

EMODnet marine data for the offshore renewable energy sector in the Northeast Atlantic, North Sea and Baltic Sea, a virtual workshop, 20-21 September 2022

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1 Executive Summary

On 20 and 21 September 2022, EMODnet together with the European Commission DG MARE, organised an online workshop on ‘EMODnet marine data for the offshore renewable energy (ORE) sector in the Northeast Atlantic, North Sea and Baltic Sea’. This was the first of two workshops, with the [second workshop](#) taking place on 20 and 21 October 2022, with a focus on the Mediterranean Sea and Black Sea.

The September workshop was attended by more than 65 ORE experts with representatives from diverse sectors including industry, research, policy and marine data services. EMODnet was well represented by thematic experts from Physics, Biology, Geology, Human Activities, Data Ingestion and the Central Portal and the EMODnet Secretariat. A key goal was for EMODnet to gather feedback from stakeholders in the Northeast Atlantic, North Sea and Baltic Sea region on which EMODnet data and data products are already used by the offshore renewable energy sector, emerging marine data needs and requirements, and the existing marine environmental and human activities data collection efforts of the offshore renewable energy sector, so that opportunities for data sharing could be identified and further discussed.

Day one included a demonstration of EMODnet services and enabled cross-sectoral dialogue on *in situ* marine environmental and human activities data needs and requirements for the offshore renewable energy value chain. The agenda included presentations from the Secretariat on the latest EMODnet ‘offer’, the transition to a fully centralised service by the end of 2022 with a common map viewer and many other upgraded functionalities. It also featured demonstrations of the latest EMODnet services from EMODnet Physics (ETT, Italy), Biology (VLIZ, Belgium) and Human Activities (COGEA, Italy). Additionally, speakers from Van Oord, Ørsted, Marine Power Systems, Waveston and the Geological Survey Ireland (GSI, representing also EMODnet Geology) presented use cases of open source EMODnet, whilst the Renewable Grid Initiative (RGI) and GSI presented case studies on existing activities and reports focused on offshore renewable energy sector data gaps and needs.

Day two focused on data sharing, specifically how the offshore renewable energy sector can contribute *in situ* marine environmental measurements to EMODnet databases through its EU EMODnet Data Ingestion service. At the meeting, the EMODnet Secretariat presented the benefits of data sharing to increase the interoperability and impact of marine data and the EMODnet for Business activities and opportunities for collaboration. Then EMODnet Data Ingestion Scientific Coordinator from MARIS presented EMODnet Data Ingestion as a public service that supports data collectors and providers in the data management, curation and integration of their data into EMODnet.

The workshop facilitated interactive and inter-sectoral dialogue, with breakout sessions and plenary discussions producing a number of interesting outcomes. Participants recognised the value of EMODnet’s centralisation and noted this would facilitate the ORE sector which often requires multidisciplinary marine environmental and human activities data, including for Maritime Spatial Planning. Marine data requirements for the ORE sector included a recurring need for increasing resolution of the existing parameters offered by EMODnet, together with the need for more data on tidal energy, soil strengths, seafloor substrate and marine biodiversity – in particular seafloor (benthic) species, marine organisms related to biofouling, sea birds and marine mammals - amongst others. Barriers and challenges to data sharing included commercial sensitivities and in some cases a lack of clear data stewardship. Participants also recommended how EMODnet could work closer with the ORE sector to address and overcome challenges and barriers to data sharing, including the opportunity for EMODnet to more visibly acknowledge data providers, and to promote the simplicity of sharing data with EMODnet Data Ingestion and the win-win benefits. Key messages, testimonials and feedback on EMODnet data use and opportunities for data sharing are included in this report, and will be used to further advance EMODnet services and collaboration with the ORE sector.

“EMODnet is one of the main data sources for European wind farms that we use in the early phases of development.” Kieran Bell (Ørsted)

“Using EMODnet could help with our initial analysis on the climate impact and social impact of our projects. It will be a very good opportunity for us to use EMODnet in the future.” Michael Henriksen (Waveston)

2 Introduction and context

In September and October 2022, the European Commission Directorate General for Maritime Affairs and Fisheries (DG MARE) and the European Marine Observation and Data network (EMODnet) co-organised two online workshops, titled 'EMODnet Marine Data for the offshore renewable energy sector', focused on different regional sea basins across European seas:

- 20-21 September 2022: [Workshop #1 'Marine Data for the Offshore Renewable Energy Sector in the Northeast Atlantic, North Sea & Baltic Sea'](#)
- 20-21 October 2022: [Workshop #2 'Marine Data for the Offshore Renewable Energy Sector in the Mediterranean Sea & Black Sea'](#)

The main objective of both workshops was to facilitate cross-sectoral dialogue and share experiences from key offshore energy stakeholders regarding their *in situ* data needs, the potential for developing targeted data products, tools and methodological approaches that can support the sector based on existing data, as well as to deliberate on the appropriate workflow to ingest data from industry. To achieve this, the first workshop explored how to:

- Increase the awareness and use of EMODnet services by blue economy sectors (in this instance offshore renewable energy), communicating EMODnet's diverse, open source marine data offer and services, particularly considering the recent centralisation and new Map Viewer;
- Explore opportunities and applications for EMODnet's diverse open source *in situ* marine environmental data and human activities data and data products to support and innovate the offshore energy sector in Europe: this should consider potential differences in the sector's development in the geographical areas identified;
- Gather feedback from experts from private and public sectors on marine environmental and human activities data/data products needs and requirements across the offshore renewable energy value chain (licensing and siting, operations at sea, environmental impact assessments, etc.) and across different European regional seas;
- Discuss opportunities for data sharing/ingestion of marine environmental and human activities data produced by blue economy sectors into EMODnet;
- Provide information on data collection, data coordination and data needs to support the EC Ocean Observation Initiative.

The workshop dialogue was in line with the policy objective of the current European Maritime, Fisheries and Aquaculture Fund (EMFAF) for a greener and low-carbon transition towards a net-zero carbon economy and resilient Europe by promoting clean and fair energy transition, green and blue investment, the circular economy, climate change mitigation and adaptation and risk prevention and management. In this context, the European Marine Observation and Data Network (EMODnet) initiated the EMODnet for Business framework, to underline the importance of open marine data and how it supports blue growth and industry.

3 Day 1– 20 September 2022: EMODnet services and data use

3.1 Welcome

The lead facilitator warmly welcomed participants to the virtual workshop on European Marine Observation and Data Network (EMODnet) marine data for the offshore renewable energy sector, co-organised by EMODnet and the European Commission's DG MARE over two half-days, on 20 & 21 September 2022. It was noted this was the first EMODnet for Business workshop dedicated to the ORE sector. The workshop would focus on the Northeast Atlantic, North Sea and Baltic Sea, with a second workshop on 20-21 October 2022 focusing on the Mediterranean Sea and Black Sea. She noted that a wide diversity of stakeholders had been invited spanning all the main platforms of ORE e.g., offshore wind, tidal energy, etc, and spanning the full

value chain of ORE, from the licensing and siting stage to the operational phase, environmental impact assessment, etc. Stakeholders at the meeting also represented diverse groups from the private sector, civil society, research, policy and marine data services.

A summary of the workshop agenda was presented. The first day would start with opening remarks by the European Commission's DG MARE. EMODnet Secretariat representatives would then set the scene, with presentations on what the network has to offer in terms of *in situ* marine data for the offshore renewable energy sector. Representatives from different thematic areas of EMODnet would then demonstrate EMODnet data, data products and services. Use cases would then follow on how diverse stakeholders in the offshore renewable energy sector practically utilise EMODnet products and data for their professional activities and operations at sea. After this, a breakout session of three groups would focus on existing and emerging marine data needs and requirements to support the offshore renewable energy sector. Lastly, day one would feature two further presentations, plus the plenaries and Q&A sessions gathering all the workshop's participants, to discuss the main findings so far.

