive digital platforms** and **Digital Twins**.
- Advancements with **autonomous vehicles** (floats, surface, underwater, and their hybrids) are poss. the **most impactful**, emerging technological transformation for the next decade; **smarter**, increasingly capable and **cost-effective**; **ultra-long range** and **duration**; equipped with chemical, biological and physical sensors to generate data sets that can **replicate ship capabilities** with zero/low-emissions.
- **New generation of sensors** will provide insights into **biogeochemistry, ocean health and marine life**; low-cost sensors are expensive to develop (→ mature Ocean Enterprise); “Ocean of Things”; EOVs to be updated along with technical advancement.

- **Molecular technology** making its way into oceanography; detection of **genetic signatures**; DNA sequencing for understanding organism and ecosystem function.
- Future lies in finding the right **combination of sensors and** their carrying **platforms** to address **specific use cases** or detect multiple **disparate events** simultaneously.
- **Multi-purpose strategies** take advantage of existing infrastructure and help overcome observing limitations: **subsea cables** for continuous measurements in the deep sea, measurements at active or inactive **offshore structures**, e.g., in offshore wind parks or platforms, enhancing the use of **Voluntary Observing Ships / Ships of Opportunity**.
- **Crowdsourcing** of ocean observation data becomes increasingly popular, e.g. measurements on **surfboards** and measurements on **sailing yachts**.
- Sensor, platform and observing mission advancements will deliver data that **improves modelling and forecasting capabilities**, esp. of sub-mesoscale ocean features (<100 km in size).



KONGSBERG

Ex.: Quantitative Mapping and Monitoring with Acoustics



Platforms / Instrument Carriers

Moorings, buoys, vessels, gliders, autonomous uncrewed vehicles

Biomass

Fish, plankton, jellies

Non-Biological Targets

oceanographic layers,
currents, sediment,
seabed classification, gas
bubbles, objects & structures

- **Ocean observations** deliver **critical data** and are the **foundation** of many downstream applications.
- Increasing **economic** and **societal need** for expanded observations and information applications.
- Ocean observing and services has significant **growth potential** and is to be established and matured as a **market**.
- **Technological advancement** plays a central role during that process.
- **Dialogues with Industry**
 - 4 Dialogues with international and multi-sectoral participation
 - Finalize the **Synthesis Report** and elaborate a **Roadmap**
 - Built a vibrant Ocean Enterprise

*We invite anybody
interested to join
and support us!*

DIALOGUES WITH INDUSTRY

The Dialogues with Industry were organized and supported by:



Organizing committee:

