



EMODnet



European Marine
Observation and
Data Network

EMODnet Secretariat and the European Atlas of the Seas

CINEA/EMFAF/2021/3.4.10/01/SI2.863177

Start date of the project: 01/01/2022 (24 months)

Centralisation Phase

**Targeted assessment on ocean observation coordination and
marine data pipeline: Regional Sea focus [D5.3]**



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Document info

Title (and reference)	Targeted assessment on ocean observation coordination and marine data pipeline: Regional Sea focus [D5.3]
WP title (and reference number)	Supporting EC DG MARE's activities related to Ocean Observation (WP5)
Task (and reference number)	Focused studies and Targeted Assessments on European Ocean Observation governance (Task 5.2)
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Dissemination level	Internal/confidential
Submission date	M24
Deliverable due date	M24

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Targeted assessment on ocean observation coordination and marine data pipeline: Regional Sea focus [D5.3]

1 Introduction

1.1 Background

In 2020 the European Commission (EC) Directorate-General for Maritime Affairs and Fisheries (DG MARE) launched the EC Ocean Observation – sharing responsibility initiative with a key objective to stimulate European Member States (MSs) to increase their levels of coordination and efficiency in Ocean observation, marine monitoring and data collection. This took forward key recommendations and a call to action from the European Ocean Observing System (EOOS) Conference in 2018, co-organised by the EMODnet Secretariat, European Marine Board (EMB) and EuroGOOS. An EC consultation launched in 2020-2021 in the framework of the EC Ocean Observation initiative gathered feedback from over 150 stakeholders, including the European Marine Observation and Data Network (EMODnet) Secretariat¹ on the needs, requirements and opportunities for strengthened coordination at national level across marine and coastal data collection efforts.

To support these endeavours, EMODnet has continued to strengthen the connection and dialogue with the European Ocean observation community and stakeholders across the marine knowledge value chain. This has included the co-organisation of joint activities such as the EC Ocean Observation workshop (18 June 2021), dedicated sessions on Ocean observation in the context of EMODnet flagship events (e.g., EMODnet Open Conference 2021 and 2023) and engagement of the EMODnet Secretariat and wider EMOD-network in wider activities and events organised by the wider European Ocean Observing System (EOOS) community. This engagement extends to EOOS governance meetings, the EOOS Technology Forum, and interactions with European Horizon Europe projects focused on this domain, such as EuroSea.

EMODnet's dedicated support to the European Commission DG MARE to advance activities in its work programme that are related to Ocean observation and in particular the EC Ocean Observation initiative continues in the EMODnet Secretariat workplan 2022-2023 Work Package (WP) 5. WP5 includes three tasks: Task 5.1 to assess the benefits of the EMODnet Sea-basin Checkpoint exercises (Task 5.1), Task 5.2 to conduct focused studies and targeted assessments related to European Ocean Observation governance and coordination (Task 5.2), and Task 5.3 to strengthen the representation of EMODnet at relevant Ocean observation fora (Task 5.3). This report focuses on the second strand of work.

The year 1 (2022) activities in the second strand of work (Task 5.2), focused on a preliminary mapping and data gathering exercise regarding the level of national coordination of Ocean observation and marine data pipelines across EU Member States. Since a large proportion of EMODnet's marine data community currently remains from the public sector, the initial scope of the year 1 activity comprised of contacting members of the National Oceanographic Data Centres (NODC) and IODE Associate Data Units (ADU)² of the International Oceanographic Data and Information Exchange (IODE) of the Intergovernmental Oceanographic Commission (IOC) of UNESCO. From this list and via additional contacts, 21 European Member States were subsequently contacted, and an additional six Associated Countries (ACs) from the wider Council of Europe³ that also feature on the IODE NODC and ADU lists were also contacted (namely Georgia, Iceland, Norway, Turkey,

¹ https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12539-Ocean-observation-sharing-responsibility/F1263204_en

² https://www.iode.org/index.php?option=com_content&view=article&id=61&Itemid=100057

³ <https://www.coe.int/en/web/portal/46-members-states>

Ukraine and the United Kingdom). Results were supplemented by a desk study and literature searches where possible which included gathering knowledge from recent Conferences including the International Oceanographic Data Conference – 1 which took place in February 2022 in Sopot, Poland.

As such, the year 1 (2022) focused study provided valuable initial information on the current status and landscape of both Ocean observation coordination and the marine data pipeline at national level across the EU, including case studies. This EMODnet Secretariat workplan 2022-2023 activity was communicated at EOOS governance meetings in November 2022, including the EOOS Resource Forum, to raise awareness of the ongoing activity.

For year 2 (2023), in dialogue with DG MARE, it was agreed that the targeted assessment would focus on the *regional sea-basin geographical level*, namely the coordination of regional ocean observation/monitoring, and the subsequent regional data services, including where possible the data flows to EMODnet. This was considered timely since many Regional Sea Conventions with mandates spanning European sea-basins already have dialogue with EMODnet via the EMODnet thematics, and this study complemented this through a pan-European approach, with the aim to provide oversight of each RSC and regional organisation's activity in ocean observation and marine data coordination, and the existing links with EMODnet. The regional focus also had the added value of complementing activities of other actors within the European Ocean Observing system (EOOS) landscape, including JPI-Oceans who in summer 2023 began a focused study consulting national ministries and wider national stakeholders to further assess the level of coordination and funding for ocean observation and marine monitoring.

1.2 Scope and objectives of the 2023 study

The main aims of the EMODnet study were to provide valuable insights to EC DG MARE, specifically in the context of the landscape and current status of joint monitoring and marine data coordination across European regional sea basins, with the aim to support the EC Ocean Observation Initiative, and the Marine Knowledge objectives of EC DG MARE, including EMODnet.

The study was split into two core components:

- Assessing regional sea mechanisms and coordination of ocean observation and joint monitoring at regional sea basin levels. This included identifying any existing online tools used by regional initiatives for the sharing of ocean observation campaign planning and/or reporting;
- Assessing regional marine data coordination and flow from EU Member States and associated countries to regional initiatives, and subsequently to EMODnet. This included identifying potential bottlenecks and potential ways to optimize the data flow for enhanced accessibility and utility.

The study also aimed to strengthen dialogue between the EMODnet Secretariat and the Regional Sea Conventions, to showcase the latest updates regarding EMODnet services, creating a central point of contact between the EMODnet Secretariat and regional initiatives, and increasing the visibility and use of EMODnet in regional Assessments and Quality Status Reports. The study complemented ongoing exchanges between specific EMODnet thematics and regional sea experts.

The study consultation focused on engaging with four Regional Sea Conventions (RSC), each representing a distinct sea basin which included European seas:

- Convention for the protection of the marine environment of the North-East Atlantic (OSPAR): Northeast Atlantic Ocean;
- Helsinki Convention (HELCOM): Baltic Sea;
- Barcelona Convention (UNEP-MAP): Mediterranean Sea;
- Bucharest Convention: Black Sea.

For the North-East Atlantic Ocean, the International Council for the Exploration of the Sea (ICES) was also included as there are already many existing collaborations with EMODnet, including in terms of data flow.

For other regions, recommendations were gathered on other regional organisations, networks and entities where further dialogue could be pursued in a future study.