European Commission welcome

Zoi Konstantinou, EC DG MARE Maritime innovation, Marine Knowledge and Investment (Unit A.1), welcomed participants, noting that participants included the EC Marine Knowledge Expert Group (MKEG) together with EMODnet partners and Associated Partners. She explained that EMODnet is a key marine knowledge service of the European Commission and a flagship initiative that the Commission supports at multiple levels. She explained that EMODnet comprises more than 120 organisations across Europe working together to source, aggregate, harmonise, and standardise marine data from diverse sources, and making these data available in high resolution integrated data layers for hundreds of parameters spanning seven thematic disciplines in the marine domain: Bathymetry, Biology, Physics, Chemistry, Seabed Habitats, Geology, and Human Activities.

She added that the EC is committed to making marine knowledge freely available to all stakeholders, to boost the development of policy and the blue economy. That is why DG MARE is supporting the EMODnet for Business workshops, held in September and October 2022, aiming to bring the work of EMODnet closer to the economy sectors. That includes dialogue with the offshore renewable energy sector, to ensure EMODnet's data products are fit for purpose for the energy sector's needs. The EMOD-network also wants to collaborate more with the sector, to bring in more data and marine knowledge – so these can be made widely available and make the oceans and their health more sustainable. The energy sector can play a role there.

She added the ORE sector is highly important, especially given today's political and historical circumstances and the need to move towards more sustainable, renewable solutions. For this reason, the European Commission is interested to find out exactly what the ORE industry and related stakeholders need in terms of marine data and data products, to further evolve EMODnet services to meet existing and emerging requirements.

Xavier Guillou, EC DG MARE Blue Economy Sectors, Aquaculture and Maritime Spatial Planning unit (MARE.A.2), underlined the important role of offshore renewable energy in meeting the EU Green Deal targets to transition to a climate neutral European continent by 2050. This was also vital considering the current energy security issues renewable energy and the REPowerEU plan published in 2022 to reduce the dependence on Russian fossil fuels and fast forward the green transition. He recognised that offshore renewable energy is already well established in some European sea basins, but less so in others where it is an emerging activity. He highlighted that EMODnet can play an important role in providing a trusted source of baseline marine environmental data and information on human activities at sea, to offshore renewable energy across its value chain from siting and deployment to maintenance and decommissioning. He added that ORE was already well developed and continuing to expand in the North Sea and Baltic Sea, with solutions also being developed for the Northeast Atlantic Ocean.

The lead moderator thanked the EC DG MARE representatives and then introduced the next agenda item where EMODnet experts would present and demonstrate the EMODnet *in situ* marine data 'offer' for the ORE sector.

3.2 EMODnet: The EU *in situ* marine data service

Kate Larkin, EMODnet Secretariat, presented an overview of EMODnet. She explained that the EU invests significantly in ocean observation, marine monitoring, and data collection. EMODnet is a flagship Marine Knowledge Initiative of the European Commission, DG MARE that adds value to these efforts, providing open and free access to *in situ* (collected in water) ocean observations that have been assembled, standardised and harmonised to EU and International standards to produce integrated marine data layers and marine data products. The EMODnet offer spans seven thematic areas, namely Bathymetry, Biology, Chemistry, Geology, Human Activities, Physics and Seabed Habitats, each offering tens to hundreds of parameters. Over the last decade, EMODnet has added a lot of value at EU level, gathering data from data collectors, providers and repositories at national or regional levels, spanning public and private data collection efforts, and making it FAIR (Findable, Accessible, Interoperable and Reusable), for the use and re-use by all. EMODnet experts also produce generic data products, for use by the private sector and other stakeholders for other applications. Data products include maps, composite maps, and some services with predictive capability. She added that the focus of EMODnet services has been on marine data from European seas, although coverage is increasingly global in many of the parameters and thematic areas, thanks to more data sharing and collaboration efforts worldwide.

She noted that more than 120 organisations contribute to the EMOD-network, with many more as data providers and users. She noted that many EMODnet experts were attending the workshop, to provide advice and expertise on EMODnet services. She added that EMODnet works very closely with Copernicus Marine Service, which is focused on remote sensing, modelling, prediction and forecasting. Together EMODnet and Copernicus are a key backbone for the marine data space in Europe.

She added that the EU Strategy on Offshore Renewable Energy highlighted both EMODnet and Copernicus as key data platforms for providing services to offshore renewable energy developers, amongst others. EMODnet offers the most comprehensive and multi-disciplinary *in situ* marine offer, with high resolution, high quality marine data layers and data products that are already used by a wide variety of users, including many sectors of the Blue Economy. Such data provide the much-needed baseline data to reduce the uncertainty and minimise the risk in decision-making and operations, such as finding the optimal location for siting a wind farm. She added that an added value is that EMODnet also offers human activities data, including European Member State Maritime Spatial Plans and many data layers on Blue Economy sector operations e.g., wind farm point and polygon data, and the location of other operations at sea including aquaculture farms.

Conor Delaney, EMODnet Secretariat, presented the latest developments of the EMODnet services, with a focus on the unification and centralisation of all EMODnet services, to be fully completed by the end of 2022. He noted that since 2021, EMODnet's online services are hosted under the EC Europa domain as an official EC DG MARE service. Whilst users can already access the thematic portals from a Central Portal, the added value from full unification will be one single portal with one central map viewer, search and download service, making the user-experience even more simplified and intuitive and offering additional functionalities and additional web services to further aid data discovery, visualisation and downloading. This would be fully operational, and externally promoted in January 2023.

The EMODnet *in situ* marine data 'offer': Demonstrations from EMODnet thematic Coordinators

EMODnet Physics

Coordinator Antonio Novellino, (ETT, Italy) and expert Patrick Goringe (SMHI, Sweden), highlighted the work already done to integrate and make accessible *in situ* ocean physics data from national repositories, regional networks e.g., EuroGOOS, and international databases, e.g. the International Council for the Exploration of the Sea (ICES). He noted a tight collaboration with other programmes, including Copernicus Marine Service.

EMODnet Physics collects data from some 7,000 platforms and diverse data providers from operational oceanography and near real-time data to citizen science data. The offer spans temperature, salinity and currents to underwater noise, riverine inputs, sea level rise products and more. Many data are now global in coverage.

EMODnet Biology

Coordinator Joana Beja (VLIZ, Belgium) presented the EMODnet offer of free and open access to marine biodiversity data spanning viruses to marine mammals. As for other EMODnet thematics, EMODnet Biology complies with the EU INSPIRE Directive (an infrastructure for standardised geo-spatial information in Europe to support Community environmental policies), Open Geospatial Consortium (OGC) standards, and FAIR principles. EMODnet Biology covers all European sea regions, including the Northeast Atlantic, North and Baltic Seas, and has data covering the whole world. Today it has 29.9 million occurrence records (and hopefully 30 million by the end of 2022) for over 1,200 datasets plus 34 data products, of which three are from external sources. The portal covers nine functional groups, among them as fish, birds, mammals, reptiles and zooplankton, i.e. anything in the water of coastal areas as well as the deep sea.