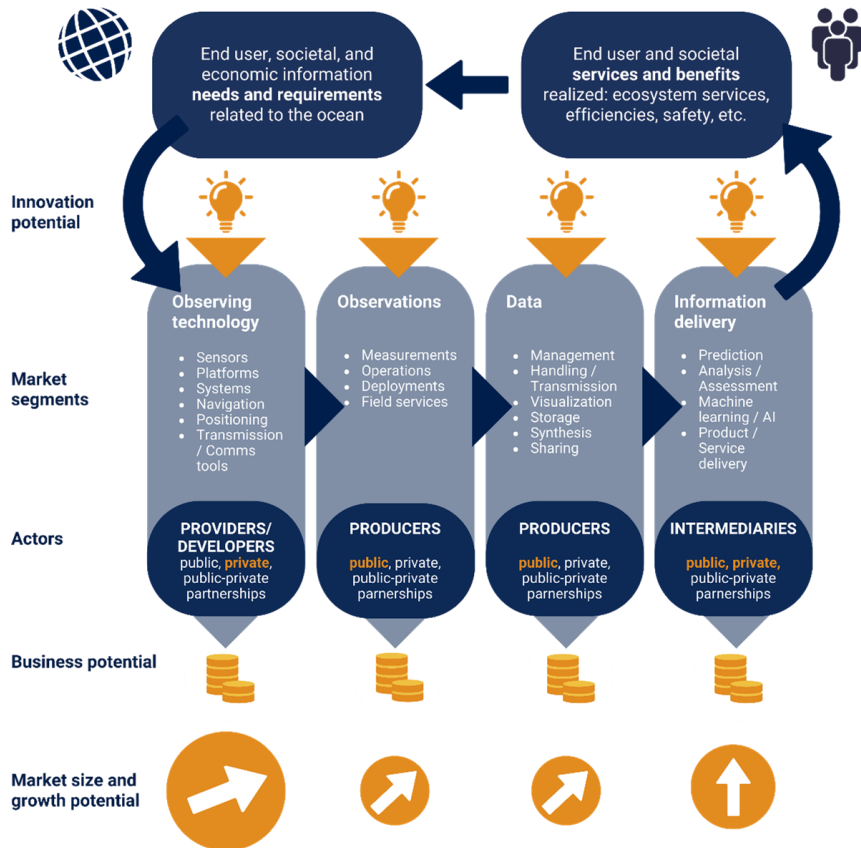
Emma Heslop (GOOS/IOC-UNESCO), **Donna Kocak** (MTS/L3Harris), **Zdenka Willis** (MTS), **Peer Fietzek** (Kongsberg Discovery), **Michelle Heupel** (Integrated Marine Observing System), **Ralph Rayner** (NOAA, IOOS Office), **Boris Kelly-Gerreyn** (Australian Bureau of Meteorology), **R Venkatesen** (MTS India), **Monica Ostrander** (MTS), **Laura Stukonyte** (GOOS/IOC-UNESCO), **Liz Tirpak** (NOAA), **Sebastien Boulay** (South Seas Science Consulting Ltd), **Matthew Hodanbosi** (NOAA)

Website with Background Paper, Dialogue Reports and the Synthesis Report Draft at:

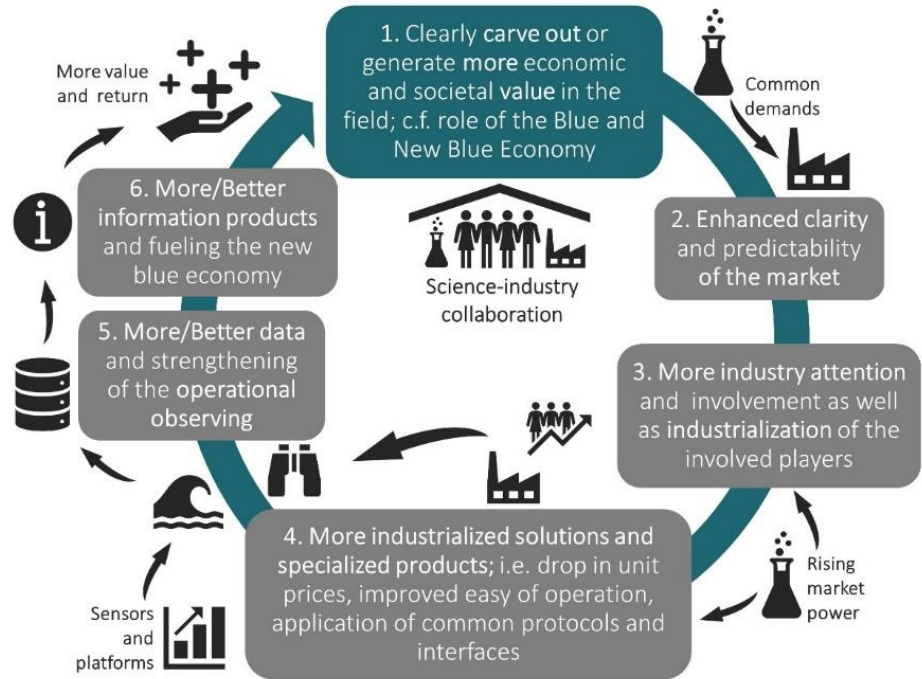
https://goosocean.org/index.php?option=com_content&view=article&id=400&Itemid=448

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Additional Figures



Peer Fietzek 2021,

<https://doi.org/10.1016/B978-0-12-821431-2.02022-9>