In addition, the Arctic Ocean is an important sea-basin to consider in terms of European (and wider) Ocean observing. However, due to the limitations of this existing study, and owing to the complexities of the Arctic region e.g., the absence of a single RSC and ongoing geo-political issues, it was not possible to conduct a full targeted assessment of the Arctic Ocean, although a high-level desk study was conducted to summarise publicly available information where possible. In addition, the OSPAR Commission which includes part of the Arctic Ocean in its region (Arctic Waters), was included in the study consultation. Further information on the Arctic Ocean joint monitoring and marine data coordination could potentially be explored further in future studies, in 2024 and beyond.

2 Methodology

2.1 Study contributors and roles

The focused study was coordinated by the EMODnet Secretariat, with the targeted assessment conducted by the EMODnet Secretariat working in close collaboration the European Marine Board (EMB), with a view to further strengthening activities with key actors in the European ocean observation and marine knowledge value chain landscape, as a contribution to the European Ocean Observing System (EOOS) and EC Ocean Observation Initiative. The planned scope of the study, and preliminary results were also presented at EOOS Steering Group meetings in late Spring and Autumn 2023 and an EOOS Resource Forum meeting in November 2023.

For this Task 5.2, EMODnet and EMB Secretariat's divided roles so that two strands of work could be developed in parallel (with joint meetings with RSCs to foster exchange and limit stakeholder fatigue):

- **Joint monitoring and ocean observation coordination across European regional seas**, including coordination with national Member States and Associated Countries. Assessing how monitoring is standardised; how is the joint monitoring planned, designed and communicated/shared; what are the Joint Monitoring plans, and how do these align with EU Policy e.g., Marine Strategy Framework Directive (MSFD)?; how regular are the plans; Are there online portals or mechanisms for sharing monitoring plans within a region?; Where does the data go initially? Content led by the EMB Secretariat;
- **Regional data coordination across European regional seas**. Assessing regional repository/services, regional data policy(ies), the data flow/harvesting to EMODnet, or to other EU organization/service e.g., EEA, including the identification of bottlenecks and ways to optimise/operationalise data flows. Content led by EMODnet Secretariat.

Results from both strands of the targeted assessment are presented for each of the RSC / regional organisations in Section 3.

2.2 Desktop study

Over the Summer 2023, prior to the consultations, a literature and desk review was initiated to assess public information on the Regional Sea Conventions and other regional initiatives working in/across the European sea basins. This included looking at the online websites and portals, open access reports and publications.

2.3 Targeted interviews and online survey

The EMODnet Secretariat contacted each Regional Sea Convention with relevance to EU sea basins, and the International Council for the Exploration of the Sea (ICES), to invite each entity to a bi-lateral meeting to exchange on this topic. The interviews were conducted between September - November 2023. See Annex 1 for the list of interviewees and dates of interviews.

In preparation of these bilateral meetings, an online survey was set up by the EMODnet Secretariat via EU Survey⁴ as a way to harmonise data collection, to solicit preliminary input to questions ahead of the bilateral meetings, and to structure the meeting dialogues. The survey consisted of 13 questions divided into two sections. One section covered questions specific to the joint monitoring of the organisation/RSC and the second section contained questions specific to the regional data services. The survey questions are presented in Annex 2 of this document, noting that for ICES, the survey questions were adapted to reflect that this organisation is not an RSC.

The survey was produced as a collaborative effort by the EMODnet Secretariat with input from EMB. The survey was then sent to the representatives of each RSC (HELCOM, BSC, OSPAR, UNEP-MAP) and ICES in advance of the meeting. During the bilateral meetings with the Regional Sea Conventions and ICES, the survey responses were further discussed and clarified.

3 Results

The following subsections, structured per sea basin, summarise and combine the results of the literature/desktop study, survey responses (see also Annex 3 for the raw responses received to the online survey) and feedback during the tele-meeting interviews.

3.1 North-East Atlantic Ocean

3.1.1 OSPAR

3.1.1.1 *Short introduction to OSPAR*

OSPAR⁵ is the mechanism by which 15 Governments and the EU cooperate to protect the marine environment of the North-East Atlantic. It is named because it brought together the Oslo and Paris Conventions. OSPAR is a Regional Sea Convention responsible for protecting and conserving the North-East Atlantic and its resources, including Areas Beyond National Jurisdiction (ABNJ) across the following five regions: Arctic waters; the Greater North Sea; Celtic Seas; Bay of Biscay and Iberian Coast; Wider Atlantic.

The OSPAR Commission implements the OSPAR Convention and its Strategy, which includes producing regular assessments of the state of the North-East Atlantic. These are based upon ocean observation, monitoring and data collected at National level, provided to OSPAR via joint monitoring programmes and thematic Working Groups. A key mission of OSPAR is to achieve its vision of a clean, healthy and biologically diverse North-East Atlantic which is productive, used sustainably and resilient to climate change and ocean acidification. OSPAR deals with the following specific thematic areas:

- Prevention and elimination of pollution from land-based sources;
- Prevention and elimination of pollution by dumping or incineration;
- Prevention and elimination of pollution from offshore sources;
- Assessment of the quality of the marine environment; and
- Protection and conservation of the ecosystems and biological diversity of the maritime area.

These specific thematic areas are supported by work on cross-cutting issues such as climate change, ocean acidification, economic and social analysis, and cumulative effects assessments.

Contracting Parties to the OSPAR Convention are: Belgium, Denmark, the European Union, Finland, France, Germany, Iceland, Ireland, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom. Work to implement the OSPAR Convention and its Strategy is taken forward through the adoption of Decisions, Recommendations and Agreements. Decisions and Recommendations set out actions to be taken by the Contracting Parties. These measures are complemented by Agreements setting

⁴ <https://ec.europa.eu/eusurvey/home/welcome>

⁵ <https://www.ospar.org/>

out: issues of importance; agreed programmes of monitoring, information collection or other work which the Contracting Parties commit to carry out; guidelines or guidance setting out the way that any programme or measure should be implemented; and actions to be taken by the OSPAR Commission on behalf of the Contracting Parties.

OSPAR published its latest Quality Status Report in September 2023⁶.

The OSPAR Commission also issues publications comprising background documents, data reports and the results of evaluations and assessments of data reported to OSPAR by its Contracting Parties and also has a regional data repository, the OSPAR Data and Information Management System (ODIMS)⁷.

3.1.1.2 *Joint monitoring and ocean observation*

Role in regional coordination of ocean observation and joint monitoring programmes

OSPAR has a long history in monitoring and assessment stretching back to the 1980s. In the OSPAR convention 'monitoring' is defined as the repeated measurement of: (i) the quality of the marine environment and each of its compartments, that is, water, sediments and biota; (ii) activities or natural and anthropogenic inputs which may affect the quality of the marine environment; and (iii) the effects of such activities and inputs.⁸ During the interview it was confirmed that there are two main programmes relevant for joint monitoring in OSPAR: OSPAR's Joint Assessment and Monitoring Programme (JAMP)⁹ and OSPAR's Coordinated Environmental Monitoring Programme (CEMP)¹⁰:

- JAMP identifies information needs and the overall approaches that will be used to address them, setting out the broad strategy and generally applicable provisions. It sets out the higher-level strategic planning for OSPAR's monitoring and assessment, including the requirements for thematic and holistic assessments, such as the Intermediate Assessment 2017 and the Quality Status Reports.
- CEMP specifies those information needs more precisely, providing detailed information on common approaches for data collection and monitoring, as well as for data analysis and assessment. CEMP aims to deliver comparable data from across the OSPAR Maritime Area, which can be used in assessments to address the specific question raised in JAMP. There are currently six thematic monitoring areas: (1) cross-cutting components; (2) biodiversity and ecosystems; (3) eutrophication; (4) hazardous substances; (5) offshore oil and gas Industry; and (6) radioactive substances. The CEMP Guidelines (and associated CEMP Appendices) provide detailed information on agreed monitoring and assessment methods for the different indicators of each theme. CEMP Guidelines are developed by the technical groups (with experts from contracting parties) to meet the requirements of the Convention and match them with feasibility and resources and are then taken to the Convention level in order to be approved as common guidelines. Guidelines are updated when needed e.g., further development of the indicators. The CEMP Appendices have been adapted to align with the European Commission's requirements for MSFD reporting and are available in the OSPAR Assessment Portal (OAP)¹¹. The CEMP includes both monitoring data from direct measurements (e.g. litter or hazardous substances) as well as data derived from monitoring through modelling and/or aggregation of parameters (e.g. for noise or certain biodiversity indicators). Furthermore, the programme includes regular data and information collection from other organisations, such as sand and gravel extraction data collected by ICES, which is used in the OSPAR assessments. There is no single contact point in

⁶ <https://www.ospar.org/work-areas/cross-cutting-issues/qsr2023>

⁷ <https://odims.ospar.org/>

⁸ OSPAR, <https://www.ospar.org/documents?v=32943>

⁹ <https://www.ospar.org/work-areas/cross-cutting-issues/jamp>

¹⁰ <https://oap.ospar.org/en/ospar-monitoring-programmes/ceмп/>

¹¹ <https://oap.ospar.org/>

the Secretariat for joint monitoring. Each of OSPAR's thematic committees¹² and the relevant Deputy Secretary for the six monitoring areas, is responsible for developing its own assessment and monitoring products that respond to the requirements of the JAMP. The implementation of the JAMP is overseen by OSPAR's Coordination Group.

In summary, one of OSPAR's main roles in the regional coordination of ocean observing is coordinating assessment and monitoring by its Contracting Parties, as outlined in the JAMP. This in turn outlines the joint monitoring and assessment products that underpin OSPAR's joint quality status reports. The CEMP and associated CEMP Guidelines are the tools OSPAR uses for coordinating national efforts in marine monitoring.¹³

Key partnerships to deliver the joint monitoring programme (JMP)

OSPAR indicated it does collaborate with other Regional Sea Conventions on ocean observing and joint monitoring, typically with a bilateral approach, also with other regional initiatives. For instance, there is a HELCOM/OSPAR Task Group on Ballast Water Management Convention (BWMC) and Biofouling and a joint OSPAR/HELCOM/ICES Expert Group on Seabirds (JWGBIRD). Furthermore, an open-access statistical tool called Harmonized Regional Seas Assessment Tool (HARSAT) is currently being developed to harmonise time trend analyses of AMAP (the Arctic Monitoring and Assessment Programme), HELCOM and OSPAR data. The HARSAT tool is planned to be released in early 2024.

Furthermore, OSPAR indicated to also collaborate with other regional bodies on an *ad-hoc* basis. The CEMP includes data and information collected from other organisations, such as ICES. ICES also provides data management services to OSPAR. Furthermore, OSPAR commissions advice requests from ICES, both individually and jointly with the North-East Atlantic Fisheries Commission (NEAFC). The advice and data management services provided by ICES, are on a contractual basis, i.e. OSPAR pays for them.

Recommendations for improving JMP / interest in EC Ocean Observation initiative

During the interview, OSPAR mentioned two points regarding its joint assessment and monitoring programme, which could be improved. Firstly, the current JAMP ended with the publication of the QSR 2023 and a new JAMP is being drafted; it will address current overlaps with the CEMP. Second, the knowledge and resource sharing between countries could be improved. For instance, there could be a better knowledge exchange of when monitoring campaigns are taking place, to avoid duplicated monitoring efforts and allow more efficient use of scarce national resources. At present there is no online platform used by OSPAR for the sharing of ocean observation and monitoring plans at a North-East Atlantic regional level. While OSPAR Contracting Parties do collaborate and coordinate their efforts to a certain extent there is room for improvement. There is an ambition to share the monitoring resources and workload more effectively; OSPAR also suggested that there might also be opportunities to improve the effectiveness of monitoring effort by working with other Regional Seas Conventions. One way to achieve this could be to get all RSCs in the same room to discuss next steps and how they could coordinate better.

3.1.1.3 Regional data services

Key data services

During the interview, the representatives indicated that OSPAR maintains a data portal that serves as a central hub for accessing and sharing environmental data related to the North-East Atlantic called the OSPAR Data and Information Management System (ODIMS). ODIMS is an online tool providing a single point of access to all the data and information gathered through OSPAR's JAMP across the different thematic work areas of the Convention. It helps ensure that data is readily accessible for OSPAR assessments. It also helps a broad range of users to find data held by OSPAR, to facilitate access to it and make further use of it. ODIMS

¹² Biodiversity Committee (BDC), Environmental Impacts of Human Activities (EIHA), Hazardous Substances and Eutrophication Committee (HASEC) Offshore Industry Committee (OIC) and Radioactive Substances Committee (RSC)

¹³ Source: <https://www.ospar.org/documents?v=32943>

provides access to various datasets, associated reports, and resources collected and contributed by OSPAR member countries and partner organizations¹⁴.

Data are packaged into submissions when they are uploaded to ODIMS. A submission can include spatial data, tabulated data (in its native format, e.g. MS Excel) and metadata. Data with a geospatial element can be viewed, aggregated and/or downloaded via the map interface. There is a host of other information available about the layers too.

ODIMS currently has 958 submissions, 63 maps, 792 layers associated with 7 data themes¹⁵:

- Biological Diversity and Ecosystems;
- Cross-cutting;
- Environmental impact of Human Activities;
- Hazardous Substances and Eutrophication;
- Offshore Industry;
- OSPAR Reference Files;
- Radioactive Substances

Next to that, it also has the data classified in 46 data streams (subsets of the main data themes)¹⁶.

Additionally, ODIMS has a complementary OSPAR Geoportal Metadata Catalogue¹⁷ which hosts reference system information, identification information, distribution information and data quality information for the hosted datasets.

Key data flow national – regional – Europe (EMODnet)

OSPAR receives data from Contracting Parties (see section 3.1.1.1.). OSPAR data is managed in a decentralised fashion, with external organisations and Contracting Parties hosting and managing datasets.

Regarding the data flow into EMODnet, it was noted during the interview that JNCC manages the OSPAR List of Threatened and/or declining habitats in the North-East Atlantic dataset. These data are published directly via EMODnet Seabed Habitats and harvested by ODIMS.

In terms of EMODnet use by OSPAR, it was noted that EMODnet thematic data and data products have been utilised in OSPAR Quality Status Reports and provided to OSPAR technical and coordination groups. An example is that EMODnet Seabed Habitat data products have been accessed by the OSPAR Intersessional Correspondance Group on Coordination Of Biodiversity Assessments and Monitoring (ICG-COBAM) for their assessment of the extent of physical damage to the seabed¹⁸. This includes a composite product showing the distribution and extent of EUNIS habitats in the North-East Atlantic for OSPAR and most recently, a version of this product that was translated into MSFD benthic broad habitat types for use in the assessment of the extent of physical damage to seabed habitats (BH3)¹⁹.

