Powering the European Marine Data Ecosystem

For a digital and green future

EMODnet
European Marine Observation and Data Network

3rd EMODnet Open Conference Summary Report

29-30 November 2023
Brussels | NHow

emodnet.ec.europa.eu

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This Conference report and all related information can be viewed and downloaded at:
https://emodnet.ec.europa.eu/en/emodnet-open-conference-2023

Contents

Executive Summary ____ 4
Conference programme ____ 7
Session 1: **EMODnet: A unified public marine data service** ____ **11**
Opening addresses ____ 11
Panel: EMODnet EC marine data service: Thematic innovations 13
Panel: EMODnet EC marine data services: Stakeholder perspectives _ 15
Session 2: **EMODnet for the Digital Era** ____ **17**
Panel: EMODnet for the Digital Era ____ 18
Townhalls ____ 20
Townhall: EMODnet and EU Policy ____ 20
Townhall: EMODnet, EU Mission Ocean and wider society ____ 22
Townhall: EMODnet, Ocean Best Practices and Interoperability _ 23
Townhall: EMODnet for the Blue Economy ____ 25
Session 3: **EMODnet community perspectives** ____ **27**
Community posters ____ 27
Open Panel: Community perspectives ____ 28
Session 4: **EMODnet, Ocean Observation and the marine knowledge value chain** ____ **29**
Panel: EMODnet and the EU Ocean Observation landscape ___ 31
Panel: EMODnet, Ocean Observation and data adequacy ____ 33
Stakeholder networking ____ 35
Session 5: **EMODnet impact for society** ____ **37**
Panel: EMODnet for EU Policy ____ 37
Panel: EMODnet and the Blue Economy ____ 40
Panel: EMODnet by and for wider society ____ 42
Session 6: **EMODnet and the Global Ocean Data Ecosystem** ___ **44**
Panel: EMODnet Ocean Best Practices, global data sharing and interoperability ____ 45
Panel: EMODnet's global and regional partnerships ____ 46
Session 7: **EMODnet evolution** ____ 49
Panel: EMODnet evolution ____ 49
Presentation of EMODnet Call to Action ____ 51
Annex I: **Physical Exhibition** ____ **53**
Annex II: **EMODnet Open Conference 2023 Virtual Exhibition** _ **55**
Annex III: **Jamboree partner Event** ____ **60**

Executive Summary

Between 27-30 November 2023, over 340 partners, associated partners and wider stakeholders of the European Marine Observation and Data Network (EMODnet) gathered in Brussels, Belgium for the third EMODnet Open Conference and Jamboree. The EMODnet Open Conference and Jamboree is a flagship event, with the previous edition having taken place in June 2021, fully online due to ongoing Covid restrictions. The 2023 edition was a fully in-person event with a wide range of networking opportunities, meetings, interactive dialogues and plenary Sessions, also including a physical exhibition.

A two-day EMODnet Jamboree kicked off proceedings, where the >120 EMODnet partner organisations and associated partners met for thematic and data ingestion consortia meetings and for cross-thematic dialogues, spanning topics from EMODnet for the coastal zone to EMODnet and citizen science, demonstrations of the EMODnet Central Map Viewer and Portal and more. Partner meetings set the stage for the public Open Conference, which took place on 29-30 November 2023.

Under the Conference title "**For a Digital and Green Future**," participants discussed the critical and expanding role of EMODnet in **powering the Marine Data Ecosystem in Europe and beyond**. The Conference was timely for the EC marine data service, following the unification of EMODnet thematic services into one Portal in January 2023. It also offered a platform to showcase the latest EMODnet offer, acknowledge the achievements of the network to date, celebrate existing and emerging partnerships, and gather stakeholder feedback on the future vision of EMODnet.

Journalist Karen Coleman served as the Conference Master of Ceremonies, with over seventy speakers and panellists taking the stage for the 1.5 day event. Presentations and debate were spread over seven Sessions and four interactive Townhall meetings. The Session topics were: 1. EMODnet: A unified public marine data service; 2. EMODnet for the Digital era; 3. EMODnet community perspectives; 4. EMODnet, Ocean Observation and the marine knowledge value chain; 5. EMODnet impact for society (EU Policy, Blue Economy, Wider society); 6. EMODnet and the Global Ocean Data Ecosystem; and 7. EMODnet evolution. Townhalls enabled deeper dialogue around four topics: EMODnet and EU Policy; EMODnet, Ocean Best Practices and interoperability; EMODnet, EU Mission Ocean and wider society; EMODnet for the Blue Economy.

Opening the Conference, **Charlina Vitcheva, Director-General for the European Commission Directorate-General Maritime Affairs and Fisheries (EC DG MARE)**, stated *"I have seen EMODnet grow from a network of marine communities to a single point of access supporting sustainable marine policies. To understand the planet, we need marine data and a better understanding of the marine environment."*

Kate Larkin, Head of the EMODnet Secretariat, noted *"EMODnet has seen significant and rapid evolution in the last few years to make it the EC marine data service it is today."* She added that *"EMODnet's unified service [achieved in January 2023] is an immediate game changer for the user….and also delivers global impact."*

Delilah Al Khudhairy, Director at EC DG MARE, gave a closing address, saying *"EMODnet is at the heart of all our marine policies. It gives access to credible, harmonised marine data and provides building blocks for a sustainable future."*

An EMODnet **Call To Action** was launched in the Closing Session. This calls upon key actors to work with the EMODnet community to help shape EMODnet's future evolution, setting the stage for an EMODnet vision to 2035 that will be developed by the end of 2024.

EMODnet: An EU asset powering Marine Data Services in Europe and beyond

CALL TO ACTION

The European Marine Observation and Data Network (EMODnet)[1] is a flagship *in situ*[2] marine data service funded by the European Commission DG MARE[1]. Complementary to Copernicus Marine, EMODnet is one of the main Marine Knowledge initiatives of the European Union.

EMODnet's key assets include:

- **Trusted FAIR[3] pan-European data layers from the marine environmental and human activities domains[4], published with associated metadata, aggregated from Europe's diverse *in situ* ocean observation capability[5] and key actors in the marine data pipeline[6];**
- **Open[7] marine data products, metadata and services produced for European regional seas and beyond, many of which are unique EU assets in terms of coverage and resolution e.g., the EUSeaMap broad-scale seabed habitat map, EU Digital Terrain Model for harmonised bathymetry, pan-European Marine Litter Database, Vessel Density composite maps, etc.**

Over the last 15 years, **EMODnet has evolved into a fully operational, unified and seamless data service** and knowledge base**, upon which thousands of diverse users depend,** including:

- **Marine and environmental research communities**;
- **EU Policy makers, in the European Commission and the Member States;**
- **Blue Economy stakeholders**, including off-shore energy, shipping, aquaculture, environmental management Maritime Spatial Planning (MSP), and more;
- **Regional stakeholders**, including Regional Sea Conventions;
- **The Copernicus Marine Service**;
- **The EU Digital Twin Ocean (DTO)**;
- **Global stakeholders and initiatives**, including the UN Ocean Decade[8] and UN 2030 Agenda[9];
- **Ocean Literacy actors** in Europe and beyond.

EMODnet will continue to evolve through well-identified opportunities **on the way to 2035:**

- Expanding and consolidating EMODnet's offer as the European focal point for *in situ* data, data products and services for the ***Ocean, land-sea interface and, when possible, inland waters***;
- Emphasizing EMODnet's core role for *in situ* marine knowledge, ***supporting establishment of the European Ocean Observing System, and development of the EC Ocean Observation initiative***;
- Consolidating EMODnet as an authority for interoperable *in situ* marine data services and infrastructures, ***driving innovation for the EU Digital Twin Ocean DTO;***
- Consolidating European marine data service ***community resources, best practices and standards;***
- Leveraging EMODnet's interoperable marine data/metadata in the ***global ocean data ecosystem***.

[1] emodnet.ec.europa.eu

[2] *In situ* ocean observations (including marine monitoring and wider data collection) are sampled directly in the water/air/sea-floor, not from satellites. In specific data products where satellite-derived data are used, data are primarily sourced from the Copernicus Programme.

[3] Findable, Accessible, Interoperable and Reusable (FAIR), as published by Wilkinson et al., 2016: nature.com/articles/sdata201618

[4] EMODnet offers marine data, data products and services across seven broad thematics, i.e. bathymetry, biology, chemistry, geology, human activities, physics, seabed habitats, collectively delivering hundreds of parameters.

[5] Public research ocean observations, operational oceanographic platforms and research infrastructures, to regulatory monitoring, private sector operations, civil society e.g., Non-governmental organisations and citizen science.

[6] National, Regional and European data infrastructures, data management centres, data networks, etc

[7] Published under open data licenses

[8] UN Ocean Decade of Ocean Science for Sustainable Development oceandecade.org

[9] un.org/sustainabledevelopment/development-agenda

EMODnet
European Marine Observation and Data Network

To consolidate and further expand existing services to address the needs of the Green and Digital Transitions, EMODnet requires community and political action to ensure sustainability and resources appropriate for a fully functioning, operational service of the European Commission. **We, the EMODnet community, call on:**

EMODnet partners, associated partners and collaborators:

- To collectively deliver an ***EMODnet Vision to 2035,*** enabling a full and expanded function of EMODnet, fit for the European and Global ocean data ecosystem;
- To fully engage with EMODnet's contributions to ***EU marine data spaces and the EU Digital Twin Ocean***, in close collaboration with Copernicus Marine Service;
- To further support the EC in its ***EC Ocean Observation Initiative and work towards a sustained and optimised marine data and ocean knowledge value-chain***[11] ;

EU agencies and authorities:

- To take forward the conclusions of the recent EMODnet evaluation and to assess the appropriate resources for EMODnet, ***ensuring it can operate at full functioning levels to meet current and emerging user needs and requirements;***
- To assess how EMODnet can further strengthen its service for EU policy, ***through enhancing its role in the regulatory monitoring data pipeline, including for European directives and ocean assessments;***

Regional marine data services and regional initiatives: To further optimise the marine data flow from Regional Sea Conventions, International Council for the Exploration of the Sea (ICES) and others into EMODnet, and the use of EMODnet data and data products in Regional Assessments;

EU Member States and Associated Countries: To work with EMODnet, in collaboration with European actors e.g., JPI Oceans, European Marine Board, EuroGOOS, Research Infrastructures and EOOS governance structures to establish EMODnet national networks, increasing national visibility and uptake;

Europe's marine and maritime community: To share *in situ* marine data and data products with EMODnet as a long-term EC marine data service, and fully utilise EMODnet for their marine knowledge needs e.g., EU Horizon Europe and EU Mission Restore our Ocean and Waters, also establishing EMODnet as a core pillar of ocean knowledge for ocean, water and climate literacy, in collaboration with the European Atlas of the Seas[12] and EU4Ocean for ocean, water and climate literacy;

Global and regional ocean data and information services: To continue to expand the data provision to EMODnet, including the deep ocean, to optimise the harvesting of EMODnet in global repositories and catalogues, including the Global Earth Observation System of Systems (GEOSS)[13], the IODE IOC/UNESCO Ocean Data and Information System (ODIS)[14], the IOC/UNESCO Ocean Biodiversity Information System (OBIS)[15] and the GOOS/IODE Ocean Best Practices System (OBPS)[16] and to foster EMODnet and other regional data service collaboration to deliver global ocean data interoperability, data sharing and stewardship for OceanData2030[17] and the UN Ocean Decade.

This Call to Action was launched at the 3rd EMODnet Open Conference, 29-30 November 2023 in Brussels, *where the EMODnet community and wider marine knowledge stakeholders gathered to discuss EMODnet's critical and expanding role in "Powering the European Marine Data Ecosystem: For a digital and green future", together with its increasing global impact and evolution. Combined with further stakeholder consultation in 2024, it will be used as a basis to develop an EMODnet Vision to 2035 Document, to be delivered by the end of 2024.*

[10]EC evaluation of EMODnet, SWD(2023)281: ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/1538-Evaluation-of-EMODnet_en

[11]EuroGOOS Conference statement eurogoos-conference2023.marine.ie; EurOCEAN 2023 Vigo Declaration euroceanconferences.eu/vigo-declaration; EuroSea Declaration eurosea.eu/download/eurosea-declaration-on-ocean-observing-and-forecasting

[13]geoportal.org

[14]IODE IOC/UNESCO ODIS https://odis.iode.org

[15]obis.org

[16]oceanbestpractices.org

[17]https://oceandecade.org/actions/an-ocean-data-and-information-system-supporting-the-un-decade-of-ocean-science-for-sustainable-development-oceandata-2030/

EMODnet
European Marine Observation and Data Network

Conference programme

Day 1, 29 November

14:00 - 15:30	***Welcome by Karen Coleman, Master of Ceremonies (MoC)*** ***Opening addresses*** Charlina Vitcheva, EC DG MARE Kate Larkin, EMODnet Secretariat
	Session 1: Opening Session "EMODnet: A unified EC marine data service" ***Panel: EMODnet EC marine data service: Thematic innovations*** Panel Chair: Karen Coleman, Master of Ceremonies Panellists: Alessandra Giorgetti, OGS, Italy Thierry Schmitt, SHOM, France Ville Karvinen, SYKE, Finland Antonio Novellino, ETT, Italy Joana Beja, VLIZ, Belgium Henry Vallius, GTK, Finland Alessandro Pititto, COGEA / BIP Group, Italy
	Panel: EMODnet EC marine data services: Stakeholder perspectives Panel Chair: Kate Larkin, EMODnet Secretariat Panellists: Pierre Bahurel, Mercator Ocean International Gerben De Boer, Van Oord Iryna Makarenko, Black Sea Commission Isida Karpuzi, The Carbon Games, EMODnet OSL 3.0 hackathon 2023 winner Bogdan Ghinea, MDLPA, Romania Emma Reyes, SOCIB, Spain
15:30 - 16:20	***Session 2: EMODnet for the Digital era*** ***Presentations:*** ***The EU Digital Twin Ocean (DTO):*** John Bell, EC DG RTD ***EMODnet's contribution to EU DTO via EDITO-Infra***: Tjess Hernandez, VLIZ, Belgium ***Panel: EMODnet for the Digital era*** Panel Chair: Karen Coleman, Master of Ceremonies Panellists: Zoi Konstantinou, EC DG MARE Simona Simoncelli, INGV, Italy Marina Tonani, Mercator Ocean International, Conor Delaney, EMODnet Secretariat Laia Romero, LOBELIA, Spain Jon Blower, NOC, UK
16:20-16:45	***Networking break***