She added that EMODnet Biology has connections to other biodiversity initiatives, such as Ocean Biodiversity Information System (OBIS) and Global Biodiversity Information Facility (GBIF): these links expand the remit of data use in Europe and beyond. All EMODnet Biology assets will soon be available via the EU-DTO (2024), the European Digital Twin Ocean. She emphasised the value for the ORE sector of using EMODnet to access and bring together data on marine biodiversity, Human Activities and other thematics, e.g., when siting wind farms. She closed by welcoming feedback from the ORE sector on data needs and requirements and highlighted that EMODnet Biology works closely with Data Ingestion and remains available to discuss data sharing opportunities for any marine biodiversity datasets, from viruses up to marine mammals.

EMODnet Human Activities

Coordinator Alessandro Pititto (COGEA, Italy) provided a live online demonstration of the datasets that EMODnet Human Activities has to offer, with a particular focus on data and data products most relevant for the offshore renewable energy sector, including existing and planned wind farms, telecommunication cables, national Maritime Spatial Plans, aquaculture and algae production sites and vessel density maps, together with ocean governance layers including Marine Protected Areas and Natura 2000 sites, amongst others. Whatever the data source or country checked, all datasets are completely harmonized: same language, same units of measurements, and same attributes.

He remarked that around 30% of EMODnet Human Activities users are from the private sector and the most downloaded data product currently is the vessel density data product which offers monthly composites of vessel activity including the volume, trajectories and types of vessels, from fishing vessels to tourism and wider shipping. He added that human activities data coverage is improving, but relies upon the data collectors and providers sharing data and information to provide higher resolution data layers and data products, for the benefit of all. He encouraged the ORE sector to discuss their data needs and options for data sharing with EMODnet. He noted that a particular benefit of EMODnet was that the user could bring together harmonised and standardised data from both human activities and the marine environment, in one place. He added that many offshore energy sector users, especially from offshore wind, now use EMODnet. For instance, they combine layers from Human Activities with Bathymetry or Physics. These layers can be especially useful in the initial phase of a development project. All these data are available to visualise and download for free on EMODnet Human Activities, saving users a lot of time and ultimately costs.

Q&A on EMODnet services

A private sector representative asked what basic technical knowledge is needed to use EMODnet data and portals. EMODnet Coordinators replied that all users can browse and easily discover and visualise EMODnet data and data products. The imminent centralisation of EMODnet services into one common map viewer will make this even more user-friendly. EMODnet offers generic data and data products, leaving the interpretation and innovation of the data to the user community, which requires some specialist knowledge.

Users can also find all technical reports on one searchable page on the new central website. A helpdesk service also assists users, if they encounter technical difficulties while accessing EMODnet data. Regarding more technical users, EMODnet data are available in various geospatial formats. Data can be shared in several ways, such as via web service links through the catalogue or by sharing on the map viewers and importing them into the desktop system. Another solution is to share data by directly downloading the data in different formats and converting them through the new Map Viewer into more familiar data formats, such as CSV.

A private sector representative asked if EMODnet will be supplying its datasets as ESRI Web services as well as OGC standards. The EMODnet Secretariat Technical Coordinator replied that at this stage, EMODnet focuses on offering OGC standards which are mandated for open source software and which are very close to INSPIRE forms for web geospatial services.

The EMODnet Biology Coordinator responded to a question on what knowledge gaps still remain within the EMODnet Biology data/data product services. The main data gaps are found in the Black Sea and Arctic, and the Mediterranean Sea to some extent. EMODnet Biology identifies data gaps in several functional groups (e.g. angiosperms, reptiles, birds and mammals) and keeps track of these in order to address them better in specific regions.

A private sector wind energy representative commented that the Google sheets demonstration, made earlier by EMODnet Physics Coordinator, was very informative for contractors in the offshore wind industry, which tends to use Excel sheets. There was a recommendation for the portal to create a series of instructional films on that process for getting data via the web service. EMODnet representatives said they were delighted to hear that, while adding that [tutorials](#) have already been produced for existing thematic portals. They added these will soon be archived, ahead of the move to a central portal, and EMODnet also has plans to produce further tutorials and instructions in early 2023.

A Latvian marine institute representative said the country's Maritime Spatial Plan (MSP) interim assessment is due in 2023 and the process would benefit from use of certain EMODnet data for thematic map making. They asked if it was possible to get spatial data, e.g. shipping traffic, as a web service (in WMS or WFS formats) directly from the EMODnet online service, asking also if this required any log-in or permissions? EMODnet replied that all data and data products are free to search and visualise and the website can also be used without restrictions, while the help desk or Secretariat offer further assistance. Many data are open access, others open source i.e. they provide information on the data provider. Traffic density maps are available in WMS and WCS formats, as raster files, and the original data files remain with the data provider.

The EMODnet Secretariat stressed that EMODnet welcomes feedback on the usefulness of the data or data products. Feedback in general is very important to EMODnet, enabling the network to show how it is used as an operational service. It can also highlight to policymakers and funders that EMODnet user numbers are growing and they find the network's services essential.

3.3 Use Cases of open source EMODnet and wider data and data products to support, optimise and innovate the ORE sector

Five speakers highlighted how EMODnet marine environmental or human activities data, as well as data from other sources, have helped their company or institute to support the offshore renewable energy sector.

Use of EMODnet Bathymetry and Physics by the offshore contracting industry to optimise micro-siting

Gerben de Boer (Van Oord, EC MKEG member) presented a use case, noting that Van Oord regularly uses three different EMODnet thematics when working on offshore wind farms. For example, it used EMODnet Bathymetry and Geology data for micro-siting work on the Borssele 3/4 wind farm completed two years prior. This public data proved key during the tender phase, when assessing where to position monopoles for the 77 turbines. The company also called upon and utilised EMODnet Physics buoy data when installing the wind farm, to predict storms and high waves before vessels left the harbour. He also noted that Van Oord is ready to share some of its less confidential marine environmental data with the network.

Finding the best deployment site for a combined floating wind and wave energy system using open source data from Copernicus Marine Service and EMODnet

Caitlin McCarthy (Marine Power Systems) noted that Marine Power Systems, based in South Wales, uses EMODnet data to find the best deployment site for a combined floating wind and wave energy system. The first multi-megawatt demonstration will be placed soon in Bay of Biscay, near Bilbao. This site was chosen after looking at public source *in situ* marine data from EMODnet, in a high resolution with a long time series of 25 to 30 years on extreme waves – since the company's wave energy devices and operating platforms must survive extreme storms. Work included reanalysis of data over long periods, verified by some local buoy data, to confidently predict extreme wave heights and wave periods.

EMODNET data use within Ørsted for Wind Farm Site Selection and Design

Kieran Bell (Ørsted) explained that Ørsted is a renewable-focused energy company with the Head office based in Denmark. Ørsted uses data from six EMODnet portals for its offshore wind farm developments. It uses hundreds of datasets across the entire lifecycle of a wind farm. Data from the Bathymetry portal is the company's go-to dataset in Europe, especially for siting wind farms in deeper waters, particularly in these development phases before Ørsted geophysical data acquisition. He added that the EMODnet Physics data are key for calculating hydrodynamic loads, i.e. the pressure on wind farms, and for identifying weather windows when vessels can install or maintain turbines or foundations. EMODnet Geology data are combined with other datasets for foundation design, such as when assessing seabed sediments. EMODnet Human Activities data are also vital for navigational risk assessments of ships around wind farms. And EMODnet Biology data help Ørsted to understand bird distribution abundance, in order to locate wind farms where they are least harmful to birds as well as to lower or raise the tip heights of turbines, if necessary. Finally, the company uses EMODnet Seabed Habitats portal data for its environmental assessments, e.g. to determine if a wind farm's construction and installation might impact special areas of conservation.