Recommendations for improving marine data/knowledge value chain to EMODnet

OSPAR indicated during the interview that they are willing to explore opportunities for more systematic data ingestion from OSPAR into EMODnet, and further engagement in the development of appropriate data products. A requirement to increase uptake of data products is provision of clear documentation, including methodologies and data lineage to ensure that there is clear alignment with the CEMP and JAMP, and the rigorous monitoring guidance implemented by OSPAR. Data ingested by EMODnet should have clear source

¹⁴ Source: <https://odims.ospar.org/en/about/>

¹⁵ Status in October 2023, at the time of the tele-meeting interview with OSPAR

¹⁶ A datastream is a high-level grouping of datasets. For example, Environmental Monitoring of Radioactive Substances is the datastream, within this are two separate datasets considering Biota and Seawater data.

¹⁷ OSPAR Geoportal Metadata Catalogue: <https://odims.ospar.org/geoportal/#searchPanel/>

¹⁸ <https://oap.ospar.org/en/ospar-assessments/quality-status-reports/qsr-2023/indicator-assessments/phys-dist-habs-fisheries/>

¹⁹ Information provided by EMODnet Seabed Habitats

information (including appropriate origin licencing) and any standardisation/processing methodologies applied and provide this together with data and associated data products, via EMODnet.

3.1.2 ICES

3.1.2.1 Short introduction to ICES

The International Council for the Exploration of the Sea (ICES) is an intergovernmental marine science organisation and a regional fisheries advisory body, which provides evidence-based scientific advice²⁰. The goal of ICES is to advance and share scientific understanding of marine ecosystems and their services. ICES' work covers primarily the North East Atlantic (FAO Major Fishing Area 27), but through strategic partnership their work also extends into other seas (e.g. the Arctic, the Mediterranean Sea and the Black Sea). ICES has 20 member countries, providing a network for nearly 6000 scientists from over 700 marine institutes.²¹

3.1.2.2 Joint monitoring and ocean observation

Role in regional coordination of ocean observation and joint monitoring programmes

During the interview, ICES explained a number of ways in which ICES plays a role in ocean observation, monitoring and data collection coordination: First, as a named end-user of the Data Collection Framework (DCF) (i.e. an end-user specifically mentioned in the DCF text), ICES gives input to the regional and national work plans on fisheries data collection regarding what information to collect and where to collect this information, in order to make sure that the data collected is what ICES needs for their assessments. Second, ICES coordinates survey and data collection efforts, especially for fisheries independent surveys. There are ~10 survey working groups in ICES, which together coordinate >40 surveys that link into the assessment of the working groups for the DCF. Each survey group is focused on a specific gear type and has specific survey and sampling guidelines outlining how the survey should be carried out. For instance, the ICES working group on Beam Trawl Surveys have a specific protocol for offshore beam trawl surveys, which among other describes the current methodologies, stratification and sample processing used in the offshore beam trawl surveys²². In addition, there are specific working groups dealing with, for instance, age reading, species identification and other topics related to the data that is collected during the surveys. The implementation of the surveys is done by the member countries. Third, ICES coordinates the use of data of some existing data collection programmes on ecosystem-based monitoring. In these cases, ICES does not coordinate the data collection framework themselves, but they receive data from other organisations and coordinate the use of this data. Moreover, they also occasionally support other surveys at sea, for instance of marine mammals. They have also organised workshops to improve survey data collection for better analysis and advice²³.

ICES does not have a central tool for coordinating marine monitoring, but there are many examples of such tools at national level within ICES' member countries. For instance, the Marine Institute in Ireland has a Survey Planning System (SPS), which is used by their Research Vessels Operations department in all aspects of survey planning and scheduling. If scientist intent to use Irish Research Vessels, they must use SPS when applying for ship-time and submitting survey details.

Key partnerships to deliver the JMP

ICES indicated to collaborate with Regional Sea Conventions (RSCs) or other Member Countries by providing management advice. In addition, RSCs or Member Countries can ask (and have done so in the past) advice

²⁰ <https://www.ices.dk/>

²¹ Source: <https://data.ices.dk>

²² [https://ices-library.figshare.com/articles/report/ICES Survey Protocols Offshore Beam Trawl Surveys Coordinated by Working group on Beam Trawl Surveys WGBEAM_/21603336/1](https://ices-library.figshare.com/articles/report/ICES_Survey_Protocols_Offshore_Beam_Trawl_Surveys_Coordinated_by_Working_group_on_Beam_Trawl_Surveys_WGBEAM_/21603336/1)

²³ E.g.: [https://ices-library.figshare.com/articles/report/Working Group on Improving use of Survey Data for Assessment and Advice WGISDAA outputs from 2020 meeting_/18618446](https://ices-library.figshare.com/articles/report/Working_Group_on_Improving_use_of_Survey_Data_for_Assessment_and_Advice_WGISDAA_outputs_from_2020_meeting_/18618446)

from ICES on specific monitoring aspects, such as techniques, optimisation, new data types, etc. ICES provides this advice on a contractual basis, i.e. the client (in this case the RSC or Member Country) has to pay for it.

ICES also collaborates with the North East Atlantic Fisheries Commission (NEAFC) on a contractual basis, for instance to provide management advice or to provide advice on data collection, if requested. This also links to the joint arrangement between NEAFC and OSPAR to coordinate their work in the North-East Atlantic, and since ICES also provides advice to OSPAR, there is a three-way link to ensure they do things in a coordinated way. In addition, ICES collaborates with GFCM on data collection and sharing standards, methodologies, etc. Through the working groups, they work together to define standards that work across the different regional areas, specifically in the NE-Atlantic and the Mediterranean Sea.

The main contact point for joint monitoring in ICES is the Steering Group chair for Ecosystem Observations, which at the moment is Joel Vigneau, but from 1 January 2023 it will be Pia Schucherdt.

Recommendations for improving JMP / interest in EC Ocean Observation initiative

Workshops on specific topics can help improve joint monitoring. For instance, ICES has organised a workshop to improve survey designs and data collection for better analysis and advice²⁴.

ICES also noted that at the moment the surveys are grouped and performed by gear type, but that one potential point for improvement could be to organise them on a regional basis instead.

3.1.2.3 Regional data services

Key data services

During the interview, ICES provided updates on several of their data services. The ICES Data Centre manages a number of large dataset collections²⁵ related to the marine environment that are made available to the public through the ICES Data Portal²⁶. ICES manages various thematic data portals²⁷ within the ICES Data Portal, each centred around specific datasets, and the list of these portals is provided below. These data portals are used to produce end products for ICES working groups, specific sets of working groups, or advisory recipients such as HELCOM, OSPAR, and the European Union. It is important to note that these portals have been developed at different times, adhere to diverse standards, have a different layout, and cater to different user groups, resulting in a degree of heterogeneity across the platforms.

- The **Biodiversity data portal** hosts Cetaceans, European Seabird At Sea, Nesting Seabirds, seals abundance and Vulnerable Marine Ecosystem records and is linked to OSPAR, and ICES groups (JWGBIRD, WGMME);
- The **Fisheries Dependent data portal** hosts bycatch data, InterCatch data and fisheries assessments data from the Regional DataBase (RDB)²⁸;
- The **Fisheries independent data portal** hosts Acoustic trawl surveys, DATRAS (the Database of Trawl Surveys), Eggs and larvae, Stomach content, SmartDots (biological readings based on images);
- The **Marine Environment data portal** hosts the DOME web portal (Database on Oceanography and Marine Ecosystems), Historical Plankton data, Oceanography data, Ocean Climate data, Ocean Hydrochemistry data and Underwater Noise data.