16:45 - 18:00	***Townhalls*** ***Townhall: EMODnet and EU Policy*** Co-Chairs: Alessandra Giorgetti, OGS, Italy; Fergal McGrath, Marine Institute, Ireland Rapporteur: Ángel Muñiz Piniella, EMB Facilitators: Nathalie Tonné & Matteo Mikos, EMODnet Secretariat
	Townhall: EMODnet, Ocean Best Practices and interoperability Co-Chairs: Conor Delaney, EMODnet Secretariat; Marie-Francoise Voidrot, OGC Rapporteur: Britt Alexander, EMB Facilitators: Vicente Fernandez & Tim Collart, EMODnet Secretariat
	Townhall: EMODnet, EU Mission Ocean and wider society Co-Chairs: Patrick Gorringe, SMHI, Sweden; Nathalie Van Isacker, EMODnet Secretariat Rapporteur: Jana Van Elslander, EMB Facilitator: Pieter Torrez, EMODnet Secretariat
	Townhall: EMODnet for the Blue Economy Co-Chairs: Luca Marangoni (CINEA); Séverine Renault (AND-I) Rapporteur: Emily Waterfield, journalist Facilitator: Megan Tijssens, EMODnet Secretariat
18:10 - 18:50	***Session 3: EMODnet community perspectives*** Moderated by Karen Coleman, Master of Ceremonies EMODnet Virtual Exhibition overview and video EMODnet centralisation explainer video EMODnet Community poster pitches Open Mic Panel: Community perspectives

Day 2, 30 November

09:00 - 10:30	***Session 4: EMODnet, Ocean Observation and the marine knowledge value chain*** Presentations: ***EMODnet in the marine knowledge value chain:*** Dick Schaap, MARIS, The Netherlands ***EMODnet and Copernicus Marine Service INSTAC and the Marine In Situ Coordination Group***: Antonio Novellino, ETT, Italy ***EMODnet Data Ingestion: in search of new data providers from every sector of marine society:*** Sissy Iona, HCMR, Greece ***Panel: EMODnet and the EU Ocean Observation landscape*** Panel Chair: Karen Coleman, Master of Ceremonies Panellists: Dominique Obaton, Ifremer, France; Copernicus Marine Service INSTAC Christos Arvanitidis, LifeWatch/ Research Infrastructures Baris Salihoglu, METU-IMS, Turkey Anu Kaskela, GTK, Finland Marco Filippone, FUGRO Neil Holdsworth, ICES
	Presentation: Ocean Observation for EU Policy - Zoi Konstantinou, EC DG MARE
	Panel: EMODnet, Ocean Observation and data adequacy Panel Chair: Zoi Konstantinou, EC DG MARE

Panellists:
Jun She, DMI, Denmark
Matthieu Belbeoch, OceanOPS
Claire Jolly, OECD
Pierre-Yves Le Traon, MOi
Inga Lips, EuroGOOS
Caroline Cusack, MI, Ireland

11:00 - 13:00

Session 5: EMODnet impact for society
Presentation: "EMODnet for EU Policy" Townhall Community Perspectives, Alessandra Giorgetti, OGS, Italy
Panel: EMODnet for EU Policy
Panel Chair: Rémy Dénos, EC DG MARE
Panellists:
Kate Larkin, EMODnet Secretariat
Céline Frank, EC DG MARE
Alice Belin, EC DG ENV
Georg Hanke, EC JRC
Adeline Souf, SHOM, France
Joni Kaitaranta, HELCOM
Stéphane Isoard, EEA

Presentation: "EMODnet and the Blue Economy" Townhall Community perspectives, Alessandro Pititto, COGEA / BIP Group, Italy
Panel: EMODnet and the Blue Economy
Panel Chair: Alessandro Pititto, COGEA, Italy
Panellists:
Luca Marangoni, CINEA
Nikolas Flourentzou CMMI, Cyprus
Madlie Le Bihan, RGI
Paul Holthus, World Ocean Council
Melanie Symes, TransMarinas

Presentation: "EMODnet for Mission Ocean" Townhall Community perspectives, Patrick Gorringe, SMHI, Sweden
Panel: EMODnet by and for wider society
Panel Chair: Evangelia Tzika, EC DG MARE
Panellists:
Antonia Leroy, WWF, NGO
Kamel Labibes, Ayam Sailing
Arianna Liconti Outdoor Portofino, Citizen Science
Patrick Gorringe, SMHI, Sweden
Tim Collart, EMODnet Secretariat

14:00 - 16:00

Session 6: EMODnet and the Global Ocean Data Ecosystem
EMODnet Ocean Best Practices, global data sharing and interoperability
Presentations:
IODE and the Global Ocean Data Ecosystem, Peter Pissierssens, IODE IOC/UNESCO
"EMODnet, Ocean Best Practices and interoperability" Townhall Community perspectives and EMODnet for the UN Ocean Decade, Lennert Tyberghein, VLIZ, Belgium
Panel: EMODnet for global
Panel Chair: Lennert Tyberghein, VLIZ, Belgium

Panellists:
Pier Luigi Buttigieg, HGF MPG, Germany
Emma Heslop, GOOS
Steve Hall, Seabed 2030
Enrique Alvarez, MOi
Joana Beja, VLIZ, Belgium
Marina Lipizer, OGS, Italy

EMODnet's global and regional partnerships
Presentation: Miao Sun (on behalf of Xiaojian Cui), NMDIS, China
Panel: EMODnet's regional partnerships worldwide
Panel Chair: Jan-Bart Calewaert, UN Ocean Decade Data Coordination Office for Ocean Data Sharing
Panellists:
Miao Sun, NMDIS, China
Mike Smit, Dalhousie, OFI, Canada
Karim Hilmi, INRA, Morocco
Renuka Badhe, European Polar Board
Sofia Mendoza, Mexican Geological Survey

16:20 - 17:30

Session 7: EMODnet evolution
Perspective of EC DG MARE: Delilah Al Khudhairy, EC DG MARE
Panel: EMODnet evolution
Panel Chair: Karen Coleman, Master of Ceremonies
Panellists:
Gert Verreet, EWI
Tina Mertens, VLIZ, Belgium
Szilvia Nemeth, EC DG RTD
Quillon Harpham, HR Wallingford, UK
Nadia Pinardi, Univ. Bologna, Italy
Alessandra Cacciari, EC DG DEFIS
Lotta Fyrberg, SMHI, Sweden / IODE

Presentation of EMODnet Call to Action: Kate Larkin, EMODnet Secretariat

Conference Closing: Zoi Konstantinou, EC DG MARE and Karen Coleman, Master of Ceremonies

Session 1: EMODnet: A unified public marine data service

Karen Coleman, Master of Ceremonies, opened the EMODnet Open Conference 2023 noting that *"The European Marine Observation and Data Network (EMODnet[1]) welcomes you to the EMODnet Open Conference 2023, which is co-organised by the EMODnet Partnership in collaboration with the European Commission Directorate-General for Maritime Affairs and Fisheries."* She explained that this Conference was the third in the EMODnet Open Conference series and said it was "particularly delightful" to have participants back in person, with the 2021 event having had to take place online because of ongoing travel restrictions due to the Coronavirus pandemic. Karen also noted that the Conference plenary was being web-streamed and that these recordings would be made available after the event on the Conference website. She explained that online Slido polling would be used, together with interactive dialogues, to gather participant feedback.

Opening addresses

Charlina Vitcheva, Director-General of EC DG MARE, gave the opening address, recognising the value and maturity of EMODnet as an EC marine data service and noting *"This is a great opportunity to celebrate and to reflect"*. She explained that with European Parliament elections in 2024 and a new college of commissioners also due to take office next year, now is the ideal time to look at past achievements and future challenges around marine data. She reminded the participants that to understand the planet, we need marine data and a better understanding of the marine environment. She warmly remarked that EMODnet as an EC marine data service is of great value not only to DG MARE, but to the whole Commission and beyond. *"I have seen it [EMODnet] grow from a network of marine communities to a single point of access supporting sustainable marine policies… It is now an integral part of the Green Transition, establishing good practices by providing good data."* Moving forward, Ms. Vitcheva provided her hopes for the Conference, inviting participants to exchange knowledge on how marine data can be used to support further good investments and policy developments, to chart the course to a more knowledge-based management of marine resources. She highlighted that this included assessing how to improve value chains and harness new technologies for even better observations, marine data and, ultimately marine knowledge fit for today's challenges and future societal needs. She noted that the EMODnet Conference was opening as COP28 climate talks get underway in the United Arab Emirates, and she underlined the importance of marine data and the need to re-harness the climate-ocean nexus.

Kate Larkin, Head of the EMODnet Secretariat, gave an opening address on behalf of the EMODnet partnership, remarking that EMODnet is a flagship *in situ* marine data service, funded by the European Commission, DG MARE. She added that, complementary to Copernicus Marine, EMODnet is one of the main Marine Knowledge initiatives of the European Union. She explained this is an exciting time for EMODnet. In January 2023 – just 11 months ago – EMODnet launched its unified EMODnet service, marking a new level of operational maturity for EMODnet. *"The unification of EMODnet was an immediate game-changer for the user, with access to all of EMODnet's multidisciplinary marine environmental and human activities data, data products, metadata and services from one single Portal. It also enables the European Digital Twin of the Ocean (European DTO) and delivers global impact, with EMODnet being harvested by global ocean data initiatives for the UN Ocean Decade."* She explained the key features and functionalities of the EMODnet Portal, namely the common map viewer, central metadata catalogue and website itself which offers a single place to access EMODnet methodologies, tools and guidelines, as part of its public service. She concluded *"These achievements and evolution are all down*

1 emodnet.ec.europa.eu

to one thing: the people that make up the EMOD-network." She thanked the > 120 partner organisations and hundreds of experts implementing EMODnet, as well as the many wider stakeholders that contribute to the EMODnet 'ecosystem'. Finally, she drew audience attention to the COP 28 Ocean Declaration launched a few days before the EMODnet Open Conference 2023, noting that this highlighted the need for both sustained ocean observations and the need to secure sustainability of the full marine knowledge value chain.

Karen Coleman, **Master of Ceremonies,** then invited the audience to an ice-breaker through which EMODnet partners and associated partners present in Brussels were recognised and participants could introduce themselves to their neighbours, to boost connections.

Panel: EMODnet EC marine data service: Thematic innovations

In the first Panel, moderated by the Master of Ceremonies, EMODnet Coordinators presented the latest EMODnet services across all seven thematics: bathymetry, biology, chemistry, geology, human activities, physics and seabed habitats. Short presentations reflected on the current EMODnet offer, latest achievements, partnerships, and emerging innovations.

Alessandra Giorgetti, OGS, Italy, Coordinator of EMODnet Chemistry, explained that the EMODnet Chemistry offer is broad, spanning from ocean oxygen and carbon to eutrophication, contaminants, marine litter and more. She highlighted that "a key achievement" has been the EU database on marine litter on beaches and the seafloor, including micro and macro litter, created by EMODnet in collaboration with the Joint Research Centre of the European Commission (EC JRC). As a direct result, *"since 2017, Marine Strategy Framework Directive (MSFD) reporting on marine litter has been based on data managed by EMODnet Chemistry."*

Ville Karvinen, SYKE, Finland, **Coordinator of EMODnet Seabed Habitats,** explained that the flagship data product remains the EUSeaMap which provides a pan-European interactive and high resolution map of seabed habitats for European regional seas and beyond. He explained that *"EMODnet's seabed habitats data have been used to support policies ranging from sustainable Blue Economy projects to the MSFD itself, and the geographical scope and product coverage of EMODnet's seabed habitats has also expanded with the creation of a Caribbean Sea Map and Caspian Sea Map."* Next steps could include the full integration of habitat observation data with species data.

Henry Vallius, GTK, Finland, Coordinator of EMODnet Geology, noted that the diverse offer of marine geological data and data products includes unique assets such as the pan-European submerged landscapes maps. These show geological landmarks including submarine volcanoes, but also less well known features, including submerged forests, lagoons, and paleo-coastlines. He remarked that *"EMODnet's harmonised geological data including seafloor geology, seabed substrates, coastline migration and more are used for siting offshore renewable energy infrastructures."*

Joana Beja, VLIZ, Belgium, Coordinator of EMODnet Biology, explained that the EMODnet Biology theme alone offers 1,301 datasets spanning the full spectrum of marine biodiversity, from phytoplankton to marine mammals and seabirds. Each dataset is a harmonised data layer containing hundreds if not thousands of single data points, aggregated from diverse data collection efforts, with a broad range of stakeholders, including governments, academics and citizens, contributing to and using these data and data-products. She added that *"EMODnet [Biology] also provides training workshops and works closely with citizen science initiatives. A key priority going forward is also the further ingestion and publication of harmonised marine genomics data."*

Antonio Novellino, ETT, Italy, Coordinator of EMODnet Physics, explained that this single thematic covers many parameters, including temperature, salinity, sea level, currents, waves and winds, optical properties of the water, underwater noise, ice data, river runoff, and meteorological data at sea level. He said that a main benefit of EMODnet is its work with common standards, methods and tools. He acknowledged the partnership with Copernicus Marine Service for providing a subset of operational oceanographic *in situ* data. He presented a use case noting that *"the Italian Institute for Environmental Protection and Research (ISPRA) draws on EMODnet data as part of an early warning and response system for the extreme sea level event in Venice known as Acqua Alta"*. He explained that next steps would include increasing the EMODnet offer for the sea-land interface, ocean sound and the deep ocean, in partnership with the international Deep Ocean Observing System, among others, and further strengthening collaboration with citizen science initiatives to diversify data sources in EMODnet.