Using open source data in desalination and wave energy farms: An example from Copernicus Marine Service

Michael Henrikson (Wavepiston) noted that Wavepiston is preparing to install its first full-scale pilot projects for wave energy devices that produce electricity and desalinate sea water. It is also looking at other areas worldwide for these devices. Although the company has not yet used EMODnet, it believes that the network's data would be invaluable for detailed analysis, plus assessing a potential site's climate, environmental and social impacts. The network's data would be especially helpful for small businesses without the financial resources to such detailed analysis.

Use of EMODnet Geology for offshore renewable energy siting

Janine Guinan (Geological Survey Ireland) highlighted the recently published research article 'INFOMARS data supports offshore energy development and marine spatial planning in the Irish Sea via the EMODnet Geology portal'. Ireland has only one wind farm in the Irish Sea, but under the government Climate Action Plan 2021, the goal is to generate 5 GW of offshore energy and 30 GW from offshore floating wind, both by 2030. Geological Survey Ireland uses seabed characterisation data from EMODnet Geology for siting and development of wind farms, e.g. understanding ground conditions or hydrodynamic processes and looking at potential areas to develop infrastructure.

Due to time constraints further discussion was taken up in later Q&A and break-out sessions.

3.4 Stakeholder presentations on ORE marine data needs and requirements

Renewables Grid Initiative (RGI) commissioned study: A Review of Biodiversity Data Needs and Monitoring Protocols for the Offshore Wind Energy Sector in the Baltic and North Sea

Roland Lleshi (Renewables Grid Initiative, RG) presented a 2021 study by the RGI and the Offshore Coalition for Energy and Nature (OCEAN) was presented by a representative of RGI. It reviewed biodiversity data needs in the offshore renewable wind energy (OWE) sector, using the Baltic Sea and North Sea as case studies. A

key finding was that there is a lack of clarity on the best monitoring methods. Also that there is common agreement on the pressures and impact from OWE, with both positive and negative impacts. The former include the creation of an artificial reef effect, while the latter include noise for marine mammals and birds colliding with turbines. The study's key recommendation was a more integrated multi-species and multi-method approach to biodiversity monitoring in the sector. This will enable monitoring of the same indicators and allow flexibility in the choice of methods, but use of those methods in a more standardised way. The presented concluded that none of the study's five recommendations will be possible without greater collaboration in sectoral and regional data sharing, plus more engagement with the main stakeholders – from companies to state institutions, academia and civil society.

Data and data gaps – ORE sector requirements in the context of the INFORMAR Seabed Mapping Programme

Janine Guinan (Geological Survey of Ireland, GSI) explained that the INFOMAR Seabed Mapping Programme, which will end in 2026, focuses on the near-shore areas of Ireland, coastal areas and biologically sensitive areas. The aim is to address relevant national policy drivers for the ORE sector and Ireland's Climate Action Plan, which calls for the installation of five GW of offshore wind energy by 2030. The GSI produces or prepares seabed and sub-bed data that is shared with EMODnet Geology. This data has near-term and long-term value for the ORE sector, such as the placing of foundations or anchors in the seabed. Various data gaps were identified. Recommendations to address these include acquiring extra high-resolution data (backscatter and SBP), and creating a shared stakeholder programme between public and private players involved in the sector.

3.5 Breakout session 1: ORE marine data needs and requirements in the Northeast Atlantic, North Sea and Baltic Sea

The goal of break-out session #1 was to share experiences in a cross-sectoral dialogue about in situ marine data needs and requirements, as well as to discuss challenges and the potential for using tools ecological approaches that can support the offshore renewable energy sector. This session also aimed to gather participants' feedback about their emerging marine data needs and requirements, and to discover if they use EMODnet data already. Participants in this session were pre-assigned into one of three groups, each led by a moderator. All groups – including a mix of people from the private sector, research, civil society and policy sectors – tackled the same three discussion points:

- What marine environmental and human activities data/data products are required by private sector operators, marine managers, etc. to support the development of the offshore renewable energy sector and to underpin an ecosystem approach in the management of the sector and overall offshore areas?
- How can the services provided by EMODnet support these needs to reduce uncertainty, save costs and drive innovation across the existing offshore renewable energy value chain including the planning, constructing, managing, monitoring and assessment of environmental impact?
- What are the additional data/data product needs/gaps now and in emerging offshore renewable energy platforms? How do these needs differ across different regional sea-basins?

A summary of each of the break-out groups was then reported in plenary (see below).

3.6 Plenary reports on breakout session 1

Each of the three break-out session rapporteurs provided an overview of key recommendations on data needs and requirements across different offshore renewable energy sectors and for different regional seas. These are grouped and summarised as follows:

It was noted that all private sector operators in the value chain, namely marine operators, public institutions, and researchers in relevant domains, support the development of the offshore renewable energy sector. Marine environmental and human activities data are required by all stages in the value chain, although data

needs and requirements differ also in terms of platform type and regional sea. It was noted that the decommissioning phase should also be considered, even from the early phases of development.

3.6.1 EMODnet marine data supporting the ORE sector

There is interest from the ORE sector in all of EMODnet's diverse data and data products, including the full suite of marine environmental data spanning the physical state (including open water and sea ice), bio(geo)chemical, ocean life and biodiversity data and human activities data. Participants recommended that continuous two-way links should further developed between the private sector, wider data providers and EMODnet to ensure data sharing as well as use is maximised. Examples were given from national representatives on how their public authorities share data. One example was from the Netherlands Enterprise Agency (RVO) that shares detailed data and information with a creative commons licence. It was noted this is available to all prospective operators, resulting in more transparency in the bidding process. The representative urged other relevant authorities and national representatives to be made aware of this possibility.

Another private sector representative noted that EMODnet should support specific needs, such as environmental impact assessments, which would help when looking at the likely environmental impact of offshore renewable energy activity. EMODnet experts noted that EMODnet produces generic data and data products so as not to influence the market, but rather to stimulate innovation in intermediate services, consultancy and business applications.

A representative from the private sector acknowledged using EMODnet data for offshore wind farms in Denmark. They remarked that given the green transition and plans for 10,000 wind turbines in the North Sea, together with the EU Biodiversity Strategy there is an urgent need for more marine biodiversity data. He suggested that further strategic partnerships with the shipping industry could potentially increase and expand the EMODnet data offer, including data collection from ships and observations animal and bird movements.

EMODnet centralisation benefits

A private sector participant praised EMODnet's move to centralise all data on one portal, while recommending using Excel or Google Docs. These are widely used in the offshore energy industry, and more than Open Geospatial Consortium (OGC) documents. An open-source European electronic nautical chart, serving as a sort of Google Maps for the seas, would also be welcome.

EMODnet Secretariat said that centralisation of the metadata catalogue, the documentation and central map viewer were a priority for the network, with a soft launch in October 2022. It was added that EMODnet Centralisation is a "game-changer" allowing the user to access and visualise EMODnet data across different thematics in one single portal and central map viewer. From January 2023, all EMODnet data and data products would be easily accessible within one area.

Addressing climate change

It was noted that EMODnet long-term time-series marine *in situ* data improves knowledge and decision-making, from the siting of wind farms, to climate-smart operations and planning for extreme events at sea. It was added that such in situ data was also crucial as input to models to produce predictions and scenarios, as produced by the Copernicus Marine Service. EMODnet experts noted that EMODnet and Copernicus work closely to ensure the right data infrastructures and FAIR data – in particular interoperability aspects - are in place for providing a EU marine data space fit for use that can also underpin key initiatives such as the European Digital Twin Ocean.