²⁴ https://ices-library.figshare.com/articles/report/Working_Group_on_Improving_use_of_Survey_Data_for_Assessment_and_Advice_WGISDAA_outputs_from_2020_meeting_/18618446

²⁵ Dataset Collections: <https://www.ices.dk/data/dataset-collections/Pages/default.aspx>

²⁶ ICES Data Portal: <https://data.ices.dk/view-map?area=35>

²⁷ Thematic data portals: <https://www.ices.dk/data/data-portals/Pages/default.aspx>

²⁸ <https://www.ices.dk/data/data-portals/Pages/RDB-FishFrame.aspx>

ICES also hosts a metadata catalogue²⁹ which includes general information on the dataset, API's, access and use constraints and technical information.

Other data services that were highlighted in the survey were:

- data viewing and downloading services;
- operational tools for indicators and decision support <https://www.ices.dk/data/assessment-tools/Pages/default.aspx> ;
- data validation and data harvesting services <https://www.ices.dk/data/tools/Pages/data-validation.aspx> ;
- vocabulary services <https://vocab.ices.dk/> ;
- scripting sharing <https://www.ices.dk/data/tools/Pages/Software.aspx> .

Key data flow national – regional – Europe (EMODnet)

From the interview it was noted that the key data flow is facilitated by member states, driven by their obligations outlined in EU regulations. Notably, ICES plays a pivotal role as the competent partner responsible for utilizing this data to provide management advice. Additionally, the data flow is influenced by obligations stemming from RSCs and regional fisheries bodies. These mechanisms collectively contribute to a comprehensive data exchange framework that spans from national to European scales, ensuring the effective utilization of data for informed management decisions.

In regard to the interactions between EMODnet and ICES, ICES has a multifaceted role within this partnership. ICES functions as a key data provider across various thematic domains, including EMODnet Biology, EMODnet Chemistry, EMODnet Physics, and EMODnet Human Activities. Moreover, ICES engages as a partner in establishing standards and harmonization efforts. Beyond data provision, ICES extends its role to include the supply of data to third parties, e.g. by its contributions to EEA indicators. Importantly, ICES also serves as an end user, benefiting from both technical and content-related services offered by EMODnet. In a broader strategic context, ICES operates as a significant partner, actively contributing to the wider mobilization and utilization of marine data by advocating for best practices and fostering collaboration. Notably, ICES functions as a stakeholder representative within the user community, specifically at the science-to-policy interface, bridging the gap between scientific insights and policy considerations. This multifunctional engagement underscores the depth and breadth of the collaboration between EMODnet and ICES.

Recommendations for improving marine data/knowledge value chain to EMODnet

National funding mechanisms for ocean observation and marine data are often structured based on specific ministries, impacting the entire system. The allocation of funds from ministries often mirrors regional funding patterns, addressing specific needs identified at the ministry level. It's worth noting that these needs may not necessarily align with the requirements of the entire country or region but may stem from a particular section within the ministry. While some countries have begun to address this issue, a significant aspect of ongoing studies involves identifying which ministries wield this influential role and devising strategies to address and resolve this situation.

3.2 Baltic Sea basin

3.2.1 HELCOM

3.2.1.1 Short introduction to HELCOM

HELCOM implements the Convention on the Protection of the Marine Environment of the Baltic Sea Area (Helsinki Convention). The Helsinki Convention seeks to protect the Baltic Sea from all sources of pollution from land, air and sea, as well as to preserve biological diversity and to promote the sustainable use of marine

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resources. The Contracting Parties (CPs) are: Denmark, Estonia, the European Union, Finland, Germany, Latvia, Lithuania, Poland, Russia and Sweden.³⁰

3.2.1.2 *Joint monitoring and ocean observation*

Role in regional coordination of ocean observation and joint monitoring programmes

During the interview, HELCOM explained that it coordinates the joint monitoring between its Contracting Parties. When HELCOM was established in the late 1900s, the Baltic Sea was in such a bad environmental status that the countries decided that there is a need to monitor and improve its condition, and it has taken decades to establish the programme. The most fundamental thing was to establish monitoring guidelines, because data harmonisation and method harmonisation is critical for joint monitoring. For instance, it was agreed that only the first 10 m of the water surface would be monitored for chlorophyll and a common laboratory procedure was established to analyse the data.

The current common plan to monitor and assess the health of the Baltic Sea in a coordinated and cost-efficient way is captured in the HELCOM Monitoring and Assessment Strategy (MAS). It sets the basis for how the HELCOM CPs commit themselves to design and carry out their national monitoring programmes and work together to produce and update joint assessments. The coordinated monitoring programme also helps the EU Contracting Parties to implement the requirements of Article 11 of the MSFD regarding the establishment and implementation of coordinated monitoring programmes, as well as the requirements to monitor and report of other directives, such as the Water Framework Directive and the Habitats and Birds Directive. The HELCOM Monitoring Manual supports the implementation of the MAS and it contains the monitoring programmes, guidelines and manuals which translate the general principles of the HELCOM MAS into concrete specifications and requirements. The HELCOM Monitoring Manual also sets deadlines for reporting data from coordinated monitoring.

HELCOM has agreed 12 monitoring programmes, namely: (1) birds, (2) mammals, (3) fish, (4) water column habitats, (5) seabed habitats, (6) non-indigenous species, (7) eutrophication, (8) hydrographic changes, (9) contaminants, (10) contaminants in seafood, (11) litter, and (12) energy, including underwater noise. HELCOM's monitoring programmes are considered 'coordinated' when the following requirements are established: (i) common technical guidelines, (ii) common quality assurance tools, and (iii) agreed data submission and data management arrangements. The main countries responsible for carrying out coordinated monitoring activities in the HELCOM area are defined per sub-basin.³¹ Typically, it is the national institutes who are dealing with the topic that are responsible for collecting the data, but in some cases, HELCOM has special arrangements to obtain data, e.g. from NGOs or institutions with privately-owned data because there are no national monitoring programmes in place to collect the data needed for the assessment.

HELCOM uses core indicators with regionally agreed quantitative threshold values to evaluate progress towards the goal of achieving Good Environmental Status (GES) in the Baltic Sea. Indicators are evaluated in terms of failing or achieving the threshold value, with the latter meaning that good status has been achieved for that specific indicator. Core indicator evaluations are regularly updated and published as core indicator reports. These indicators form the basis of status assessments in the Baltic Sea region, such as HELCOM holistic assessments (HOLAS), which gives a comprehensive overview of the Baltic ecosystem health.³²

During the interview HELCOM further indicated it also helps countries in coordinating their monitoring activities. For instance, if Finland does a cruise in the Baltic that is not limited to Finnish waters, there is the possibility to share research vessels between countries. Although this can happen bi-laterally between

³⁰ Source: <https://helcom.fi/>

³¹ Source: <https://helcom.fi/action-areas/monitoring-and-assessment/monitoring-manual/>

³² Source: <https://helcom.fi/wp-content/uploads/2021/01/BSEP175.pdf>

countries, HELCOM's role is to provide a platform in which countries can cooperate more easily, for instance by easing the process of applying for permits to make a cruise in another country's waters. In addition, HELCOM has developed an online tool, which is available on their website³³, which shows where research vessels are going, has links to planned cruises and provides cruise summary reports to facilitate cooperation.

There is no single contact point in the Secretariat for joint monitoring. The professional secretary of each domain is the main contact point. The working groups have been divided so that for instance biodiversity issues are for one professional secretary and source to sea nutrients and contaminants are for another professional secretary.