Thierry Schmitt, SHOM, France, Coordinator of EMODnet Bathymetry, noted that bathymetric data in EMODnet was sourced from hydrographic offices, research and private sector surveys, amongst others. Data in EMODnet is aggregated and harmonised and EMODnet also offers its flagship Digital Terrain Model (DTM) with high resolution bathymetry for European regional seas, now also for the Caribbean area. *"Recent examples of the many uses of the EMODnet DTM include for the marine habitat mapping of the Croatian part of the Adriatic Sea, and for routing a submarine electricity interconnection between Spain and France."* He noted that content, services and partnerships are all likely to evolve, with the areas of coastal mapping and coastal delineation for instance already drawing strong interest.

Alessandro Pititto, COGEA – BIP Group, Italy, Coordinator of EMODnet Human Activities, noted that the Human Activities offer spans from offshore installations and area-based management to National Maritime Spatial Plans for EU Member States. A Vessel Density Map developed in 2019 and updated annually has quickly become one of EMODnet's most downloaded products. Human Activities data from EMODnet also feeds into the world database of protected areas. He noted that *"around a third of users of EMODnet Human Activities come from the offshore industry. In addition, the National Geospatial-Intelligence Agency (NGI) now uses a methodology [Vessel Density composite maps] developed in Europe by EMODnet."* Future work would focus on the continued ingestion of Maritime Spatial Plans and on expanding the fishery-related and coastal tourism data offer.

A focus on user needs, alongside the need to further increase the resolution of existing parameters, including via ingestion of citizen science data and data from the private sector, emerged as themes of this Panel. Coordinators also noted that whilst EMODnet has achieved a lot in terms of standardisation and now centralisation of services, it continues to evolve. Further increasing interoperability of EMODnet data across themes and services continues to be vital. Participants closed by summarising the future evolution of their thematics, with EMODnet service evolution including enhanced offers at the land-sea interface including rivers and coastal areas, and the deep sea, geotechnical data and genomics data.

Panel: EMODnet EC marine data services: Stakeholder perspectives

Following the opening Panel's call for more user engagement, a second Panel heard from several key stakeholders on the use and value of EMODnet.

Kate Larkin, Head of the EMODnet Secretariat, moderated the Panel, inviting panellists to provide concrete examples of how their organisation, initiative and networks use EMODnet for societal applications, highlighting also key partnerships and ideas for strengthening EMODnet and the wider EU provision of marine knowledge into the future.

Pierre Bahurel, Director General, Mercator Ocean International, provided a video recording where he welcomed EMODnet's continued development and its partnership with Copernicus Marine Service, explaining that the two services were ultimately *"creating and sharing more knowledge about the ocean."* He noted that *"many uses and applications of data require the combination of vertical (satellite) and horizontal (in situ) data used to provide simulations of the state of the ocean"*, recognising that EMODnet and Copernicus Marine Service were working together for the European DTO joint EMODnet and Copernicus Marine Service statement on *in situ* marine data

Iryna Makarenko, Black Sea Commission, via a pre-recorded message highlighted the many ongoing dialogues between EMODnet and the Black Sea region, including a 2017 Memorandum of Understanding with EMODnet Chemistry on cooperation aimed at supporting the provision of pollution and contaminants data. She noted that this partnership should be further strengthened and expanded to the full EMODnet service, to support more harmonisation between the Black Sea Information System in Odessa, Ukraine, MSFD requirements and EMODnet.

Bogdan Ghinea, MDLPA, Romania, provided a national EU Member State perspective. He explained in a pre-recorded message that EMODnet has helped provide a solution for the centralisation of marine data, noting that in Romania different authorities hold different amounts and types of data. He referred to the issues of security surrounding data but stressed the importance of making data obtained through public funds publicly available. He noted that *"the Ministry for Development, Public Works and Administration of Romania (MDLPA) was able to use data obtained from EMODnet to develop national policies in-line with present needs and future trends."* He added that, in the immediate future, MDLPA will look into steps needed to make metadata also openly available.

Isida Karpuzi, The Carbon Games, winner of the Open Sea Lab (OSL) 3.0 EMODnet hackathon, explained that The Carbon Games is a mobility tech startup aiming to minimise the environmental impact of commuting through the use of advanced data analysis, machine learning and gamification. The company set out to develop *"the equivalent of Google Maps"* for small boat operators, drawing on EMODnet ocean data and Copernicus weather data. For the OSL 3.0 hackathon The Carbon Games developed a novel maritime route planning solution, using EMODnet data, creating a matrix through which boats can navigate to avoid currents, marine litter, and protected areas.

Gerben De Boer, Van Oord, Netherlands, explained how EU policies and Blue Economy operations can be supported through the use of EMODnet data, naming relevant themes in each case. Enhancing the energy transition requires bathymetry, geology, physics and seabed habitats data, he explained. Accelerating climate actions will rely on bathymetry, geology and physics, while hitting net-zero ermissions by 2050 requires understanding a lot about human activities. Empowering nature & communities means looking at seabed habitats and, again, human activities. *"EMODnet provides high quality pan-European data and data products for many thematics that are valuable for the future of humanity."*

Emma Reyes, SOCIB, Spain, reminded participants that coastal tourism is one of the "biggest and growing" sections of the economy for countries like Spain, which saw 17 million visitors to its coast last year. She gave an overview of the work of the Balearic Islands Coastal Observing and Forecasting System (SOCIB), including use cases of EMODnet data and data products for Blue Economy applications. *"Sustainable coastal tourism needs timely access to quality and interdisciplinary marine and coastal data, and SOCIB utilises EMODnet data, in combination with other open source data, for its planning and advising Blue Economy operations, safety at sea and citizen science engagement."*

Session 2: EMODnet for the Digital era

A second Session of this first day considered EMODnet's contribution to the European DTO and wider EU marine data space, in the global context.

John Bell, Director at EC DG Research and Innovation (RTD), presented the European DTO in a pre-recorded message, noting its importance to enable better understanding of the oceans to drive change, competitiveness and sustainability, in line with the EU 'Mission Restore our Ocean and Waters'. He noted that *"EMODnet has a very special and strong role to play in the European DTO" and that the European DTO depends on access to data, emphasising that openess is a critical word."* He explained this is why a 2024 edition of the Digital Ocean Forum will bring together experts, stakeholders, policymakers and citizens in the co-design and co-creation of the European DTO, developing core infrastructure and clear instructions for an open and inclusive approach. *"We must work together to ensure a sustainable future for Europe,"* he said. *"A sustainable future for our ocean and for the people who live around it."*

Francisco Hernandez, Technical Director at VLIZ, Belgium, followed up with a closer look at EMODnet's contribution to the European DTO, specifically via the EU Public Infrastructure for the European DTO, EDITO-Infra. He explained that *"the digital twin is a leap in ocean knowledge and sustainable action, and EDITO-Infra, powered by EMODnet and Copernicus Marine Service, is its 'backbone'"*. Once completed, the European DTO would mimic the real ocean and thus allow better decisions to be made through better understanding. The European DTO requires a continuous flow of multidisciplinary data, describing the changing state of the marine ecosystem and the use of and impact on the marine ecosystem. He added that in order to power a shared European DTO moving forward, EMODnet would be making its full offer of data and data products available together with data from Copernicus Marine Service in a common data lake, and that ultimately this would include the fast delivery of analysis-ready data to feed the models and applications in the European DTO. In addition, he stressed there will be a need for combined multidisciplinary data to answer more complex problems and for near real-time ecosystem data to monitor impact and validate predictions.

Panel: EMODnet for the Digital era

This Session's Panel then focused on how the EDITO-Infra brings in EMODnet's cutting edge technology. It also further examined the role of EMODnet in the European DTO backbone and data lake, how this relates to the Copernicus marine data store, EDITO-Model Lab and wider projects or initiatives such as Destination Earth, Horizon Europe projects and International Digital Twin of the Ocean initiatives, for instance Digital Twin of the Ocean DITTO.

Marina Tonani, Mercator Ocean International, explained the key partnership of EMODnet and Copernicus Marine Service for the European DTO. She noted that *"the data lake and engine provided by EDITO-Infra is a 'unique' EU investment that will provide blue, green and white ocean information based around EMODnet and Copernicus Marine Service data"*. There is already a high level of standards and of interoperability between EMODnet and Copernicus but this could be further leveraged, making use of the latest available technology, to provide for instance easier user access. *"In the future everything [data] will be faster than today. Faster, and used to address all the latest questions,"* she concluded.

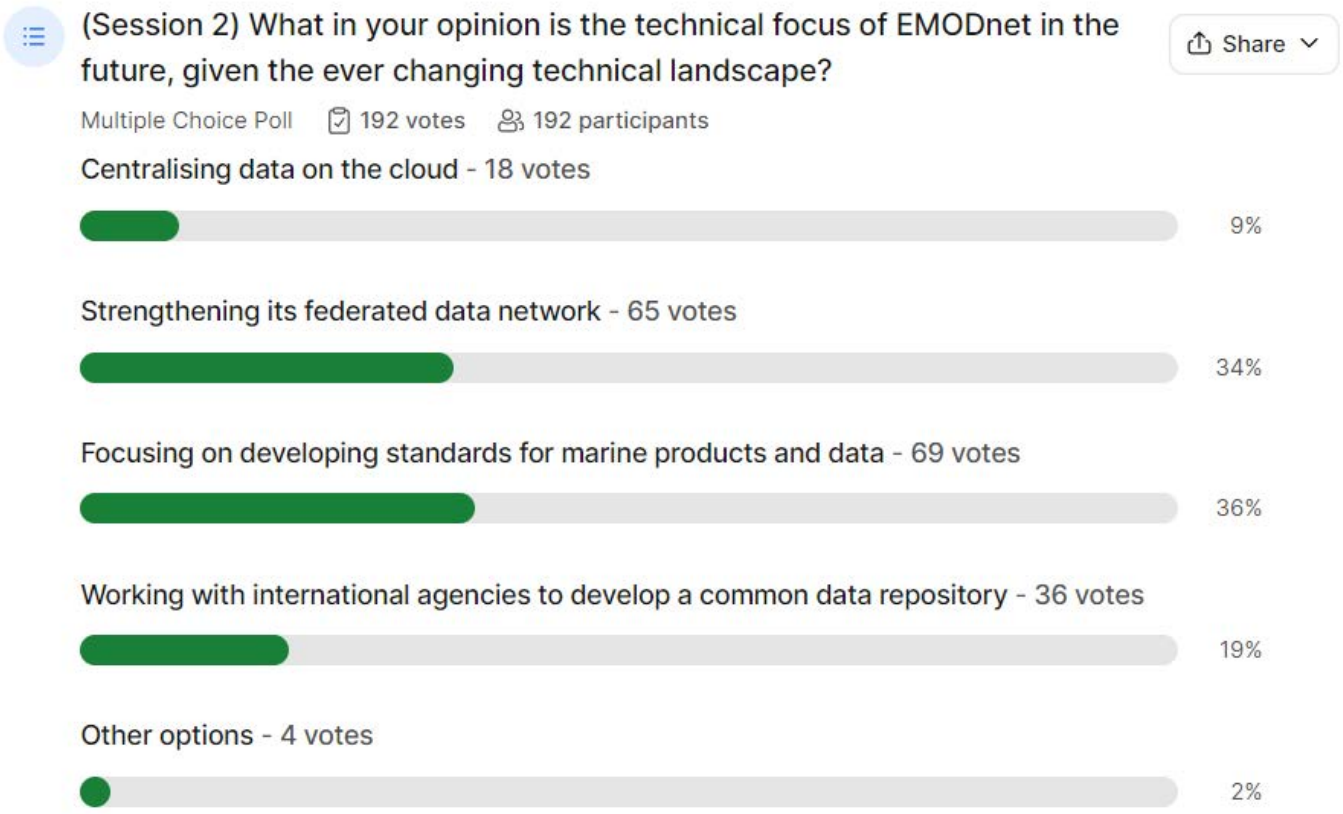
Zoi Konstantinou, EC DG MARE , agreed that without robust, standardised, accessible data, it would not be possible to access any of the opportunities offered by a digital replica of the ocean. She pointed to Destination Earth as another EU initiative offering data mapping to power the Green Deal and Digital Strategy, explaining that *"Data is going to be at the core of the EU Digital Twin Ocean and Destination Earth initiatives, and EMODnet is a key partner to these developments."* She added that the EU added value is dependent on the way complex data is handled, as this affects ownership and privacy. Trust must remain central to the sustainable future of data analysis and use.

Laia Romero, Director Lobelia Earth, Spain, provided a video recording in which she explained that *"the fast-paced development of cloud technologies is already improving access to marine data, and is being utilised for the European DTO to create a common data lake with EMODnet and Copernicus Marine Service."* She added that if data is stored in a ready-optimised format, users will be able to access *"flexible, cost-efficient"* products and technologies quickly. She called for there to be no barriers to data access, noting that we are ready to deploy new technologies and to allow users to access these technologies.