Maritime Spatial Planning (MSP)

It was noted that EMODnet is becoming a focal point for Maritime Spatial Planning data, notably marine environmental and human activities data. EMODnet already offers datasets on the use of ocean spaces (maritime spatial planning or MSP) already exist and they include information on ocean spaces, e.g. if they are protected areas, military areas, shipping routes or used by oil and gas platforms. This can help users in

the pre-siting/scoping phase of renewable energy projects. For National MSP plans it was noted that the harmonised nature of the MSP plans can allow Member States to compare across countries, which is useful for cross-border MSP planning. It was noted that private sector operators may not be aware of the data layer on EMODnet for maritime spatial planning, hence the need for awareness raising about these layers and the wider EMODnet service e.g., through workshops like the ORE one taking place.

Further information was requested on EMODnet's National Maritime Spatial Plan offer. In 2021, EMODnet set up a database on Maritime Spatial Planning in the EU. This is updated whenever an EU Member State adopts a new plan, the database is available for viewing and download on EMODnet Human Activities. Data layers include polygons, points and lines (where available) representing MSP in National EU Member States. At the current time of the workshop, EMODnet had published six National MSP plans, namely Belgium, Denmark, Finland, Germany, Latvia and Poland, with more in the pipeline and others still to be submitted by the Member State.

Marine Strategy Framework Directive (MSFD)

EMODnet is already the focal point for some descriptors of the EU Marine Strategy Framework Directive, such as for marine litter, for which it has the largest and most comprehensive database. Member States can use this for data and reports for their own MSFD reporting and vice-versa. In addition, EMODnet monitors the data that flow between national data collection efforts and the network, but it was noted it can strengthen this.

3.6.2 ORE sector marine data gaps, needs and requirements

Fisheries data

A representative from the private sector asked why EMODnet did not offer the full spectrum of fisheries data. A EMODnet representative noted that fisheries surveys data are not a focus for this portal, since these data are well managed by other data services and organisations, including the International Council for the Exploration of the Sea (ICES). It was noted that EMODnet collaborates with ICES and already receives some of the open source data provided to ICES is part of a regulatory obligation on the fishing sector and is open source. In addition, it was noted that via a collaboration with EurOBIS and OBIS, EMODnet does publish wider fish data, including non-commercial species. Speaking more broadly of the EMODnet Biology offer, it was noted that for all oceans it offer over eight million species occurrences (>1.5 Million in the Atlantic, ~1 Million in the Baltic and >4 Million in the North Sea). The data cover a period from 1753 to 2021 and can be found via the R packages or via the EMODnet Biology portal. It was noted that from January 2023 all documentation as well as data and data products would be centralised in the EMODnet Central Portal.

Biodiversity data

An EMODnet representative asked participants if they had any further biodiversity-related datasets that could potentially be shared with the network and submitted to EMODnet Data Ingestion, noting that the more data EMODnet has, the higher the resolution datasets will be, and the more precise the marine knowledge will be to underpin policymaking decisions or operations at sea.

A representative from civil society noted that experts have identified species that are under-researched, through assessment reports in the North Sea. To roll out renewable energy solutions, a deeper understanding is needed of the biodiversity of species and EMODnet platforms should keep an eye on this when updating information. More data can always be collected for biodiversity, e.g. for particular seabed features or species. Habitat models are one way to predict where those species are likely to occur. EMODnet has a few habitat models, but more could be included.

Participants also called for sensitivity mapping for biodiversity. Because continuous ecological corridors are not just sensitive areas for biodiversity. This data gap is a huge issue when planning offshore wind farms. It would also be useful to data on the carbon sinks of ecosystems (to assess how precious an ecosystem is), more data about birds and mammals, plus detailed AIS (Automatic Identification System) data.

Geological factor maps

A UK marine expert in the private sector remarked he had used EMODnet marine data for over 15 years. He recommended EMODnet should consider producing geological factor maps, modelled on those by the British Geological Survey. Maps like these include soil strengths, which support foundation design for offshore wind farms.

Summary of data gaps, needs and requirements

In summary, participants identified the following areas where EMODnet could further expand its marine data offer:

- Tidal energy data. Despite renewed interest in tidal energy, there is very limited tidal current data information available on EMODnet. Enhanced data points could also be of value in this context.
- Geological factor maps (including soil strengths);
- Seafloor:
 - Seafloor substrate and information on the ideal depth beneath the sea floor for the foundations of a wind farm;
 - EMODnet Geology currently only supplies the location of data. Participants noted EMODnet could offer data on differences between regional sea-basins. This data would help with installing new types of floating platforms for wind farms.
- Surface ocean conditions: Higher resolution wind data would enable operators to assess the costs of caretaking and carrying out maintenance on facilities;
- Ocean salinity: It is important to have average salinity for the Baltic Sea and information in specific areas;
- Marine biodiversity: It was noted that EMODnet offers data across multiple countries allowing for marine organism e.g., bird and mammal data to be assessed over multiple national jurisdictions. However, there remained a need for more data and higher resolution particularly for:
 - Seafloor (benthic) species;
 - Microorganisms and small animal occurrence to assess biofouling of marine organisms adhering to structures that can lead to degradation of infrastructure;
 - Sea birds;
 - Marine mammals;
- Sensitivity mapping for biodiversity;
- Resolution of data remains key. There is a need for higher resolution products to be produced and published.

An EMODnet expert noted EMODnet is constantly checking if additional data types and areas are needed. Its Data Ingestion facility enables users to mention their requirements, enabling it to identify data sources.

The lead moderator thanked all participants for Day 1 and welcomed participants to return for Day 2 which would focus on data sharing.

4 Day 2 – 21 September 2022

4.1 Welcome

The lead moderator welcomed participants to the second half-day of the EMODnet Business Workshop #2 'Marine Data for the Offshore Renewable Energy Sector in the Northeast Atlantic, North Sea and Baltic Sea'. She briefly summarised the key messages on data gaps and needs, emerging from the day 1 breakout sessions (see Day 1 summary above). She thanked participants for their inputs so far, then introduced the two core items on the agenda for the final half day as:

- Communicating and presenting the benefits of data sharing with EMODnet, the EMODnet Data Ingestion Service, and EMODnet's ongoing activities with the private sector;

- Discussing challenges and barriers for data sharing by the offshore renewable energy sector and how EMODnet Data Ingestion can support this process.

4.2 Win-win data sharing with EMODnet: Communicating the benefits of data sharing and the EMODnet Data Ingestion Service

EMODnet: A best practice in Findable, Accessible, Interoperable and Reusable (FAIR) marine data sharing for the EU Green Deal and UN Ocean Decade

Kate Larkin (EMODnet Secretariat) presented the value of marine data sharing, noting that marine environmental and human activities data are initially collected for one purpose, and yet have so many other applications and uses. These benefits can be unlocked by sharing data with a data service like EMODnet so it can be made FAIR. This also safeguards the data for long-term availability, it creates a better return on investment for the data collection, and adds marine knowledge for society. Building on this, she noted that FAIR marine data is crucial to underpin Blue Economy operations at sea and to support evidence-based policy making to achieve the ambitious targets of the EU Green Deal, the UN 2030 Agenda and the many objectives of the UN Decade of Ocean Science for Sustainable Development.

She underlined that EMODnet is a trusted in situ EU marine data service that already offers a service to collate, assemble, standardise and harmonise marine data from many sources and to make these data as FAIR as possible, so they can be harnessed by the private sector, policymakers, researchers, civil society or wider society. EMODnet follows the European INSPIRE Directive on geospatial data and applies both European and International (e.g., ISO) standards to data and metadata as well as offering a range of data and web services so that data can be discovered by person-machine and machine-machine searches. This is fundamental for an interoperable marine data space in Europe and beyond, and to provide both the infrastructure and the data to underpin the digital evolution, a digital commons and applications such as digital twins, including the EU Digital Twin Ocean.