Key partnerships to deliver the JMP

HELCOM currently only collaborates with other Regional Sea Conventions to coordinate the joint monitoring for birds, for which there is a joint Working Group between HELCOM, ICES and OSPAR (JWGBIRD). This is because they are highly mobile species. Otherwise, HELCOM's work is very regional sea specific. However, some CPs are part of both HELCOM and OSPAR, so coordination and harmonisation is important for them, and this is something the RSCs always aim for.

There is also collaboration with ICES, who host some of HELCOM's data, but this is a contract-based working relationship. In addition, the Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas (ASCOBANS) has been relevant for the harbor porpoise work, but this does not necessarily link to monitoring.

Recommendations for improving JMP / interest in EC Ocean Observation initiative

HELCOM noted that there is always room for improvement and that something that is clearly needed are inter-comparison exercises, so that samples are always analysed in the same way. This is quite well established for radioactive substances, but not as much for biological samples, where there is much room for interpretation. Maybe this could be improved with the use of novel methods e.g., for biological ocean observation and data collection. The most fundamental thing is that there is a need for a guideline that every country follows. Without that there is no point in doing international assessments if country A is monitoring differently than country B.

3.2.1.3 Regional data services

Key data services

The HELCOM Map and Data Service (HELCOM MADS)³⁴ is an online platform that offers access to a wide range of spatial data and maps related to the Baltic Sea environment. This includes data on water quality, habitats, pollution, and more. It serves as a resource for data sharing and visualization. It harbours over 1,000 data maps with different data models. Datasets are grouped under eight different 'services' which can be accessed by using the free text search tool or by browsing the services tree. The data is available in various formats, including vector and raster data and accessible as a service (ArcGIS Rest, OGC WMS, WFS). Each dataset is linked to the INSPIRE compliant HELCOM Metadata Catalogue³⁵ where data is made available for download. MADS also includes an array of functionalities to aid data visualization and analysis such as legend widgets, attribute tables, data querying, multiple background maps, links to unique map features, and many more³⁶.

HELCOM hosts several thematic databases, listed below:

³³ <https://helcom.fi/action-areas/monitoring-and-assessment/research-vessels/research-vessels-live-map/>

³⁴ HELCOM MADS: <https://maps.helcom.fi/website/mapservice/>

³⁵ HELCOM Metadata catalogue:

<https://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/search?facet.q=type%2Fservice&resultType=details&sortBy=relevance&from=1&to=20>

³⁶ HELCOM. (n.d.). Map Service. Retrieved from <https://maps.helcom.fi/website/mapservice/>

- Biodiversity data base: species observations in specific data model;
- Database for riverine input/ contaminants;
- Marine Protected Areas (MPA) database;
- Radioactive substances database;
- Database on AIS raw data which we cannot share publicly;
- Other more but MADS is most used.

Key data flow national – regional – Europe (EMODnet)

Data moves in multiple directions, from the regional seas to EMODnet via ICES, and vice versa. ICES shares data with EMODnet, although these data originate from the HELCOM framework and are primarily used for HELCOM processes.

Notably, some highly aggregated datasets, such as dredging and extraction data, are collected within the framework of EMODnet's Human Activities and shared with ICES and EMODnet, fostering collaborative data sharing.

HELCOM actively contributes to EMODnet by collecting data on gravel extraction, further enhancing the pool of available information. HELCOM benefits from EMODnet data, such as the Seabed Habitats' EUSeaMap, which is used for regional assessments. For HOLAS, a combination of EUSeaMap and national data is used. However, some regional experts have noted that regional details in the former may not always align perfectly with the broader European perspective, underlining the need for continuous improvement.

Data sharing within HELCOM and EMODnet enhances the accuracy and completeness of available data, contributing to the region's overall assessment efforts. Challenges emerge when some Member States prefer to use only official national monitoring data over research data/not in combination with research data, reflecting concerns about data quality and provenance.

No interaction with research infrastructures was noted.

Recommendations for improving marine data/knowledge value chain to EMODnet

No feedback was provided regarding the improvements of marine data/knowledge value chain to EMODnet.

3.3 Mediterranean Sea basin

3.3.1 UNEP/MAP

3.3.1.1 Short introduction to UNEP/MAP

The Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (Barcelona Convention) is the Regional Sea Convention for the Mediterranean Sea. This convention and its seven Protocols (Dumping Protocol, Prevention and Emergency Protocol, Land-Based Sources Protocol, Specially Protected Areas and Biological Diversity Protocol, Offshore Protocol, Hazardous Wastes Protocol, and Integrated Coastal Zone Management Protocol) constitute the principal legal framework for the protection of the marine environment and sustainable use of the Mediterranean. The convention is implemented by the United Nations Environmental Program Mediterranean Action Plan (UNEP/MAP) and has 22 Contracting Parties: Albania, Algeria, Bosnia and Herzegovina, Croatia, Cyprus, Egypt, France, Greece, Israel, Italy, Lebanon, Libya, Malta, Monaco, Montenegro, Morocco, Slovenia, Spain, Syrian Arab Republic, Tunisia, Turkey and the European Union. The Contracting Parties pledge to take appropriate measures to prevent, abate, combat fully, and eliminate pollution of the Mediterranean Sea Area, and to protect and enhance the marine environment to contribute towards its sustainable development. Furthermore, they pledge to implement the Mediterranean Action Plan (MAP) to pursue the protection of the marine environment and the natural resources of the Mediterranean, meeting the needs of present and future generations in an equitable manner. Represented by their competent Ministries, the Contracting Parties decide on the MAP policies, strategies, budget and programme of work at their ministerial-level meetings

held every two years. They designate Focal Points that serve as official conduits for communication to review the progress of work and ensure the implementation of recommendations at the national level.³⁷

The UNEP/MAP Coordinating Unit acts as the overarching coordinating mechanism. Among others, it develops, implements and monitors the Programme of Work and provides through the UN Mediterranean information system (InfoMAP) effective reporting services to facilitate implementation of the Barcelona Convention. In addition, the Coordinating Unit is responsible for preparing regular reports on the State of the Environment and Development in the Mediterranean, as well as on the overall status of implementation of the Barcelona Convention and its Protocols, through the Barcelona Convention Reporting System (BCRS).³⁸

The Coordinating Unit receives technical support and assistance from the so-called MAP Components, which play an important role in strengthening the entire MAP-Barcelona Convention system. MAP components are either Regional Activity Centres (RACs) or programmes (see below). This set-up allows the system to acquire and develop essential expertise for the execution of the Convention, notably through the specific mandates of the RACs, while keeping a shared sense of direction and common purpose. Each centre acts as a focal point for data collection, analysis, and the development of methodologies and is dedicated to specific environmental themes. The MAP Components are:

- The Mediterranean Pollution Assessment and Control Programme (MED POL) based at the Coordinating Unit in Greece;
- The Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea (REMPEC) based in Malta;
- The Plan Bleu Regional Activity Centre (PB/RAC) based in France;
- The Priority Actions Programme Regional Activity Centre (PAP/RAC) based in Croatia;
- The Specially Protected Areas Regional Activity Centre (SPA/RAC) based in Tunisia;
- The Regional Activity Centre for Sustainable Consumption and Production (SCP/RAC - MEDWaves) in Spain; and
- The Regional Activity Centre for Information and Communication (INFO/RAC) based in Italy.

In the context of this study, we exclusively conducted interviews with representatives from UNEP/MAP, responsible for implementing the Barcelona Regional Sea Convention. However, we acknowledge that the General Fisheries Commission for the Mediterranean (GCFM) also plays an important role in coordinating fisheries data collection in the Mediterranean.