Simona Simoncelli, INGV, Italy, presented the Horizon Europe Blue Cloud 2026 project. She noted that *"Blue-Cloud 2026 is building a federated platform for web-based open science with Virtual Research Environments that build on existing infrastructure and rely upon Findable, Accessible, Interoperable and Reusable (FAIR) data from data services like EMODnet"*, where researchers and wider users can together use data to generate products and create an interactive workflow. Stressing that this means co-developing solutions to create FAIR digital assets she concluded that a Blue Cloud task force is developing a strategy around plugging services into the European DTO.

Jon Blower, Associate Director, Digital Ocean, NOC, UK, explained *"The oceans are all connected, so our thinking has to be connected. This is why the international initiative 'Digital Twins of the Ocean' (DITTO) is so important."* Conceived as part of the UN Ocean Decade, DITTO fosters a strong sense of collaboration and coordination, which is particularly important given that "*the European picture can be quite complicated to organise.*" DITTO could help to address societal challenges related to the ocean and environment on many levels, ranging from the global to the local, which are often interlinked but face many data gaps. DITTO should encourage interaction with users and a better link between legal and governance issues.

Conor Delaney, Technical Coordinator, EMODnet Secretariat, explained, simply, that *"people need data fast."* The data should also be robust and scalable, he added. This is why *"EMODnet is now focusing on streamlining and rationalising all the quality data it publishes. This really is cutting edge stuff on a global scale"* he said. He explained that the centralisation of EMODnet thematics had not only led to improvements for the user but had also enabled EMODnet to become a fully operational, unified service. This includes the 24-7 technical monitoring and service support that is required to provide the public service, upon which may users depend, and is the operational backbone for applications including the European DTO.



Townhalls

The > 340 participants of the EMODnet Open Conference on-site in Brussels then split into four parallel Townhall meeting groups. The dialogues covered four key topics, namely: EMODnet and EU Policy; EMODnet, EU Mission Ocean and wider society; EMODnet, Ocean Best Practices and Interoperability; and EMODnet and the Blue Economy. Below are short reports of the four Townhall Sessions. The co-chairs, rapporteur and facilitators for each Session are listed in the Conference programme. Key messages were also presented in plenary on Day 2.

Townhall: EMODnet and EU Policy

The Townhall "EMODnet and EU Policy" focused on discussing EMODnet's current role in the EU Green Deal and related policy implementation (Marine Strategy Framework Directive (MSFD), Marine Spatial Planning Directive (MSPD), Birds and Habitats Directive, Data Collection Framework, etc.), and inviting community feedback on how EMODnet's role could be strengthened. Townhall co-chairs, **Alessandra Giorgetti, OGS, Italy**, **EMODnet Chemistry Coordinator**, and **Fergal McGrath, Marine Institute, Ireland, EMODnet Seabed Habitats partner,** presented examples of how EMODnet data and products currently provide marine data and knowledge for policy. Some of the many specific examples included the use of EMODnet Seabed Habitat's EUSeaMap, Chemistry's marine litter and wider marine biogeochemical data in MSFD, Human Activities data including both National Maritime Spatial Plans (MSP) and information on Blue Economy installations in MSPD, and EMODnet data on river outputs in the Water Framework Directive (WFD).

An interactive Slido Session collated community views on EMODnet's current role in providing marine knowledge for EU Policy and recommendations on how EMODnet should further evolve its services to meet EU policy needs and requirements. Audience interventions acknowledged that there is a wide use of EMODnet data and products across a range of EU policies, and that this plays an important role in the harmonisation of data products also at regional scale, and making non-aggregated data accessible, usable and comparable. It was indicated that EMODnet has taken huge steps towards increasing the resolution of data and products and has been pivotal to improving marine *in situ* data adequacy and accessibility for European regional seas.
It was suggested that the inclusion of new maritime activities in EMODnet should help improve future updates of national MSP plans. With regard to MSFD, labelling the data e.g., according to MSFD descriptors could be useful, and horizontal harmonisation across the thematics should be considered in addition to harmonisation within a thematic. Furthermore, the discussion highlighted a series of challenges in the European data-sharing landscape, and related policy. For instance, the impact of EMODnet goes far beyond the information of monitoring directives, however there is a lack of visibility of such uses. Secondly, it was highlighted that various issues in the harmonisation process of data sharing arise due to 1) differences in resources allocated to data gathering between geographical regions and 2) differences in the data-sharing cultures across Europe. Such issues largely hinder the production of Europe-wide harmonised data products.

Townhall: EMODnet, EU Mission Ocean and wider society

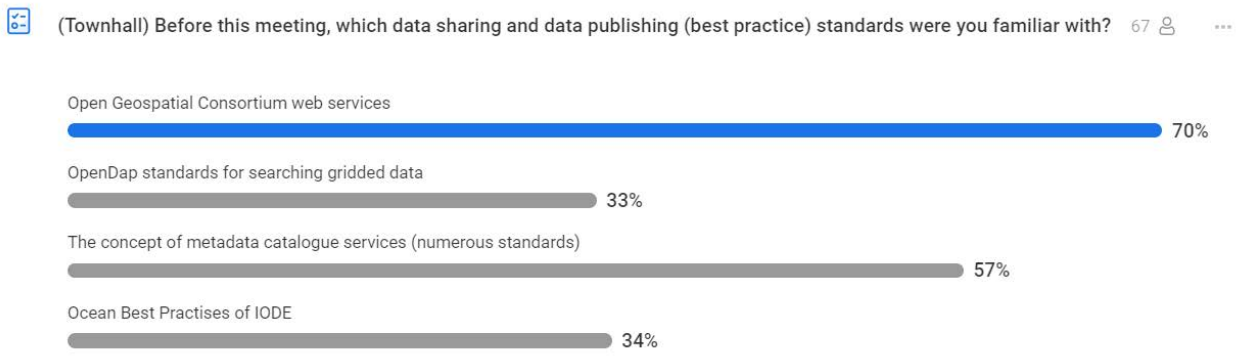
Townhall co-chairs **Patrick Gorringe, SMHI, Sweden, EMODnet Physics expert** and **Nathalie Van Isacker, EMODnet Secretariat**, gave a joint presentation. Demonstrating how EMODnet and the European Atlas of the Seas support the objectives of the EU Mission: Restore our Ocean and Waters they provided examples of connections with wider society, in particular with educational initiatives. It was noted that low-cost sensors open up many new opportunities for citizen science. In a presentation, **Sheila Heymans, Executive Director, European Marine Board** highlighted work carried out by the European Marine Board related to public mobilisation and engagement, with a focus on best practices for citizen science, art and science.

EMODnet is a key resource of marine data, information and knowledge to support the EU Mission: Restore our Ocean and Waters and could be better utilized by Mission projects, Lighthouses and Member States, some of which still lack data for Mission related indicators. In turn, such projects and initiatives related to this EU Mission are producing new data and data products that could be ingested into EMODnet to increase their uptake and impact even beyond the project life-time. Whilst all Mission projects have the obligation to share their data, it was noted that the pipeline could be optimised. **A map of Mission: Restore our Ocean and Waters actions and pledges to the Charter is available in the European Atlas of the Seas**.

EMODnet already collaborates with **citizen science** initiatives, including advising on data collection protocols and standards, and ingesting data into EMODnet derived from citizen science. This can be expanded, particularly in relation to the ambition of the EU that 20% of the marine data should come from citizen science by 2025. For this, it is important to communicate the value of data sharing, to provide targeted guidance for non-professionals and to set up the data flows at the beginning of projects so that the appropriate processes are put in place. Citizen projects are local. Evaluations at a small scale are needed. An important question is how to guarantee the quality of citizen science data. Harmonised protocols are important to allow for data comparison but it is not easy for citizen science project teams to find and implement protocols. It is also important to determine how quality control should be implemented for these projects. EMODnet can assist here and is actively working with initiatives such as Erasmus Maris, Plastic Pirates and others on this. Citizen science projects can bring huge benefits to data sharing, providing access to data that would otherwise not be available. It is essential to identify the projects for which data ingestion is possible and to provide specific training and guidance to citizen science data providers. Working with them from the start of the project and providing feedback on the outcomes is the key to success. A webinar 'EMODnet for Mission: Restore our Ocean and Waters and Horizon Europe' is planned on 28 February 2024 to provide more guidance to EU Mission and wider Horizon Europe projects that have not yet established their data pipelines to EMODnet.

Townhall: EMODnet, Ocean Best Practices and Interoperability

The Ocean Best Practices and Interoperability Townhall, chaired by **Marie-Francoise Voidrot, Open Geospatial Consortium (OGC),** and **Conor Delaney, Technical Coordinator, EMODnet Secretariat**, centered on a technical discussion about data and metadata standardisation, harmonisation, flows and digital services best practices.



The Session gathered community recommendations on existing and emerging EMODnet best practices and how EMODnet can improve engagement with other regions worldwide to increase data interoperability for a Global Ocean Data Ecosystem. A series of presentations on technologies and best practices currently used by EMODnet were given and a further discussion took place with some key recommendations. This included **Frederic Leclercq, from the Flanders Marine Institute (VLIZ), Belgium,** who introduced the OPeNDAP standard and illustrated how the ERDDAP server, which is based on the OPeNDAP specification, is crucial to a unified EMODnet portal. **Virginie VanDongen, EuroGOOS and Ocean Best Practice Repository (OBPS)**, introduced OBPS as a global initiative to improve and standardise methods and practices to share ocean data and information, organised by IODE and GOOS of IOC/UNESCO. **Pier Luigi Buttigieg, HGF MPG, and Info Hub (OIH),** presented semantic web and metadata publishing.

Participants were also asked which data sharing and data publishing (best practice) standards they were familiar with, with the most commonly known being the Open Geospatial Consortium (OGS) web services. It was also recognised that there remains a large knowledge gap between researchers and professional data architects, and that the gap must be closed to build the global digital ecosystem. For instance, Research and Development Forum (RDF), is an important data architecture concept but not well known within the research community.

Highlights of stakeholder recommendations for EMODnet service evolution in terms of ocean best practices and interoperability to meet needs and requirements included the fact that OPeNDAP is already widely used in the ocean data community. Professionalised standards such as OGC are necessary as a basis to build international interoperable infrastructures, and more international conversations about who decides on the standards are required. For open standards and open software, there is a need to share positive experiences with the wider community, so that people can make informed choices. The community needs reliable software that implements standards to ensure the standard is adopted. More work is needed on protecting the software that exists, in addition to work on developing standards. It was also noted that semantics are required to work towards interoperability and that it is essential that products are aligned with open public standards to avoid having isolated digital ecosystems. It was said that EMODnet is INSPIRE-compliant. When discussing OGC services at the INSPIRE Conference 2023, taking place concurrently with the EMODnet Open Conference, it was remarked that EC DG Connect, which is responsible for data spaces, has not yet recognised OGC standards. This recognition is important so that data spaces do not only share data but enable knowledge creation.

In terms of global interoperability, EMODnet is now fully connected as a regional contributor to the IODE IOC/UNESCO initiative Ocean Data and Information System (ODIS) via the EMODnet common metadata catalogue. It was remarked that both EMODnet and IODE can further improve the traceability of source of data (provenance) and downloadable metadata. EMODnet already contributes to the IOC/UNESCO Ocean Best Practices System (OBPS), which aims to provide a registry of standard methods for observation and processing, etc. The importance of linking data with the best practices used to obtain them, to increase trust in the data and the product, was noted.

Townhall: EMODnet for the Blue Economy

The EMODnet Blue Economy Townhall, chaired by **Luca Marangoni, Deputy Head of D3 Sustainable Blue Economy Unit, CINEA,** and **Séverine Renault, AND-I and EMODnet Human Activities partner**, centered on the role of EMODnet's services in the Blue Economy sector, emphasising ways to enhance private sector engagement. Luca Marangoni presented the European Commission investments in Blue Economy data, which focus on improving the clarity of data and improving interoperability. Séverine Renault's presentation looked at facilitating access to marine data, particularly regarding EMODnet's Human Activities data offer.

On the use of EMODnet data and data products by the Blue Economy private sector, **Noelia Ortega, CTN-Marine Technology Centre,** presented on understanding and monitoring how Blue Economy activities generate underwater noise using EMODnet data. Audience interventions revealed that EMODnet data is predominantly utilised in the early planning stages, often by companies bidding for offshore sites. It was further noted that the offshore wind sector is substantially growing, increasing the need for cumulative data on offshore wind farms to support sustainable development.

On data sharing by the Blue Economy and wider private sector, **Sissy Iona, HCMR,** introduced the EMODnet Data Ingestion Service, promoting standards for making marine data findable, accessible, interoperable, and reusable (FAIR). It was noted that in a collaboration with the Crowne Estate, publicly available Environmental Impact Assessment (EIA) data obtained for UK offshore renewable energy license areas is ingested into EMODnet. Questions about licensing and accessibility still persist, and it was recommended that EMODnet could assist with guidelines on this.

Stakeholder recommendations for EMODnet service evolution to meet Blue Economy needs and requirements emphasised the importance of time sequences in data for decision making and assessments. Access to fisheries data was highlighted as challenging, with suggestions made to expand available fish sector data, noting that EMODnet Human Activities is looking into expanding management-based fisheries data. The value of underwater noise data for industry was highlighted, noting that EMODnet Physics already offer some data for this parameter, yet challenges in accessing and sharing such data remain.

Participants recommended that the EMODnet portal could be made even more user-friendly as an online interface, suggesting that data product collections could be offered not only via thematics but also based on user profiles, for instance coastal tourism, offshore renewable energy, or aquaculture.