She added that EMODnet is active at many levels at EU and international levels to strengthen partnerships for international marine data interoperability and to bring regional best practice and high quality marine data to users worldwide. She added that EMODnet is already a key partner globally for data diplomacy, open data, open science and digital data stewardship. It is moving from just the FAIR principles to even more inclusive equitable access to data through the CARE Principles for Indigenous Data Governance.

She noted that EMODnet is continuously evolving its services to meet current and future user needs. She noted that in addition to the centralisation of EMODnet services, the sourcing and ingesting more diverse sources of data to compliment and expand the EMODnet offer was also crucial and she passed the floor to colleagues of EMODnet Data Ingestion to explain more.

EMODnet Data Ingestion: EU public service supporting the Blue Economy towards FAIR marine data sharing

EMODnet Data Ingestion Technical Coordinator Dick Schaap (MARIS, Netherlands) presented the [EMODnet Data Ingestion](#) Service, which aims to further enhance and expand the EMODnet data and data product offer, ingesting data from diverse sources including the private sector, civil society and citizen science. Marine data already flows into EMODnet from National Oceanographic Data Centres (through the EU network SeaDataNet), other national and regional repositories and through collaboration with other data services e.g., ICES, Copernicus Marine Service, PANGAEA and others. However there is a wealth of marine environmental and human activities data that are not yet submitted to EMODnet which would add significant value to the EMODnet offer creating even higher resolutions and filling gaps in parameters, temporal/spatial resolution and geographical coverage. EMODnet Data Ingestion was set up in February 2017 to offer a public service to meet this need. It supports data collectors and holders – from government, science, and industry – to submit their data to EMODnet in a fast, efficient way, to allow more data from diverse sources to be ingested into EMODnet, with the relevant metadata to acknowledge data collectors and provider. Data are submitted through a submission service and go through a principle data workflow. Depending on the region, the dataset is assigned to one of 50 expert data centres and specialised marine centres in Europe for data curation, which includes the Coordinating institutes/organisations of all EMODnet thematics. The data are

categorised by domain, such as biology or geology, and made ready for the EMODnet central portal and distributed through EMODnet thematic portals. The FAIR data principles are also applied to the data, to ensure they can be shared and reused by humans and machines.

The Data Submission process, supported by experts, includes two phases: Phase I involves data submission to publishing 'as is' in a Summary Service; or the more complete Phase II, where data are more standardised according to European and international standards. EMODnet aims to educate data providers to send in better organised datasets that can quickly flow through the pipeline and become available for different products. Around half of the datasets received are taken to Phase II level. They can be viewed and downloaded through EMODnet's on-line Summary Service. The network aims to make more data available and works with other data repositories to set up automatic (machine to machine) exchanges. Examples include SeaDataNet/SEANOE data citing service (190 entries so far) and The Crown Estate (TCE) Marine Data Exchange (MDE) for the UK North Sea sector.

The network aims to make operational data available faster, by establishing machine to machine transfers, together with EMODnet Physics. Some 450 platforms, such as weather stations, have been added to the NRT (near real-time) exchange, which is connected to the EU operational Oceanography data exchange.

To date, EMODnet Data Ingestion has received 1,200 submissions, Phase I-II. Most are in the public domain e.g., academia and government, though input from the private sector is increasing with over 200 submissions from private companies. Examples were given of monitoring data from windfarms published at EMODnet Ingestion and ingested into either EMODnet Biology or Physics. Citizen science is increasingly important for the platform, such as data from Romania on marine litter. It was noted that extra emphasis will be given in the future to improving and documenting the availability of data provided for coastal and offshore licensing, e.g. for aquaculture, offshore energy, etc.

Q&A and open floor

A private sector representative asked if EMODnet has a document outlining the benefits for companies of supplying industry data to the network, as well as the formats and standards required when supplying the data. The EMODnet Secretariat referred the participant to the EMODnet for Business Leaflet.

The EMODnet Biology Coordinator noted that EMODnet Biology has developed a course with IODE/UNESCO Ocean Teacher Global Academy to help with submitting data to this portal and with wider EMODnet experts has developed a leaflet on publishing habitats point data. Further guidance on how to share biodiversity data is available on the EMODnet Biology webpages on the EMODnet Central Portal.

Following a question on data standards, EMODnet expert confirmed whilst some standards e.g., minimum metadata are common, the data standards depend on the data type, being different for different thematics. The EMODnet Secretariat reminded participants that EMODnet Data Ingestion is the best starting point to submit your data, and referred to a Data Ingestion video that explains more. Data Ingestion experts assess your application submission and together with EMOD-network experts then support the data submitter with the full process, to assist the data submitter or provider. The network can offer guidance on how to establish a long-term data flow to any of the thematic lots. It was confirmed that EMODnet Data Ingestion will also centralise as a service under the EMODnet Central Portal during 2023. Participants were encouraged to visit EMODnet Data Ingestion and to see how easy it is to upload your data with minimal metadata and the data centre partners in Data Ingestion will do the rest.

A question was posed on data ownership. It was re-confirmed that EMODnet does not own the data and data collectors/providers/owners are always acknowledged in the metadata describing the data. The integrated data layers (from hundreds of providers) and data products are public.

An EMODnet Physics representative noted that EMODnet Data Ingestion also covers near real-time ingestion flow, which can be shared with other programmes like Copernicus Marine Service. He invited potential data submitters to contribute their data to the network. It was noted this is easier under Physics, because there are often fewer constraints on sensitive data, such as temperature or salinity. Data submitters can establish

relationships with many other experts in the network, among them 120 institutes, besides Data Ingestion. This can lead to the creation of a mapping procedure for exchange by machine to machine interfaces.

A national environment institute participant commented on the importance of good organisation of data during a project's realisation phase. For instance, the Dutch government ensures that data are assembled together for all the impact studies before, during and after a wind farm's placement.

A private consultant highlighted the importance of understanding the industry's demand for EMODnet. Why is a company using EMODnet or why is it not using the network? The EMODnet Sea-basin Checkpoints and Use Cases were valuable tools to highlight how and why people use EMODnet. He also added that workshops such as this one with the ORE sector were important to collect feedback industry needs and requirements for marine data

A participant noted the importance of duly recognising companies that make the effort to submit data, as this is often a costly process for them. He noted that by acknowledging data submitters it would help to encourage these companies other organisations in the private sector and beyond to submit (more) marine data to EMODnet. Lastly he noted that EMODnet could highlight more the huge benefit to the private sector of the Data Ingestion service that does the work for them, standardising data and offering added value data sets back to the provider, as well as higher resolution data layers for all.

4.3 EMODnet for Business, Associated Partnership and stakeholder engagement

A short EMODnet video was shown, highlighting the huge potential of renewable energy in Europe, especially in the seas around the continent, and how it contributes to the EU's ambitious plans to tackle climate change. Development of Europe's ORE, including wind, wave, tidal platforms, etc, is a key focus, in line with the EU Green Deal and blue economy goals. The European Commission has set deployment targets for ocean energy in the EU, such as 300 GW of offshore wind energy in 2050 and 40 GW of ocean energy. Achieving these targets will require a huge scaling up of ORE, whilst protecting biodiversity, backed by extensive and reliable marine data to guide project developers and policy-makers. EMODnet is a global gateway for marine data and data products, in areas from bathymetry to human activities, and the network supports the whole ocean energy sector.