3.3.1.2 Joint monitoring and ocean observation

Role in regional coordination of ocean observation and joint monitoring programmes

The Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and Related Assessment Criteria (IMAP) lays down the principles for integrated monitoring, to ensure monitoring of biodiversity and non-indigenous species, pollution and marine litter, coast and hydrography happens in an integrated manner. This Monitoring Programme is structured along 11 ecological objectives (biodiversity, non-indigenous species, harvest of commercially exploited fish and shellfish, marine food webs, eutrophication, sea-floor integrity, hydrography, coastal ecosystems and landscapes, pollution, marine litter, and energy including underwater noise), which reflects the ecological objectives to achieve Good Environmental Status (GES) in the Marine Strategy Framework Directive (MSFD).

During the interview it was clarified that for each ecological objective in the IMAP there are indicators, which can be either “common indicators” or “candidate indicators”. Common indicators summarise data into a simple, standardized, and communicable figure and are ideally applicable in the whole Mediterranean basin, or at least on the level of subregions. They are monitored by all Contracting Parties and give an indication of the degree of threat or change in the marine ecosystem, delivering valuable information to decision-makers. Common indicators have guidelines, which are prepared and coordinated by experts in the relevant MAP

³⁷ Source: <https://www.unep.org/unepmap/>

³⁸ <https://www.unep.org/unepmap/who-we-are/institutional-set>

Components (such as the Regional Activity Centres). Basing on guidelines data standards and data dictionaries (reporting templates), which lay out how the countries should report on the indicators, have been developed and they are provided as excel files for analysis. Candidate indicators are indicators which still have many outstanding issues regarding their monitoring and assessment and therefore are recommended to be monitored in the initial phase of IMAP on a pilot and voluntary basis before they are confirmed as Common Indicators.³⁹

The reporting related to the IMAP Common indicators is managed and harmonized by the Regional Activity Centre for Information and Communication (INFO/RAC), as well as all the Barcelona Convention reporting data flows. INFO/RAC provides the infrastructure (storage, website, user interface) and makes available data standards, and tools to verify that the reports match the requirements. In addition, the Specially Protected Areas Regional Activity Centre (SPA/RAC) have databases related to Marine Protected Areas (MAPs), such as a thematic database on non-indigenous species and the Mediterranean Biodiversity Platform (MbP). The MbP is an online tool developed by SPA/RAC to inventory, catalogue and store data on marine and coastal biodiversity in the Mediterranean, and view them on maps.

Overall, the IMAP aims to strengthen national capabilities in integrated monitoring of the Mediterranean Sea and coast. To this end, it also provides support to the Contracting Parties in enhancing their relevant capacities, including through targeted training, exchange of specific best practices, and undertaking of pilots in new areas of monitoring of IMAP, with a focus on the sub-regional level.

The main contact points from UNEP/MAP for joint monitoring are the various Correspondence Groups on Monitoring (CORMON), which cover specific topics. Namely, there is a CORMON group for Coast and Hydrography, one for Pollution and marine litter, and one for Biodiversity and Fisheries.

Partnerships to deliver the JMP

UNEP/MAP collaborates with other European RSCs at the level of the MAP Coordinating Unit. They are also in close exchange with the Executive Directors of other RSCs. The exchange on Marine litter is more substantial, as they have yearly meetings with the RSCs. They also collaborate closely with the Black Sea Commission and have some bilateral cooperation. In addition, they keep an eye on technical groups of the RSCs, but this is not an institutional collaboration in the sense that they are part of the review.

UNEP/MAP also cooperate with ACCOBAMS regarding mammals and GFCM regarding fisheries, both of which collect data for them because they are dealing with many common species. SPA/RAC in particular, has strong collaboration links with ACCOBAMS and GFCM. There is also a common database on vulnerable species for bycatch. In addition, INFO/RAC collaborates with the EEA regarding data collection and management on a technical level, and, under the umbrella of the CBD, UNEP/MAP is also in dialogue with other regions and they try to have common roadmaps. Overall, most of the collaboration between UNEP/MAP and other regional organisations focuses on data exchange.

Recommendations for improving JMP / interest in EC Ocean Observation initiative

The representatives of UNEP/MAP noted that there is currently a revision of the ecosystem approach in the Mediterranean being carried out, including for the Integrated Monitoring and Assessment Programme (IMAP), including for the Integrated Monitoring and Assessment Programme (IMAP). The preparatory elements for EcAp and IMAP revision will be available soon and they will probably yield insights on possible recommendations for improving collaboration about countries data flows.

³⁹ Source: <https://www.medqsr.org/integrated-monitoring-and-assessment-programme-mediterranean-sea-and-coast/> and https://wedocs.unep.org/bitstream/handle/20.500.11822/17012/imap_2017_eng.pdf?sequence=5&isAllowed=y#:~:text=their%20sustainable%20development,-,The%20Integrated%20Monitoring%20and%20Assessment%20Programme%20of%20the%20Mediterranean%20Sea,th e%20UN%20Environment%20FMAP%20Barcelona

3.3.1.3 Regional data services

Key data services

UNEP/MAP representatives explained during the interview that the Information and Communication Regional Activity Centre INFO/RAC⁴⁰ provides infrastructure, database storage, a user interface and makes sure the data are compliant with data standards for the Barcelona Convention.

INFO RAC manages the IMAP Info System⁴¹, the core of the UNEP/MAP knowledge platform conceived to provide and share data, information services and knowledge for the benefit of the Mediterranean Action Plan components and Contracting Parties. This system holds the InfoMAP Data Centre⁴² which is the central part of the IMAP Info System and which is able to manage different data flows from the Barcelona Convention Reporting System (BCRS) and the National Baseline Budget Reporting (NBB) (Infographic in Annex 4). They allow for managing Contracting Parties data (documents, tables, geographical layers etc.). It was further explained that IMAP Info System, the reporting system dedicated to IMAP, follows specific validation steps of the data they receive and publish. Data are available once validated, part of them with restricted access. The IMAP Info System enables the Contracting Parties to start reporting data for 19 IMAP Common Indicators, namely, biodiversity, non-indigenous species, , , eutrophication, , hydrography, coastal ecosystems and landscapes, pollution, marine litter, etc⁴³.

During the interview it was also mentioned that in the IMAP Info System, there is a Spatial Data Infrastructure, the InfoMAPNode⁴⁴ for geographical layers sharing which serves geographical layers by means of interoperable services (following OGC standards).

All the systems mentioned above are managed by INFO/RAC that provides infrastructure (i.e. database, storage, user interface, website) and data standards. For each data there are guidelines (pollution, litter, fisheries, etc).