Session 3: EMODnet community perspectives

The final Session of day one of the EMODnet Open Conference 2023 was moderated by **Karen Coleman, Master of Ceremonies** who explained that in addition to the in-person Conference and physical exhibition and networking, the Conference organisers had produced a **Virtual Exhibition**, building on the 2021 Conference, updating all of the material to provide a diverse array of resources on EMODnet thematics, data ingestion, partnerships and the European Atlas of the Seas. She added that the Virtual Exhibition also has a dedicated room for Community posters, for which EMODnet received over 50 submissions. A fly-through video of the EMODnet Open Conference 2023 Virtual Exhibition was then shown in plenary and it was noted that this would remain available as a free and fully public resource for 1 year, until the end of 2024. Following this, a second video was shown of a newly released EMODnet centralisation explainer animation video

Community posters

Ms. Coleman then explained that the Session 3 plenary would hear from > 20 community poster authors who would each pitch their posters live, providing a snap-shot summary in just one minute each. The posters ranged from presentations on the use of EMODnet by national organisations and infrastructures to Horizon Europe projects spanning the marine, maritime, digital ocean and wider environmental domains. Many EMODnet partners presented research and innovation developments for EMODnet data and data products. Other presenters came from the wider stakeholder community as data collectors or providers to EMODnet, research infrastructures, service providers and users.

Open Panel: Community perspectives

Karen Coleman, Master of Ceremonies, then announced that it was time for an EMODnet community "open mic" where any member of the audience in Brussels could step forward and provide a perspective, reflection or recommendation on EMODnet, including from the Conference Sessions and Townhalls but also the wider EMODnet service.

Participants took to the stage from **EMODnet Associated Partner HR Wallingford, the European Marine Board (EMB), the Flemish Institute for Technological Research (VITO) and the Flanders Marine Institute (VLIZ)**. Participants congratulated EMODnet on having made substantial progress, and having *"a very good level of usability."* One open mic participant recommended that, although EMODnet has a good offer of academic research data, it could do more to bring in additional historical research data and more systematically bring in research data from all European projects. In turn, open mic participants discussed how EMODnet could be better connected with policy makers to support evidence-based policy making, and how to better connect EMODnet with citizens. This included raising awareness among citizens about EMODnet and explaining how they could get involved in collecting ocean observations and other data for citizen science projects. The point was made that EMODnet could do more in communicating to citizens and in general all data providers about why it benefits them to submit their data to EMODnet. This means better explaining the uptake and impact of sharing data with EMODnet and the benefits of having experts curating and harmonising data to be integrated into EMODnet's pan European maps. *"People will contribute to anything if they see value coming out of it. We have to show citizen scientists that their information is useful and used."* A final intervention said, however, that for data providers, this feeling of usefulness is already in place. One open mic participant who works within the EMODnet partnership concluded *"It's been nice to see all the applications that can be developed with the things I work on."*

Session 4: EMODnet, Ocean Observation and the marine knowledge value chain

The opening Session of the second day showcased EMODnet's key role within the marine knowledge value chain, as well as the data portal's strong connection with the ocean observation and data collection community across Europe and beyond. Topics presented and discussed included EMODnet Data Ingestion, EMODnet's key role as an in situ marine data aggregator, publisher and data product producer, and its partnerships with Copernicus Marine Service and EuroGOOS, via the Marine In Situ Coordination Group. The Session also showcased the diversity of ocean observation and data collection that provides the foundation for EMODnet, ranging from European Research Infrastructures such as LifeWatch ERIC, to the private sector, including EMODnet Associated partner Fugro, the geological community, including national geological surveys like the Geological Survey of Finland (GTK), national marine institutes such as METU-IMS, Turkey, and the International Council for the Exploration of the Seas (ICES). A second Panel brought together representatives of EuroGOOS, Copernicus Marine Service, EMODnet Sea-basin Checkpoints, OceanOPS, the EuroSea project and the OECD, to discuss the role of EMODnet in connecting with and supporting the European Ocean Observing System.

Dick Schaap, MARIS, The Netherlands, EMODnet Data Ingestion, Bathymetry and Chemistry Technical Coordinator, gave the first presentation on **EMODnet in the marine knowledge value chain**. He noted that the EU spends a huge amount on ocean observation and data collection, for both satellite-derived data and in situ data that is collected in or around the ocean and seafloor (field data). He added there are many reasons why such observations are needed, and highlighted the value of the marine knowledge value chain that transforms raw observations into marine data and knowledge, to support research and innovation, environmental management, modelling, and EU policies. For EMODnet, he emphasised that the in situ ocean observation and marine data provision to EMODnet relies upon many diverse data collection efforts, showing an infographic that identifies key sectors and communities from research and academia, research infrastructures, hydrographic offices, geological surveys, the private sector, national authority regulatory monitoring, citizen science, NGOs and more. He presented the marine knowledge value chain in the form of a pyramid, with a foundation of ocean observations rising up to data management, leading to integrated data services and marine knowledge users. Within this he explained the key role of SeaDataNet, a European network of National Oceanographic Data Centres (NODCs), noting that *"SeaDataNet and data infrastructures are pillars of EMODnet."* He concluded that there is a lot of ambition for EMODnet going forward and that EMODnet partners see a lot of interest from other organisations and data providers who are not yet connected to EMODnet. These partnerships can also be leveraged from Horizon Europe and wider projects. A key priority going forward is to expand and diversify EMODnet's data collectors and providers, to more systematically include academic, industry, and citizen science derived data.

Antonio Novellino, ETT, Italy, EMODnet Physics Coordinator, presented EMODnet and its partnership with the Copernicus Marine Service In Situ Thematic Assembly Centre (INSTAC), including via the Marine In Situ Coordination Group (MIC Group). He explained *"that the MIC Group was set up in 2022 by EMODnet Physics and the Copernicus Marine Service INSTAC, to synchronise synergies in data standards, flows and exchanges for operational in situ data, with a focus on the operational oceanographic data provided by the EuroGOOS network and some wider research infrastructures"*. The focus of the MIC data exchange is a targeted number of ocean physics parameters, namely temperature, salinity, ocean state, sea level, ocean optical properties, currents, sea ice, river data and ocean sound. For these parameters the MIC Group has a common ingestion procedure so that data can serve both EMODnet and the Copernicus Marine Service. EMODnet Chemistry and Data Ingestion also participate in the MIC Group dialogues, together with representatives of EuroGOOS, SeaDataNet and OceanOPS. He noted that through this group it has been possible to standardise formats and promote best practice, bringing together marine data experts. He provided examples of success stories, including the ingestion of data collected by fishing vessels in the Adriatic Sea and Baltic Sea, ocean temperature data from professional diving networks and physical and biogeochemical sensors fitted to the hulls of sailing yachts.

Sissy Iona, HCMR, Greece, EMODnet Data Ingestion Scientific Coordinator, continued on the theme of data ingestion, with a presentation of EMODnet Data Ingestion: in search of new data providers from every sector of marine society. She explained that some publicly funded ocean observation and marine data efforts – particularly data for research and academia, hydrographic offices and geological surveys – have an established pipeline to EMODnet via National Oceanographic Centres and European infrastructures such as SeaDataNet. However, there is much historical data that is not yet shared and data from various sectors that has a less systematic data flow into EMODnet. This includes data collected by national authorities, NGOs, the private sector and citizen science. EMODnet Data Ingestion was set up to address the need to provide support in the curation and integration of data from diverse sources to EMODnet *"We aim to provide a public service to everyone, also offering support and training for data holders to share their in situ marine data."* she explained. She then added that EMODnet Data Ingestion streamlines cooperation between a consortium of 50 data centres, specialised marine centres, and EMODnet thematic coordinators, to provide trustable data and products. Data providers to EMODnet Data Ingestion include over 200 organisations, such as NGOs, academics and civil society. This is just the tip of the iceberg, she said, as in total EMODnet has > 600 data providers, not including hundreds that collect original ocean observations at sea. The ingestion of eutrophication data from national monitoring efforts by Marine Scotland and environmental monitoring data from offshore windfarms in the Dutch part of the North Sea were given as examples of recent success stories. She concluded that the challenge remains the inaccessibility of a lot of public and private data. Even when accessible, a lot of the data is not usable, so EMODnet proactively communicates on the win-win benefits of data sharing. There are many more promising collaborations for future growth, she added, explaining that EMODnet Data Ingestion also organises workshops and webinars.

Panel: EMODnet and the EU Ocean Observation landscape

Moderated by **Karen Coleman, Master of Ceremonies**, this Panel showcased the diversity of data being provided to EMODnet from operational oceanography and from wider research, including the private sector.

Anu Kaskela, GTK, Finland, EMODnet Geology, explained that *"EMODnet Geology works with many partners across Europe including National Geological Surveys, research and academia and more, to source, aggregate and standardise marine geological data and deliver integrated pan-European geological map products."* This includes data, for instance, on sedimentation rates, seafloor geology, coastal behaviour, and submerged landscapes. The European approach has now expanded to the Caspian Sea and the Caribbean Sea.

Christos Arvanitidis, CEO of LifeWatch ERIC Research Infrastructure, explained that *"Lifewatch is one of a number of key European Research Infrastructures that are important data collectors and providers, and also provide many services to users"*. He posed the question of how data providers and stakeholders can work more closely together, to share not only data but also services. He explained that diversity, opportunity, and freedom of user access are all important. He also said that science clusters are working together as vehicles for researchers and communities to collaborate, and that there is an opportunity for closer partnership between EMODnet and Research Infrastructures.

Baris Salihoglu, METU-IMS, Turkey, explained that Turkey is surrounded by three different and distinctive seas, and that METU-IMS has data from all three seas, with various types (parameters) and amounts of data. He noted that *"the diversity of seas shows the value of developing pan-European FAIR data and products, drawing on national input but ensuring this is interoperable with EMODnet"*. METU-IMS is for the first time looking for Black Sea data but this is often not accessible or may not be possible to assess according to a standard template. This is where linking different project outputs together through EMODnet can help to support projects.

Dominique Obaton, Ifremer, France, Copernicus Marine Service INSTAC, noted that collaboration between the Copernicus Marine Service and EMODnet is important and that *"the overall aim of marine in situ coordination is to clarify the offer of the EC marine data services to users, through joint, practical actions. This in turn increases the availability of new data and enhances workflow."*

Marco Filippone, Fugro, EMODnet Associated partner, gave a private sector perspective of partnering with EMODnet. He said *"Fugro is in active dialogue with EMODnet, in collaboration with Seabed 2030, to explore opportunities for data sharing of bathymetric data."* He added that FUGRO is looking at implementing automation for the ingestion capacity of data they collect, and that in the future data sharing could also include other marine environmental data, such as biological data. He explained that an upcoming transatlantic crossing from the Baltic Sea to the Caribbean Sea would be a further opportunity to collect more data, concluding that "*Data collection is important for science. Much is still unchartered.*"

Neil Holdsworth, ICES, rounded off the Panel presentations with a look at data exchanges between EMODnet and the International Council for the Exploration of the Sea (ICES). *"This is a great success story about synergies"*, he said. *"EMODnet and ICES have worked with the European Environment Agency (EEA) to create a data flow on contaminants for the whole European region. This is a very powerful thing that we couldn't have done alone,"* he noted. He said that ICES also provides fisheries management data to EMODnet (Human Activities) and others, adding that there was opportunity for further collaboration with EMODnet to align data flows, standards and formats.

Panel: EMODnet, Ocean Observation and data adequacy

This Panel was moderated by **Zoi Konstantinou, EC DG MARE**, and brought together regional, European and international representatives to discuss how EMODnet can evolve work in data adequacy (e.g., EMODnet Sea-basin Checkpoint methodology) and user feedback.

Zoi Konstantinou, EC DG MARE, gave a presentation on the EC Ocean Observation initiative: vision and links to EMODnet. She listed key EU policies that need data from ocean observations. These range from the Marine Strategy Framework Directive (MSFD) and the Marine Spatial Planning Directive (MSPD) to Green Deal Objectives, the circular economy, biodiversity beyond national jurisdiction, and even sustainable food. DG MARE identified a need for a better understanding of how observations are taking place within Member States and so proposed *"an efficient and effective EU process for planning and implementing ocean observations."* The aim here, she explained, is to identify the actors who own the data, then consider how this can be harmonised, standardised and, potentially, shared. The process includes collecting stakeholder feedback on the benefits of ocean observation. Developments on this are expected under the next mandate of the Commission. Ms Konstantinou concluded that *"Until then we continue working in the whole Ocean Observation value chain. For the Commission, marine knowledge is a public good that should be used for multiple purposes and coordinated in an optimal way, for the benefit of all. EMODnet is a key initiative in delivering this"*.

Jun She, DMI, Denmark, explained that the EMODnet Seabasin Checkpoints are a great example of the fit-for-purpose data adequacy assessment approach. As the Baltic Sea Coordinator of the EMODnet Sea-basin Checkpoints, he explained that in 2022-2023 there had been a stakeholder consultation on the added value and benefits of these activities. He noted that *"the methodology of the EMODnet Sea-basin Checkpoints remains very useful and that the Danish Meteorological Institute (DMI) has used this approach to assess offshore windfarms."* Looking to the future he added that EMODnet could further develop its offer in the areas of underwater noise and plastics, including in areas beyond the EU's jurisdiction.

Pierre-Yves Le Traon, Scientific Coordinator, MOi, explained that without ocean observations there would be no value chain. Speaking as a representative of the Copernicus Marine Service, he noted *"collaboration across the value chain is important to identify gaps in the ocean observing system"*, referring to ocean carbon sampling as one example. He added it is also important to understand the impact of ocean observation upstream, to appreciate the impact this has on services.