Kate Larkin (EMODnet Secretariat) then presented EMODnet for Business activities, spanning EMODnet participation in industry-led events, dialogue with private sector at EMODnet events and through workshops such as the ORE workshops, and closer dialogue through the EMODnet Associated Partnership Scheme.

She highlighted that EMODnet's dialogues with the private sector span the full marine knowledge value chain from data collection to use, since the private sector are not only key users of marine data but also important marine environmental and human activities data collectors and holders. She noted that EMODnet works closely with EC DG MARE to achieve this, including supporting the EC Ocean Observation initiative 'Sharing Responsibility', designed to support the coordination of data collection efforts.

She highlighted EMODnet aims to further communicate the benefits of EMODnet data and data products for the Blue Economy and also to promote the win-win benefits of data sharing, acknowledging that the private sector is already sharing some data and that these contributions can be recognised more, to promote further data sharing efforts.

She underlined that in addition to attending and presenting at multi-sector industry events e.g., Ocean Business, Oceanology and others, EMODnet also organised sector-specific workshops including the ORE workshops of September – October 2022 and previous workshops with the Aquaculture sector in 2020-2021. She added that EMODnet has close dialogue also with the European Commission Marine Knowledge Expert Group, which brings together representatives from across the Blue Economy that provide input and feedback from a user perspective on EMODnet services and the private sector needs and requirements.

She explained the main benefits for the private sector to use and share data with EMODnet including access to high resolution, harmonised EMODnet marine environmental data that can be used to assess baseline conditions without the need for further marine data collection, saving costs and improving knowledge and

reducing risks. She underlined that EMODnet does not produce tailored products but rather generic data and data products for use by all. In this way, EMODnet stimulates innovation so that businesses and other users can use EMODnet services to produce added value applications based on EMODnet data and data products. She referred participants to the EMODnet Central Portal EMODnet for Business leaflet for more information.

She noted that the EMODnet Sea-basin Checkpoints had been a crucial activity that stress-tested the EMODnet services system to see the data provision and adequacy for concrete user applications such as monitoring an oil spill and the siting of an offshore wind farm. Interestingly, when this was conducted in 2018, offshore energy operators at the time noted that EMODnet had the parameters but lacked the high-resolution data needed for the micro-siting of offshore wind installations. However, the evolution of EMODnet services meant that now in 2022 EMODnet had a number of testimonials e.g., from the ORE workshop in the Northeast Atlantic, North Sea and Baltic Sea, where offshore energy companies noted they can now use EMODnet's high resolution data and data products for this purpose. She highlighted that the EMODnet central portal has a wealth of use cases and communication resources on different sectors, such as business in general, maritime spatial planning, and data ingestion, and per the thematics.

She underlined that EMODnet welcomes feedback and ideas from all stakeholders on emerging needs and requirements for marine data, data products and services. She added that two key events for stakeholders to join in 2023 would be the EMODnet Open Sea Lab 3.0 hackathon (March 2023) and the EMODnet Open Conference 2023 (November 2023).

For those wishing a closer dialogue with EMODnet, she highlighted the EMODnet Associated Partnership Scheme as a flexible and open network for any stakeholder to apply to. It has proven as a useful platform for wider stakeholders to have a closer dialogue on data sharing and data use, share best practice and capitalise on the vast expertise in the EMOD-network on in situ marine data. The scheme includes 28 members, from SMEs to much larger industry, plus private public partnerships and spin-offs from universities and the public sector.

4.4 Breakout session 2: Data sharing by the ORE sector

In the day two break-out session, three groups, each led by a moderator, debated the challenges, barriers and benefits of sharing marine data with EMODnet, with a focus on the ORE sector. All groups – including a mix of people from the private sector, research, civil society and policy sectors – tackled the same six discussion points:

- Do you/your organisation already share marine data with EMODnet or other public data repositories and services, e.g. at national, regional, EU level?
- What types of data can be shared, e.g. marine environmental data (baseline data or also operational data), human activities data, e.g. offshore platforms, socio-economic data, other?
- What are the challenges and barriers for data sharing? How does this vary across the value chain, e.g. from location siting/licensing to operations/monitoring, environmental impact assessments, etc.?
- Are there specific challenges for each regional sea basin?
- With EMODnet Data Ingestion offering a free and public service for ingesting data, how likely are you to share marine environmental or human activities data in the future?
- How can the offshore renewable energy sector contribute more to EMODnet databases through data ingestion of its in situ marine environmental measurements? What incentives/actions are needed?

4.5 Plenary reports on breakout session 2

In this session, all participants reconvened in plenary to report back on breakout session discussions and to take stock of key challenges, barriers and opportunities for data sharing with EMODnet.

4.5.1 EMODnet: facilitating the process for private sector marine data sharing

Building on the solutions, a representative from EMODnet Data Ingestion noted that the private sector are increasingly approaching EMODnet to see if they can share their data and find a path to an open data policy. All data collectors now realise they cannot just collect data for one purpose, as they hold information valuable for humanity. EMODnet must convince companies that more data sharing is a win-win for everyone, with benefits like higher resolution maps, cost savings for projects and reduced environmental impact. It would be useful to prioritise which stakeholders to engage with first, and to identify certain developers that are more flexible on data sharing.

Several organisations acknowledged sharing data with EMODnet, among them a Latvian institute, the Geological Survey of Ireland, and the Royal Belgian Institute of Natural Sciences does. It was noted that some of their European counterparts do not yet share their data with the network and this was a largely untapped potential for increasing data coverage, parameters and resolution.

A representative from the British Oceanographic Data Centre noted it is a partner in EMODnet Data Ingestion. It can be contacted to improve the flow of data from an organisation to central European repositories such as EMODnet and Copernicus. One avenue is to contact people or organisations to convince them to release as much (non-sensitive) data as possible. Deltares is also a partner involved in EMODnet Data Ingestion. The Crown Estate in the UK was given as a good example of data sharing that now has data flows into EMODnet.

It was noted that companies were more likely to be eager to share their data if they knew that help is available from EMODnet Data Ingestion. The network today sees more companies looking to share their data and find a path to an open data policy. Data collectors realise they should not just collect data for one purpose: their information is valuable for humanity.

Participants also noted that whilst all data have value, quality versus quantity of data is key and EMODnet could strive to provide a higher quality mark indicating they meet FAIR (findability, accessibility, interoperability, and reusability) principles, a type of 'gold standard'.

4.5.2 Challenges and barriers to data sharing

It was noted that despite the increasing momentum to share data, there are still challenges to data sharing. Participants noted the following barriers:

- Several participants acknowledged that some data are sensitive for commercial or other reasons. Activities for gas exploration are for example considered to include sensitive data that cannot easily be shared. There are some types of data that could be useful to others which could be easily sold;
- A representative of a network noted that offshore industry and transmission system operators generally do not share their data because of their perceived commercial value or because data are indirectly collected by consultants who do not want to share. NGOs are more willing to share data, but the problem here is dealing with lots of fragmented data, such as from citizen science. A Spanish company said it is willing to share non-confidential data with EMODnet. The EMOD-network does and could work further with data providers from the private sector to establish which data have less/no commercial value and could more readily be shared e.g., temperature, salinity, and which datasets are more sensitive, such as on commercial and marine species. For these, EMODnet can work with partners to find the appropriate level of data access, which can be graded from fully open access to open source (visualisation and metadata, requiring permission of the data provider to access the original data);
- For some data it was acknowledged that the data provider may wish to sell the data, although the private sector was increasingly seeing the win-win benefits of data sharing with public data services like EMODnet;
- Ecological marine data are sometimes not shared because of their commercial value and intellectual property constraints. But there is a willingness to share data, despite the challenges. These include working out where renewables data should go or understanding the differences between archives and working out data flow processes;

- Some companies are reluctant to share data from environmental impact assessments, fearing NGOs will use the data to block offshore renewable energy projects;
- There remain challenges in data sharing also in public data related to ORE, including academic research data thanks to the prevailing culture of ‘publish or perish’. It was noted this was changing but support was needed to encourage PhD/other grants funded by the private sector to also include open data sharing policies, particularly after a certain embargo period to allow for academic publishing;
- A challenge for some organisations is data ownership. They cannot share data when they collect them for a client, so the data are not theirs to share publicly. One participant was involved in Seabed 2030, which maps the sea floor globally. As the data were collected on behalf of a client, their organisation did not own the data and could not share it publicly. Seabed 2030 developed a method to thematically process the data.