Inga Lips, Executive Secretary, EuroGOOS, noted that *"more EU-coordination is needed to establish a fully functioning European Ocean Observing System (EOOS)"*. Sustained funding is needed, but funding alone does not make observation services sustainable and national observation services alone are not enough. There is a need for pan-EU ocean observation services, including a high-level decision-making body.

Caroline Cusack, MI, Ireland, representative of the Horizon Europe EuroSea project, explained that *"the EuroSea project had driven research and innovation for ocean observation, working closely with the EOOS community and its Implementation Plan."* EuroSea produced a Declaration at its final Conference in September 2023 and the project identified EU Ocean Observation & Forecasting System gaps and recommendations. *"There is a huge amount of work for us to do as a community, It is very important we talk to each other and get ready."*

Claire Jolly, OECD, said it was important to make the case for ocean observation. This means looking at value chains in new ways. Offshore wind, for instance, uses a lot of marine data, including through new data "collection applications." She agreed with several participants that the role played by citizen science is growing. She also flagged the challenge of the private sector often being unable to share data, calling for "ground rules" to be set for data owners and gatherers. *"Marine data is flowing throughout the economy. EMODnet is one of the few institutions trying to track its benefits."*

Matthieu Belbeoch, OceanOPS, said he was very impressed with *"the footprint"* of EMODnet and how "*EMODnet has evolved into a strong service for users."* Moving forward, he said there would be a need to connect meta-systems, potentially by adding a metadata "tag" to the system to further indicate data sources and build trust. Even though EMODnet is just starting to move into the international level, he reminded the audience that in the EU there is *"a big community of users to be reached. Europe can afford to go more global than it is today."*

Stakeholder networking


Your gateway to marine
data in Europe
and beyond

Session 5: EMODnet impact for society

This Session brought together diverse stakeholders to discuss the value and use of EMODnet data and data products for EU Policy (MSFD, MSP, Birds and Habitats Directive, Water Framework Directive, and others), supporting the Blue Economy (planning and operations) and wider society (Mission Ocean, NGOs and citizens). Participants also heard key recommendations from Townhall Meetings held on the previous day.

Alessandra Giorgetti, OGS, Italy, opened the Session with an overview of Townhall Community perspectives on EMODnet for EU Policy. This was followed by Panel presentations and debate on the same topic. The Townhall found that the impact of EMODnet goes far beyond monitoring data, just as EMODnet itself is broader than the EU, but warned that there are perceived differences in data accessibility between the north and south of Europe. Priorities moving forward should include visibility for data access and use. The Townhall also suggested having a guidance document on what data is relevant for EU directives and policies, as well as identifying new policy areas that do not currently use EMODnet.

Panel: EMODnet for EU Policy

Panel Chair Rémy Dénos, EC DG MARE, said *"Marine data provides essential evidence for policy making"*, and explained this Panel would look at what EU policies EMODnet already serves and where it could further support. He explained that marine data is of utmost importance to inform on the health of seas and oceans and to derive strategies to preserve and restore their state. He added that data has to be fit for purpose and made available to the users in the right formats.

Kate Larkin, EMODnet Secretariat, said *"EMODnet is well trusted and used both directly and indirectly, to inform EU environmental and Blue Economy policies."* She gave examples spanning the MSFD and MSP, noting that marine litter data was not well harmonised around the EU until EMODnet created a pan-European beach litter database, produced in collaboration with the EU Joint Research Centre (JRC) and the MSFD Technical Group on Marine Litter. In the same way, EMODnet is working with MSP technical working groups to further harmonise national MSP plan models and methodologies, towards the trans-boundary interoperability of MSP plans, using EMODnet's multidisciplinary marine environmental data to support future MSP planning.

Céline Frank, EC DG MARE, noted *"there is still work to do harmonising maritime spatial planning data around Europe, with data not yet available for all EU seas."* She agreed that more use could be made of EMODnet data for offshore energy production, for instance finding the best locations for future activities.

Alice Belin, EC DG ENV, explained that any assessment of the status of marine waters starts with the monitoring and collection of data. She noted that this is however *"extremely complicated"* and requires much cross-border and pan-EU coordination. *"It is the responsibility of Member States to bring this data together and move to the next step."*

Georg Hanke, EC JRC, said it was very obvious there are some gaps in marine data and that *"EMODnet makes it easy to see where data is missing for any country."* There is also a problem of data accessibility, since *"in theory all data is out there but we can't always get to it,"* and of data quality, with some data not fit for purpose when found. He asked for EU guidance on comparability and harmonisation, since *"it's unthinkable that anyone produces data and doesn't share it at all."* He further explained the key collaboration between the JRC and EMODnet for the delivery of the EU marine litter database, it's a flagship product utilised by the MSFD.

Joni Kaitaranta, HELCOM, said that in some cases, such as the MSFD, it should always be possible to refer to an underlying dataset with a single URL. For Maritime Spatial Planning (MSPD), it is already recommended that data be made publicly available in line with an agreed format and data model. *"The HELCOM Regional Sea Convention worked with EMODnet and the MSP Technical working group on the harmonisation of MSP National plans."*

Adeline Souf, SHOM, France, suggested that *"data are required to meet marine public policy needs at the right scale and resolution."* This should include thinking about Member States and how they themselves view or use the data collected, and if this can help to address gaps. She noted that the French Naval Hydrographic and Oceanographic Service (SHOM) was *"very happy"* with the Bathymetric Portal available through EMODnet.

Stéphane Isoard, EEA, explained that *"the European Environment Agency (EEA) increasingly uses EMODnet data to complement national databases when developing indicators and assessments."* This approach has been helpful for instance for data on contaminants in European seas. The Copernicus Marine Service currently has data gaps on marine heatwaves, which EMODnet may help to fill. *"We are less into mapping problems and more into taking action,"* he concluded.

Panel: EMODnet and the Blue Economy

Alessandro Pititto, COGEA / BIG Group, Italy, opened the Session with an overview of Townhall Community perspectives on key messages from the Blue Economy Townhall noting that although industry often does share data, there is some lag with this, due in part to a lack of incentives to "give away" key data soon after spending money on a project. A UK mechanism under which the Crown Estate requires project data to be shared as part of the lease agreement was given as a possible best practice example for consideration. Data could also be made more accessible for users by creating "thematic collections," for instance with a list of all data sets relevant to offshore wind developers. Possible priorities for the coming years include capitalising on EU leadership in the Blue Economy, by identifying business opportunities to engage a global audience. There is also likely to be a need to expand cross-thematic cooperation and promote good communication with stakeholders. The Townhall also highlighted the importance of data showing the link between the marine environment and local communities, including in jobs, services, and local biodiversity.

Luca Marangoni, CINEA, explained that the European Commission provides a high level of investment in Blue Economy projects. He then referred to the EMODnet Associated Partnership Scheme, which offers a more flexible arrangement allowing organisations to join EMODnet more easily. He said, *"I am hopeful that EMODnet and its Associated Partnership will further bring new data to EMODnet, including from the private sector and public authorities regarding their planning and decisions."*

Madlie Le Bihan, RGI, explained that the Renewable Grid Initiative works across the private sector and NGOs with a view to increasing data sharing and evidence-based planning, operations and environmental impact assessments. She noted that *"encouraging the private sector to share data, for instance around offshore wind, is a big challenge. RGI is already in dialogue with EMODnet on how to work closer together to improve this"*. As well as the UK Crown Estate, she pointed to a Belgian example in which a public authority monitors industry offshore wind projects and provides some data as part of the licensing agreement.

Nikolas Flourentzou CMMI, Cyprus, EMODnet Associated partner, said *"the Cyprus Marine and Maritime Institute (CMMI) is developing easy-to-use tools for presenting ocean information. These require harmonised, long term, reliable data."* He said there had been conversations, including at the Townhall, about a wind industry map of Europe that could be customised for different sectors. But he warned that using data across different sectors, from ship building to management, would create a need for new subsectors and could lead to complications.

Paul Holthus, World Ocean Council, said that the shipping sector is unlikely to share much data unless regulated to do so. *"71% of the atmosphere of the planet is above the oceans, and there is a need to gather more ocean and atmospheric data"* In order to maximise global dialogue around marine data, he said the WOC was working to bring together the global ocean private sector, including shipping, fishing and energy companies. *"We identify leadership companies and bring them into a simple, effective procedure to supply more data."* He said it is *"pretty easy"* to get companies involved with metadata if they are engaged, but often *"they don't realise the value or that it is easy to get involved. The future is getting companies involved in the easy win areas, then creating relationships over the longer term."*

Melanie Symes, TransEurope Marinas, provided a video recording and represented the coastal tourism sector, noting that *"TransEurope Marinas have an overview of 18 coastal areas in 12 European countries, all of which need to be protected from adverse weather – and can be helped to do so by the availability and use of good data."* As well as addressing climate change and promoting sustainable tourism, coastal areas need this data to support regulatory compliance, including through eco-certification.

Panel: EMODnet by and for wider society

The third Panel then opened with a presentation by **Patrick Gorringe, SMHI, Sweden**. The clear focus from the wider society Townhall, he said, was on citizen science and how this can be further explored. The EU hopes to get 20% of its marine data from citizen scientists by 2025. Mr Gorringe said Europe was "well on the way" to meeting that target but was now in a hurry. *"Citizens and citizen science can be of huge benefit for data collection and production. That is becoming more and more obvious."*

A Slido question in this session found that EMODnet could best engage citizens, particularly for the EU Mission Restore our Ocean and Inland Waters project, by providing feedback on how data is used. Local events and workshops were suggested as a way to increase engagement. Schools and educational professionals should also be encouraged to contribute to the European Atlas of the Seas.

Evangelia Tzika, EC DG MARE, said that the European DTO would enable better decision making, by connecting data and models through tailor made applications. At the same time, she agreed *"there is a need for public mobilisation. This should include citizen assemblies and also citizen science"*, such as for instance ERA Plastic Pirates. Youth engagement, partly though student and school initiatives like Blue Schools, will also help to build the water knowledge system.

Kamel Labibes, Ayam Sailing, set out a positive circle of empowerment for citizen science and the JRC, *"to foster co-creation and knowledge preservation for the marine environment."* Scientists must first empower teachers. When teachers are empowered they can go with students on citizen science projects. Students then join forces to gather project data, which is in turn returned to the scientific community. Mr Labibes noted that *"we are engaged in the Erasmus Maris initiative and in dialogue with EMODnet, in terms of standardisation of data collection and data ingestion of marine/in-land waters litter data into EMODnet"*.

Patrick Gorringe, SMHI, Sweden, presented a coastal project carried out across continents. This involved citizen scientists providing data to a wide community, with EMODnet engagement then adding another dimension. *"Citizen scientists often act very locally but they are always wanted globally,"* he said. *"Their potential is massive and there are many opportunities."*

Arianna Liconti Outdoor Portofino, Citizen Science, agreed that *"people who experience the ocean every day can be the many eyes and hands science needs."* She mentioned for instance citizen science projects in water sports, which have been used to collect data on marine biodiversity sightings at sea, plastic.

Antonia Leroy, WWF, NGO, said it was currently impossible to compare the effects of human activities on the environmental status of the marine environment because MSFD data is missing from the Map Viewer. *"WWF uses a lot of EMODnet data for both policy implementation and policy advocacy,"* she said, but would welcome common methodologies to describe areas of the viewer, and called for data on upcoming restoration plans to be included in EMODnet.

Tim Collart, EMODnet Secretariat, explained that EMODnet powers the European Atlas of the Seas, which is an EU web-mapping and communication tool for ocean literacy. *"There are amazing citizen stories out there,"* and a priority now should be turning around these stories and bringing knowledge to society. The European Atlas of the Seas, he reminded participants, has 294 layers, more than nine data services, including EMODnet providing data layers, 30 thematics, and is available in all 24 official EU languages. It also includes teaching resources, for which he said it was important to understand what kind of information teachers need.

Session 6: EMODnet and the Global Ocean Data Ecosystem

This Session focused on EMODnet in the global landscape, including regional partnerships worldwide. It was built around two presentations and two Panels. The first Panel focused on EMODnet's contribution to global initiatives, including ocean best practices, interoperability, data sharing and data service provision for the global ocean data ecosystem and for the UN Ocean Decade. This was followed by a Panel on existing and emerging partnerships between EMODnet and other regions worldwide, including data sharing, best practice exchange, and connecting regional data services.

Peter Pissierssens, IODE IOC/UNESCO, presented the work of the International Oceanographic Data and Information Exchange (IODE), noting *"We're not building a centralised data system but an ecosystem. Data and information are key to delivering the science we need for the ocean we want,"* particularly when it comes to the UN Ocean Decade. With this in mind he presented IODE's "*transformation*" plans for 2024-2025. The transformation will include reinforced data management support and capacity development. It is also expected to increase the focus on inclusion, in part through local and indigenous knowledge. The new IODE structure will continue to be based around 3 central components: the Ocean Biodiversity Information System (OBIS), the Ocean Data and Information System (ODIS) and the Ocean Teacher Global Academy (OTGA). With ODIS, for instance, *"ocean data and digital resources are exponentially increasing daily, in both volume and diversity of data types and sources,"* he said. This makes it more important than ever for independent digital initiatives to be *"connected to form a diverse but interoperable and inclusive"* system. EMODnet partnerships already exist for all three components but cooperation will be strengthened through this transformation. Mr Pissierssens said there would also be a return to further *"co-designing and delivering top level training,"* after a pause during the COVID-19 pandemic.

Panel: EMODnet Ocean Best Practices, global data sharing and interoperability

Lennert Tyberghein, VLIZ, Belgium, presented key findings from the Townhall on EMODnet, ocean best practices and interoperability. These included the importance of geolocation as part of efficient data transfer. Knowledge gaps were identified at the Townhall between users and researchers, along with interoperability gaps between standards and countries, suggesting a need for better collaboration. This led on to a presentation of the EMODnet for the UN Ocean Decade Coordination and Implementation Group (E4OD-CIG). *"EMODnet is a diverse network with many contributions to the UN Ocean Decade. We have set up an internal EMODnet coordination and implementation group for the UN Ocean Decade to map existing activities against UN Ocean Decade outcomes and challenges, inform and engage the EMODnet community of our actions, and highlight opportunities to get involved. We will continue to enhance our contributions to the findability, transparency, accessibility and interoperability of marine data"*, he said. He then went on to introduce the next Panel as Panel Chair.

Pier Luigi Buttigieg, HGF MPG, Germany, noted the success story of EMODnet now being harvested into the international ODIS so that *"EMODnet data and data products are now even more connected to the global ocean data ecosystem and more visible and discoverable by regions worldwide."* Regarding data sharing, he said the future for European Horizon Europe researchers should be about *"getting data into the hands of decision makers and the public."* Talking to the EU community about priorities for research and policy making is necessary to promote transparent data sharing. Researchers want to be able to see where their research goes. *"As a researcher, I want to know, for instance, if I put data into EMODnet, what is the impact?"*

Emma Heslop, GOOS, said *"it is important that the right data gets into the right hands and is fit for purpose."* Data underpins a wide range of applications, for instance for weather forecasting and climate change understanding. Collecting ocean data is also very expensive. It is therefore important to be sure that the data collected is in line with science and policy needs – and with public expectations. She set out the value chain supported by ocean observation and made recommendations for priorities. These included strengthening FAIR data flow and gathering feedback on data implementation.

Steve Hall, Seabed 2030, reminded participants that it took over 100 years to get the first 6% of ocean floors mapped. *"Still today, despite absolutely crucial partners like EMODnet, which offers a one-stop-shop for one part of the world, much bathymetric seafloor data remains hard to access and may even be lost."* All of it is however needed. He half-jokingly called on anyone who has *"dusty 1960s data, handwritten maps"* of the ocean or ocean bed to come forward. *"We'll take it. We'll find a way to use it."*

Enrique Alvarez, MOi, presented a video message, reminding the audience that *"we are trying to connect the world around ocean observation. Without data we cannot do proper forecasting."* EMODnet and Copernicus have done an incredible job of gathering data in one place, he added, but warned that *"it does not stop there."* He called for EU-style data gathering and forecasting to be extended to the rest of the world.

Joana Beja, VLIZ, Belgium, EMODent Biology Coordinator, echoed her VLIZ colleague and Panel Chair, saying the need for data harmonisation and interoperability had been a strong message from the Townhall. *"Data harmonisation and interoperability is a thing we do in Europe"*, she explained. For EMODnet Biology she said the collaboration with EurOBIS and OBIS means that EMODnet Biology data is discoverable on global ocean data platforms and that EU users also have access to global data on biodiversity and marine ecosystems.

Marina Lipizer, OGS, Italy, EMODnet Chemistry, explained there are already lots of efforts to engage with the user community, for instance through the EMODnet Chemistry thematic, including the contributions of EMODnet Chemistry to global initiatives on marine litter. She said this could be further extended to more global initiatives to improve interoperability, data quality and comparability, including by aligning both metadata and vocabularies. She suggested promoting the implementation of guidelines around ocean best practices. This improved interoperability is the next step, taking the EU and partners *"from good data to good decisions."*

Panel: EMODnet's global and regional partnerships

"The importance of sound data management and sharing for the success of the Ocean Decade has been well recognised," said Panel Chair **Jan-Bart Calewaert, co-Chair UN Ocean Decade Data Coordination Group**, opening the Panel on EMODnet's global and regional partnerships. *"The recognition and most importantly the use of data and information to deliver solutions for addressing the ocean challenges we face is now crucial."* This means working towards a *"global, distributed, trusted, inclusive, and interconnected"* Ocean Data and Information Ecosystem. Lifting up the global digital ecosystem and its core components is the main aim of the Decade's Data and Information Strategy. Steps along the way include the development and implementation of a Data Strategy Action Plan and an expert working group, whose members are developing a roadmap towards *"a comprehensive digital representation of the ocean, including a dynamic ocean map, which provides free and open access to explore, discover and visualize data and information on the past, current, and future state of the ocean."* With EMODnet, Europe has managed to develop a European digital ecosystem that is widely used, which can serve as an example and regional best practice delivering to the Global Digital Ecosystem we need.

Miao Sun, NMDIS, representing Xiaojian Cui, NMDIS, presented the work of the National Marine Data and Information Service (NMDIS), China and talked about the China-EU Marine Data Network Partnership (CEMDNET) and the Blue Partnership for the Ocean. Signed in 2018, this *"promising partnership"* enables the two economic regions to collaborate on marine data research, comparing for instance methods for determining environmental carrying capacity and developing seabed habitat maps. In the future, there are hopes that China and the EU will further improve data interoperation mechanisms, as well as expand data cooperation further around Europe and Asia.

Mike Smit, Dalhousie, OFI, Canada, presented an overview of Canada's latest ocean observing and data activities, including the 'transforming climate action' project which engages four universities across Canada, together with Canada's ocean observatory assets including the North Atlantic Carbon Observatory. He congratulated EMODnet, sharing his excitement for promoting international marine collaborations saying *"It would be easy not to see the value of engaging globally and instead stay close to home. But this kind of leadership has downstream effects in terms of making data available."*

Karim Hilmi, INRA, Morocco, said *"it is very important to create a digital ecosystem for Africa, and EMODnet is a very nice platform to collaborate with for this."* Coastal and ocean waters in Africa are increasingly gaining importance as a potential source of economic growth and employment, and the Ocean Decade Africa Roadmap has set out nine priority actions for the next ten years, as well as aiming to enhance coordination between agencies.

Sofia Mendoza, MGS, Mexico, presented the collaboration between the Mexican Geological Survey and EMODnet Geology, noting that she believes *"EMODnet is an important platform for the collection and exchange of data. MGS and EMODnet Geology are collaborating for marine geological data in the Caribbean Sea region."* She noted *"There are many challenges,"* but also opportunities for collaboration.

Miao Sun, NMDIS, China, added that China hopes to build on the Blue Partnership to *"extend collaboration into wider areas."* These include paying closer attention to small island communities, potentially also through a new partnership with Africa.

Renuka Badhe, European Polar Board, presented a video recording to explain the European Polar Board work in the Arctic and Antarctic, explaining that *"the polar regions have many data gaps and there is an opportunity for data services like EMODnet to work further on this."*

Session 7: EMODnet evolution

This final session looked at EMODnet's evolution from the perspective of EC DG MARE, which funds EMODnet as a flagship marine knowledge initiative, and wider stakeholders. Lastly, an EMODnet Call to Action was launched, calling upon key actors in the landscape to work together with EMODnet to shape its future. This session was moderated by **Karen Coleman, Master of Ceremonies**.

Delilah Al Khudhairy, Director at EC DG MARE, opened the final Session noting that *"EMODnet has been one of the most important investments of DG MARE. It is at the heart of all the European Commission's marine policies."* The network gives access to credible, harmonised marine data and provides building blocks for a sustainable future, she explained. *"In all of you we trust for the future evolution of EMODnet."* Over more than a decade, EMODnet has established itself as a successful operational service. At its heart are methodologies that power the Digital and Green Transitions, both requiring high level, interoperable data. Looking towards the future for EMODnet, she said DG MARE would work even more closely with other DGs, acting as a catalyst for more focused, targeted action. The most important value of EMODnet is and will remain *"the network of people and institutions"* it builds upon. *"EMODnet started 15 years ago as an assortment of marine knowledge players. It has evolved into a successful operational service. We will move forward together."* The Commission is working on a long-term strategy for EMODnet, through which it will reaffirm commitment to the overall framework while adapting to new policy and ocean challenges, in a way that best serves the needs of all services. *"This is the way forward for the EU,"* Ms Al Khudhairy concluded.

Panel: EMODnet evolution

This final Panel, moderated by **Master of Ceremonies Karen Coleman**, gave participants chance to discuss EMODnet evolution, ahead of the launch of an EMODnet community Call to Action.

Geert Verreet EWI, said a great strength of EMODnet was its ability to draw on the competences of both small and large institutions, making it possible to gather marine data more efficiently. Since collecting marine data is generally more expensive than collecting terrestrial data, *"the business case for EMODnet is certainly there,"* he said. Any future evolution should ensure that users have the opportunity to give their feedback, he said, adding that EWI would soon have a report on the value of sharing data.

Tina Mertens VLIZ, Belgium, agreed that the Conference had shown *"collaboration is vital,"* particularly for a network service like EMODnet. She suggested widening the scope of EMODnet through regional collaboration and internationally, for instance through partnership with UNESCO.

Alessandra Cacciari, EC DG DEFIS, noted that *"The Copernicus Marine Service and EMODnet have established a long-standing collaboration, including for EMODnet to provide crucial in situ observations used by the Copernicus Marine Service for the calibration and validation of satellites and constraining ocean assimilation models. The Copernicus Marine Service and EMODnet partnership also fosters collaboration on the technical evolution of the respective services."* She underscored that satellite and in situ observation has served and should continue to serve the needs of all marine stakeholders.

Szilvia Nemeth, EC DG RTD, noted that the progress made by EMODnet since its launch has been *"amazing." She added that "Going forward, one of the main deliverables for EMODnet is the European DTO, which relies heavily on EMODnet data."* For the future of EMODnet, she suggested it will be important to create even stronger links between communities. The development of the European DTO, she added, could be a good sounding board for EMODnet community engagement. Artificial Intelligence (AI) is also likely to influence the future of EMODnet, because it could bring us close to "real time" availability of data.

Quillon Harpham, HR Wallingford, UK, explained that *"A private company creates things that people want to use. That's the end goal. EMODnet should now develop and build on achievements to date, increasing communication on added value, and interoperability."* He added *"I'm glad the future is framed as an evolution, not a revolution."* EMODnet speaks the language of science very fluently, he said, but warned against talking too much about *"interoperability,"* which he said many people struggle to understand because it is *"not the language of industry."* Instead, it would be important to explain why data, particularly sharing data, is important.

Lotta Fyrberg, SMHI, Sweden/IODE, explained that *"sharing data with EMODnet [has] benefits for the entire IODE."* She added that working with EMODnet means accumulating valuable experience, data and information and technological solutions. *"This aggregated expertise is vital for the quality work of IODE and others,"* she explained. This UN Ocean Decade will be an exceptional decade, she predicted.

Nadia Pinardi, University Bologna, Italy, said oceanography has evolved so much over the preceding decades, creating a global interconnected ocean system, *"but also because we have AI coming. EMODnet, working with Copernicus, is a cornerstone of ocean knowledge, and now needs to consolidate, innovate, and see how AI fits in. This is a challenge, and we need to take it."*

A Slido poll on "What are the priority areas for further EMODnet development and evolution?" Found that the main audience ask was for "Semantic interoperability." Other most popular audience suggestions were: spatial coverage and FAIR data, followed by expanding data coverage, and policy commitment from member states.

Presentation of EMODnet Call to Action

Kate Larkin, EMODnet Secretariat, closed the EMODnet Open Conference 2023 proceedings by formally launching the EMODnet Call to Action (see also pages 5 for full text). She explained that the EMODnet Call to Action had been produced by the EMODnet Secretariat and Coordinators of the EMODnet thematics, data ingestion and Central Portal, as representatives of the full EMOD-network, launched today on behalf of the EMODnet Partnership. She then presented the key components of the Call to Action. Firstly, it takes stock of EMODnet's evolution to-date into the operational European Commission in situ marine data service, as a flagship initiative funded by the EC DG MARE and one of the main Marine Knowledge assets of the European Union. The Call to Action also recognises that EMODnet and the Copernicus Marine Service are complementary EU assets, and underlines EMODnet's key role in the development of the European Digital Twin of the Ocean (EU DTO), for which the two EC marine data services EMODnet and the Copernicus Marine Service work in close partnership. The Call to Action also recognises the key user groups and the thousands of diverse users who depend on EMODnet for trusted and FAIR pan-European multidisciplinary data layers, data products and metadata on the marine environment and human activities that are standardised to European geospatial data standards such as INSPIRE, international metadata standards e.g., ISO, and accessible via openly available data and web services.

She recognised the funding offered by the EU, Member States and the Flanders Government to-date to support the European Marine Observation and Data Network (EMODnet) and explained that the open Conference 2023 had exemplified the significant return on investment that the EMODnet community has provided over the past 15 years for the EMODnet public marine data service we all know today. She explained that going forward, the Call to Action identifies a number of key areas where EMODnet will continue to evolve through well-identified opportunities on the way to 2035.
She underlined that *"to continue delivering on the aforementioned, whilst also expanding services to address the needs of the Green and Digital Transitions, EMODnet requires community and political action to ensure sustainability and resources appropriate for a fully functioning, operational service of the European Commission"*. She then mentioned each of the key actors in turn that EMODnet calls upon to work with the EC marine data service to shape its evolution. This starts with the EMODnet community itself, and includes also EU Member States and wider nations, Regional Sea Conventions and regional initiatives, European Agencies,

networks, initiatives and projects, the wider European marine and maritime community – including the Blue Economy – and global ocean initiatives, together with regional initiatives worldwide.

She recognised the significance of recent stakeholder events held in 2023, and of COP 28 which was taking place at the same time as this EMODnet Conference, continuing into mid-December. She noted that all of these events and their respective statements and ocean declarations and the wider framework of United Nations Ocean Decade put a spotlight on the value and importance of ocean observation and marine knowledge, for climate change, biodiversity loss, and the digital transition.