Specific challenges by sea basin

It was recognised that different sea basins present specific challenges for data collection and sharing. The Black Sea is relatively small, whereas the Atlantic is enormous. There is relatively less data on the Arctic and some of the historic data are only available on paper. The North Sea is bordered by EU nations including Denmark, the Netherlands, Belgium. The Mediterranean Sea included many non-EU Member States particularly in the southern part of the basin, making data sharing more complex. Regional or national data collection policies or standards also come into play, also data restrictions for defence reasons.

Data Ingestion

Participants noted that EMODnet could communicate more powerfully how easy sharing data with EMODnet is. One participant noted the interface should also be more simple and intuitive suggesting that an ‘Apple-like interface’ would reduce the effort required by the data provider. The more structured the data is, the faster and better it can be integrated into EMODnet. It was also noted that whilst NGOs are more willing to share data, this can be more complex data e.g., including citizen science. EMODnet can manage and publish citizen science data of good quality. The network can also mask or anonymise commercially sensitive data.

4.5.3 Potential solutions to overcome barriers and improve data sharing

- Developers often need data from multiple locations, e.g. because seabirds encounter several wind farms during migration, but that data is not available. So, there is a need to combine data from existing projects to get a better picture. Such data could be anonymised if they are open source, or users can be required to ask for permission to use a certain data provider’s data;
- EMODnet could promote more how its data and data products can help ORE and the wider Blue Economy with the green transition and the EU’s energy strategy. This strategy is to source one quarter of EU energy from offshore and this cannot be done without data and EMODnet. This is a huge incentive for the private sector to both use and share their data with an established EU marine data service, as a contribution to sustainability efforts and targets, and to in turn benefit from the higher resolution and expanding offer of EMODnet marine data, thanks for increased data sharing;
- Incentives could encourage those who collect data to share their data. Among academics or research projects, this could involve adding value to any researcher uploading the data, e.g. through a citation index or h-index linked to usage of the data provided. For commercial organisations, a financial incentive should be provided for data sharing, as there are costs and effort involved in preparing and quality-checking data;
- Standardisation is important, with benefits for industry of having data standardised and a lack of duplication. This could be further communicated as a win-win benefit of data sharing;
- Companies often over-estimate the value of their data and do not want to share it. One solution might be to write in a contract’s clause for all environmental data to be made public eventually. The EU could also encourage project tenderers to include a data steward officer, such as for environmental data, as a good practice;
- Private companies could be given a certificate of participation if they share environmental data;

- Having a global perspective can encourage organisations to share their data, when they see data benefit the wider community. EMODnet ensures Seabed 2030 data is interoperable internationally. Data collectors who want to sell data can use the French service SEANOE, under an embargo period.
- There should be wider education on the benefits of sharing data. While an individual or operator may not see the overall value of their contribution, this contribution should be understood as a collective endeavour, where value accumulates. EMODnet could learn from environmental NGOs on how to communicate this message;
- Data sharing should happen from a project's inception, not as an afterthought, especially for public bodies. There could be mandatory requirements for public bodies issuing operating licences or awarding research grants. Public bodies could also set standards on data quality and usability;
- The EU could produce more guidelines to promote data sharing with the public and private sectors. It was noted this was considered within the EC Ocean Observation: sharing responsibility and was important going forward;
- The EU could encourage project tenderers to include a data steward officer in contracts, such as for environmental data, as a good practice. Another way to boost data sharing would be to include a clause in contracts for all environmental data to eventually be made public;
- Further showcasing of marine data use cases by ORE, the wider Blue Economy and national authorities for MSP would help to show the added value of sharing marine data;
- EMODnet could produce guidelines for blue economy operators, especially in offshore renewables energy, on sharing data. The European Commission will this in 2022 release guidance on better coordinating marine data collection in Europe;
- An EMODnet representative suggested that the answer is to get all maritime stakeholders working better together, by highlighting the general need for baseline data as a minimum, for all. This may break down barriers between sectors and encourage data sharing;
- The National approach could be utilised more for promotion of EMODnet data sharing, in collaboration with EMODnet partners from each country (including those involved with data ingestion) who could contact stakeholders to have a first contact with them about data sharing. It was noted this is already happening at some levels but could indeed be strengthened, including considering Memoranda of understanding at National level between data providers and National data repositories and/or EMODnet National partners.

The lead moderator thanked all participants and noted that reports would be produced on both the EMODnet for ORE Workshops (see Executive Summary for url links). They then passed the word to organisers to close the workshop.

4.6 Closing words

Kate Larkin (EMODnet Secretariat) representative thanked everybody who had joined or helped to organise and facilitate the first ORE workshop, including EMODnet experts, EC Marine Knowledge Expert Group, wider presenters and participants. She noted that the workshop had been particularly timely considering that the offshore renewable energy sector was likely to continue to grow in Europe, driven by the EU Green Deal and the EU's net zero climate ambitions. She added that although the event had focused on a relatively small (100 invited) group of experts, this had been crucial for enabling interactive discussions and gathering meaningful feedback. In addition, the workshop reports would be a way to summarise sector needs and requirements and further promotion of the key messages would be done at multiple levels and through a variety of channels, aiming to increase the awareness of EMODnet across the ORE and wider Blue Economy. She noted that the workshop had been timely with EMODnet services currently evolving to become fully unified and centralised by the end of 2022, aiming to make EMODnet even more fit-for-use.

She noted that the network's experts are always willing to help with any questions, as well as to address marine data gaps and requirements from the offshore renewable energy sector. The workshop has thrown up many really interesting ideas, whilst highlighting current challenges and potential solutions for data sharing with the network. The goal is more data sharing of marine data, to make this data more open, and to

create a win-win for everyone involved in the marine sector. It is also important that any data provider sees how it can benefit from data sharing with EMODnet.

There would be a second online EMODnet for ORE workshop focusing on the Mediterranean Sea and Black Sea on 20 & 21 October 2022. Targeted invitations were being sent out and experts were welcome to also contact the EMODnet Secretariat for more information.

The reports of both workshops together with presentations would be available in due course on the EC Maritime Forum. A list of participants would not be included for data protection reasons.

Lastly she reiterated that EMODnet is constantly evolving to meet user needs and she invited participants to visit the new EMODnet Central Portal to discover the many services and diverse data and data product offer. She noted there were also many ways for the private and public sector to get involved in EMODnet, including providing use cases and feedback on services, sharing data, attending EMODnet and related events and joining closer dialogue e.g., through the EMODnet Associated Partnership Scheme. She encouraged participants to contact the EMODnet Central Portal helpdesk or Secretariat for any questions, and to subscribe to the free monthly newsletter.