She then concluded *"we now come to you all, as key experts and actors in the ocean observation, marine data and wider marine knowledge landscape, to ask you to support and help implement this EMODnet Call to Action, advocating for a sustained marine knowledge value chain, so that we can collectively deliver the marine knowledge we need for the ocean we want and to provide the knowledge base to achieve the Digital and Green transitions, international climate targets and Sustainable Development Goals that the European and global society deserve to address the ongoing triple planetary crisis of climate change, biodiversity loss and pollution….. We, the EMODnet community, stand ready to deliver the next generation services that are needed. And we call upon you, the stakeholder community, to join us on this journey!"*

Zoi Konstantinou, EC DG MARE, gave some closing words, with a number of thank-yous, firstly to Karen Coleman for serving as Master of Ceremonies, next to the full EMODnet Secretariat that led all programme delivery of the Conference, also thanking all the technical, logistics, registration and hotel support, and last but not least all of the speakers, Panel Chairs, panellists, and participants who had so actively contributed to making the week-long events of the EMODnet Open Conference and Jamboree a success.

Annex I: Physical Exhibition

The EMODnet Open Conference 2023 also included a physical exhibition, which played a pivotal role during networking breaks. Prominent participating organisations included: Copernicus Marine Services, featuring the innovative EDITO project jointly with EMODnet, UNESCO's Intergovernmental Oceanographic Commission (IOC) and International Oceanographic Data and Information European Global Ocean Observing System (EuroGOOS), the International Council for the Exploration of the Seas (ICES) Exchange (IODE), EMODnet itself, the European Atlas of the Seas, SeaDataNet, Seabed2030, and EurOBIS. Furthermore, the exhibition provided a platform to spotlight essential EU Infrastructure Projects like Jerico RI, EMBRC-ERIC, and Euro-Argo.

This bustling exhibition area served as a dynamic hub, offering attendees an immersive experience that showcased not only EMODnet but also key European and international ocean observation networks, cutting-edge marine data services, and broader marine data initiatives. Throughout the duration of the Conference, multiple screens continuously showcased participating organisations and projects, contributing to an engaging and informative atmosphere at the Conference venue. A special note of appreciation is extended to The European Marine Board (EMB) for their substantial support in reporting the outcomes of the Townhall Sessions.

The organisers extend their heartfelt gratitude to all participating organisations and projects for their invaluable presence, collectively transforming the physical exhibition into a central focal point for knowledge exchange, networking, and collaborative endeavours. These contributions significantly enriched the Conference experience, emphasising the importance of cooperation and sharing within the marine data community.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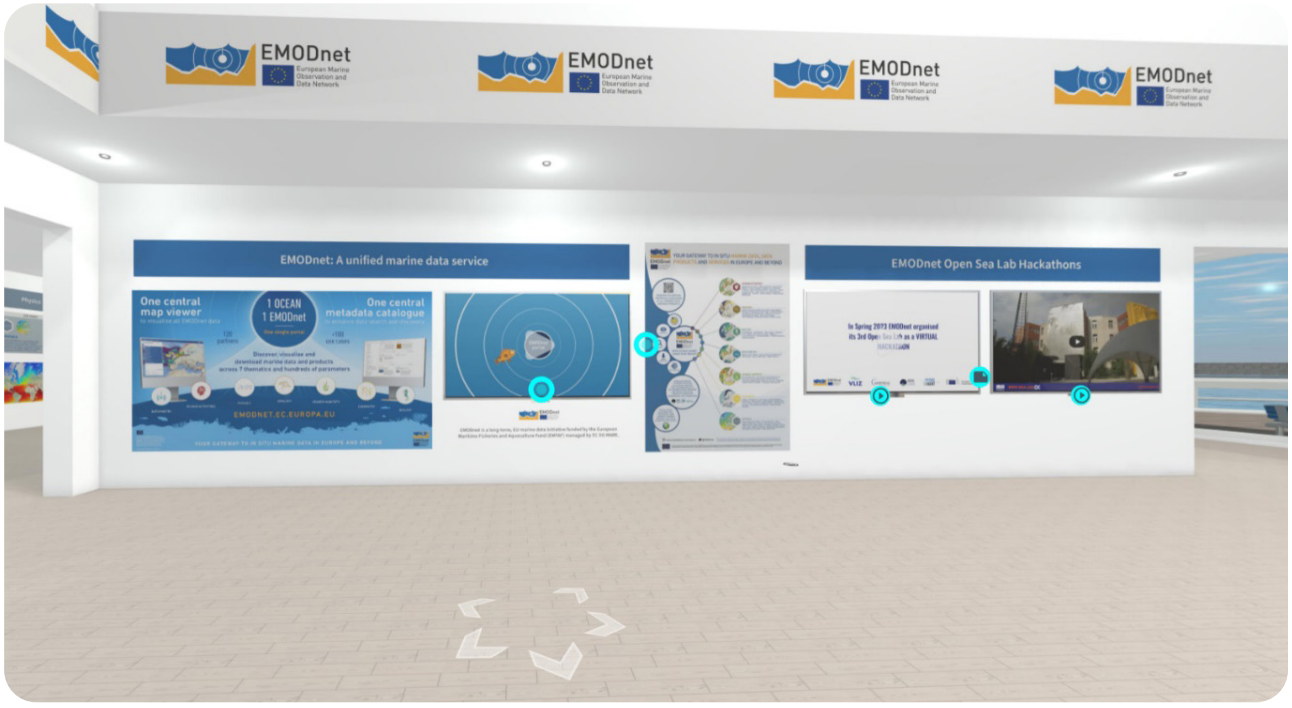
Annex II: EMODnet Open Conference 2023 Virtual Exhibition

During the EMODnet Open Conference 2023, attendees had the chance to explore the updated EMODnet Virtual Exhibition through an interactive Session and the presentation of a short “fly-through” video. This online hub is packed with resources and updates on EMODnet’s thematic and data ingestion services. It also showcased important partnerships spanning various sectors, from business to ocean observation, both at the EU and global levels, hosting EMODnet videos, communication materials, the European Atlas of the Seas highlights and updates, among other themes. In addition, over 50 community posters specifically curated for the Open Conference 2023 were hosted on the Virtual Exhibition platform, giving attendees chance to participate in a live poster pitch presentation, with community members presenting their work in quick and engaging succession. The variety of posters on display highlighted the wealth of expertise within the EMODnet community. All these Thematic and Secretariat updates can be explored on the EMODnet Virtual Exhibition platform, which will be online until the end of 2024.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EMODnet Open Sea Lab Hackathons


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EMODnet Video Gallery
EU MISSIONS
The European Digital Twin Ocean


USE CASES
BATHYMETRY
Powering the European Marine Data Ecosystem
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Geology
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Data Ingestion
Human Activities
Physics
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European Atlas of the Seas
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EMODnet
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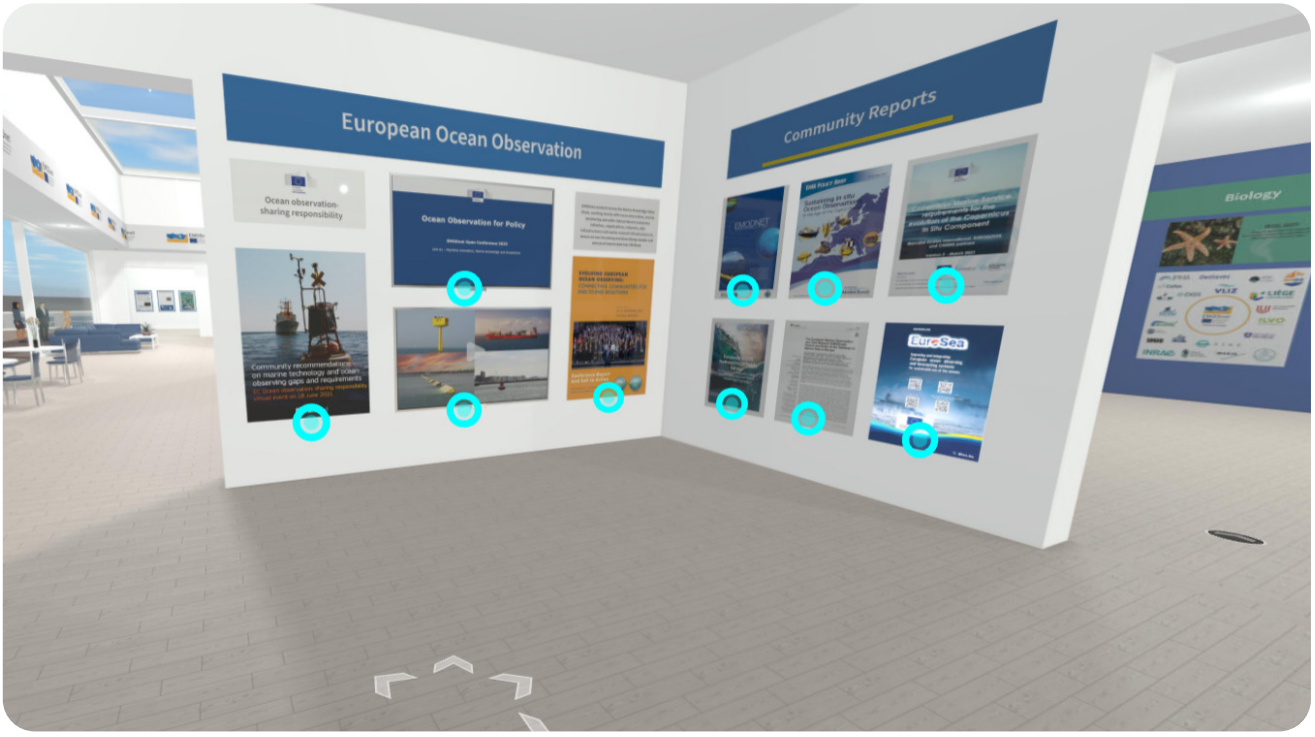
European Ocean Observation
Ocean observation-sharing responsibility
Ocean Observation for Policy
Community recommendations on marine technology and ocean observing gaps and requirements
Community Reports
EMODNET
LureSea
Biology

Annex III: Jamboree partner Event

Before the commencement of the EMODnet Open Conference 2023, the EMODnet community gathered for the EMODnet partner Jamboree 2023. This event, only for EMODnet partners and associate partners, served as a prelude to the main Conference. It offered an opportunity for partners to engage in detailed discussions, cross-thematic dialogues, and collaborative projects, effectively laying the groundwork for the Conference.

The Jamboree began on the afternoon of 27 November with EMODnet partners meeting in thematic and data ingestion consortia. Discussions focused on workplans, significant achievements, and future planning.

On 28 and 29 November, the partner Cross-Thematic Dialogues began, with **Kate Larkin, the new Head of the EMODnet Secretariat, and Jan-Bart Calewaert, the former Head**, introducing the **Call to Action** during an **EMODnet Strategy meeting**. The dialogues included a comprehensive discussion of the evolution of EMODnet and laid the foundation for the development of an EMODnet Vision for 2035.

Angelika Karampourouni, **EMODnet Secretariat,** led a Session on joint communication strategies across all thematics**. Jula Falvey**, **Seascape Belgium**, an expert in storytelling and science communication, contributed to the discussions on enhancing EMODnet's communication approach**. Pieter Torrez**, **science communication officer, EMODnet Secretariat,** presented online tools and resources available on the EMODnet website.

A dialogue on EMODnet's cross-thematic data products was co-chaired by **Sytze Van Heteren**, **TNO, The Netherlands,** and **Nathalie Tonné**, **EMODnet Secretariat**. The focus was on emerging areas in which users could benefit from data products that amalgamate various marine environmental and human activity themes.

The Jamboree also addressed the subject of citizen science, with a Session led by EMODnet Coordinators, including **Antonio Novellino and Patrick Gorringe from EMODnet Physics**. This Session built upon discussions at the EMODnet Open Conference 2021, revisiting and advancing citizen science initiatives within EMODnet.

An interactive Session on the EMODnet Central Portal was another key feature of the Jamboree. Conducted by the secretariat and technical team, including **Tim Collart** and colleagues from **VLIZ, Belgium**, it provided a hands-on demonstration of the EMODnet services centralised since January 2023. This Session encouraged open discussions and offered insights into future functionalities.

The European DTO was another highlight, with a presentation open to all EMODnet partners. Led by **VLIZ** and featuring contributions from **Conor Delaney, EMODnet Secretariat,** the Session focused on EMODnet's role in the European DTO through the EDITO-Infra project.

The evening of 28 November saw the EMODnet Partnership Dinner, featuring speeches from **Kestutis Sadauskas of EC DG Mare** and **Kate Larkin**. The event celebrated the contributions of the entire EMOD-network, including the Coordination, Steering Committee, Technical Working Group, and Central Portal Team, and acknowledged their efforts in the centralisation of EMODnet.

The final day of the Jamboree, 29 November, included Sessions on technical dialogues, EMODnet for coastal applications, and EMODnet for the Blue Economy. These Sessions were led by **Conor Delaney, EMODnet Secretariat**, **Francisco Campuzano**, **+Atlantic / EMODnet Physics, Vicente Fernandez** , **EMODnet Secretariat, Alessandro Pititto, COGEA – BIP group,** and **Megan Tijssens** and **Kate Larkin, EMODnet Secretariat.**


The proposed workflow


What's next


EMODnet


EMODnet


EMODnet

EMODnet

European Marine Observation and Data Network

The European Marine Observation and Data Network (EMODnet) is financed by the European Union under Regulation (EU) 2021/1139 of the European Parliament and of the Council of 7 July 2021 establishing the European Maritime, Fisheries and Aquaculture Fund.