Also the other Regional Activity Centres (RACs) collect data for the Barcelona convention as follow:

- The Priority Actions Programme Regional Activity Centre (PAP/RAC)⁴⁵ for example does not manage a particular data platform but collects project-based data from the Coastal Area Management Programmes – CAMPs and from coastal or Integrated Coastal Zone Management plans⁴⁶;
- The SPA/RAC⁴⁷, Specially Protected Areas Regional Action Centre is in charge of several thematic portals: the Mediterranean Biodiversity Platform (MBP)⁴⁸, MAPAMED Database⁴⁹ and the Marine Mediterranean Invasive Alien Species MAMIAS⁵⁰
- The Programme for the Assessment and Control of Marine Pollution in the Mediterranean (MED POL⁵¹) activities generates information or data of several type, flowing into the IMAP Info System;

⁴⁰ INFO/RAC: <http://www.info-rac.org/en>

⁴¹ INFOMAP SYSTEM: <http://www.info-rac.org/en/infomap-system>

⁴² InfoMAP Data Centre: <https://idc.info-rac.org/>

⁴³ INFO/RAC. IMAP Pilot Platform. INFO/RAC. <http://www.info-rac.org/en/infomap-system/imap-pilot-platform>

⁴⁴ InfoMAPNode: <https://infomapnode.info-rac.org/#/>

⁴⁵ PAP/RAC: <https://maritime-spatial-planning.ec.europa.eu/practices/priority-actions-programme-regional-activity-centre-paprac>

⁴⁶ Source: European Commission, Priority Actions Programme Regional Activity Centre (PAP/RAC). Maritime Spatial Planning. <https://maritime-spatial-planning.ec.europa.eu/practices/priority-actions-programme-regional-activity-centre-paprac>

⁴⁷ SPA/RAC: <https://www.rac-spa.org/>

⁴⁸ <http://data.rac-spa.org/>

⁴⁹ <https://www.mapamed.org/>

⁵⁰ <http://www.mamias.org/> (url currently not operational)

⁵¹ MEDPOL: <https://www.unep.org/unepmap/who-we-are/institutional-set/med-pol>

- The Plan Bleu/RAC⁵² identifies, collects and processes environmental, economic and social data for decision-making; assessment of the interaction between the environment and socio-economic development; preparation of analyses and prospective studies to support decision-making. During the interview there was no representative of the Plan Bleu/RAC present to provide further information on the data collections and data repositories that are in place for this Regional Action Centre⁵³;
- The Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea (REMPEC)⁵⁴ provides a framework for the exchange of information on operational, technical, scientific, legal and financial matters on the prevention of pollution from ships and preparedness for and response to accidental marine pollution in a dedicated data base⁵⁵;
- The Regional Action Centre for Sustainable Consumption and Production (MEDWAVES) analyzes the way Mediterranean countries produce and consume goods and services, collecting related data.

Key data flow national – regional – Europe (EMODnet)

Data from member states flows into UNEP/MAP through various channels, including Regional Activity Centres (RACs) and thematic data centres. These centres act as intermediaries, consolidating and organizing data based on specific themes or regions. The InfoMAP Data Centre manages the different data flows from the Barcelona Convention Reporting System (BCRS) and the National Baseline Budget Reporting (NBB). The BCRS data flow within the Data Centre is subdivided in seven mandatory Protocols that Contracting Parties have to report⁵⁶:

- Dumping Protocol;
- Land-Based Sources (LBS) Protocol;
- SPA Protocol;
- Prevention and Emergency Protocol;
- Offshore Protocol;
- Hazardous Wastes Protocol;
- ICZM Protocol.

INFO/RAC plays a crucial role in enhancing the reporting and data management processes. The National Baseline Budget is a reporting system within the Data Centre, whose entire procedure has been streamlined by INFO/RAC simplifying the fulfilment of data obligations for countries, reducing duplication and share data/metadata via internationally recognized data and metadata standards⁵⁷.

It was noted during the interview that, according to MAP Data Policy⁵⁸, data from Member States and from data centres should be managed nearest to where it is collected. It's important to note that UNEP/MAP's data management system is continually evolving and undergoing fine-tuning.

To ensure a cohesive process, representatives from each country serve as national contact points, playing a crucial role in assisting with data elaboration contributing to the structured upload of data for each pillar, ensuring a standardized and comprehensive approach.

Recommendations for improving marine data/knowledge value chain to EMODnet

⁵² Source: Plan Bleu/RAC: <https://planbleu.org/en/mission/observer-of-the-environment-and-development-to-inform-governments-and-the-general-public/>

⁵³ United Nations Environment Programme. Monitoring and Assessments. UNEP Mediterranean Action Plan. <https://www.unep.org/uneppmap/what-we-do/monitoring-and-assessments>

⁵⁴ REMPEC: <https://www.rempec.org/en/about-us/mandate>

⁵⁵ REMPEC. (n.d.). Our Tasks. Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea. <https://www.rempec.org/en/about-us/mandate/our-tasks>

⁵⁶ INFO/RAC. (n.d.A). BCRS Reporting. INFO/RAC. <http://www.info-rac.org/en/infomap-system/bcrs-reporting>

⁵⁷ INFO/RAC. NBB Reporting. INFO/RAC. <http://www.info-rac.org/en/infomap-system/nbb-reporting>

⁵⁸ https://wedocs.unep.org/bitstream/handle/20.500.11822/37132/21ig25_27_2510_eng.pdf

UNEP/MAP representatives explained EMODnet is used for assessments, and there is potential for more utilization of EMODnet data and data products for this purpose. This topic is actively under development within the framework of the EEA-INFO/RAC Joint Working Party (JWP) task force.

UNEP/MAP and its Mediterranean Geographical Intercalibration Group (MedGIG) actively collaborate with Plan Bleu. The goal is to achieve greater unification of standards, policies, and ingestion procedures to streamline data management. It was recommended that EMODnet could have direct dialogue with Plan Bleu, noting this would be in future studies 2024 and beyond.

In terms of data sharing, UNEP/MAP still faces obstacles, including mandates and ownership complexities. As a data repository rather than owner, UNEP/MAP faces challenges in fully implementing MAP data policy.

Despite these challenges, UNEP/MAP envisions future collaboration, aiming to provide data for contracting parties across the entire Mediterranean region. The focus is on real-time data to better assist decision-makers, beginning with standardization and harmonization and progressively advancing toward improved real-time data offerings.

Interoperability remains a key challenge, significantly contribute to the effectiveness of platforms, aligning with ongoing European projects like IIIAD that tackle interoperability challenges and standards.

In summary, UNEP/MAP is actively using EMODnet and is interested in future collaborations to enhance data utilization and interoperability for improved decision support in the Mediterranean region.

3.4 Black Sea basin

3.4.1 Black Sea Commission

3.4.1.1 Short introduction to Black Sea Commission

The Commission on the Protection of the Black Sea Against Pollution (BSC⁵⁹) is an inter-governmental body established to implement the Bucharest Convention. Concrete activities of the BSC are based on the Convention on the Protection of the Black Sea Against Pollution⁶⁰, The Strategic Action Plan on the Protection and Rehabilitation of the Black Sea⁶¹, coordinated with national and regional projects/activities, international financing agencies, national and regional policy measures, and overall efforts of the countries to restore and preserve the environment of the Black Sea. A detailed work-programme reflecting these is drawn up on an annual basis. Contracting Parties to the BSC are Bulgaria, Georgia, Romania, Russian Federation, Turkey, and Ukraine. The Contracting Parties cooperate through the BSC to establish appropriate scientific criteria for the formulation and elaboration of rules, standards and recommended practices and procedures for the prevention, reduction and control of pollution of the marine environment of the Black Sea.

3.4.1.2 Joint monitoring and ocean observation

Role in regional coordination of ocean observation and joint monitoring programmes

During the interview it was indicated that the Black Sea Integrated Monitoring and Assessment Programme (BSIMAP) is based on national monitoring programmes and integrates thematic surveys on various environmental problems within the framework of various projects financed by UNEP, EC, and FAO for example. Its main activities are: reaching consensus on common principles for regional monitoring and assessment programmes; establishment of an initial affordable program to harmonize assessment methodologies on a regional level (e.g. analytical techniques, reporting formats); elaboration of environmental quality criteria/objectives; development and establishment of mechanisms of integration of scientific results into the assessment process; elaboration of mechanisms and procedures for quality assurance quality control; elaboration and maintenance of the Black Sea Information System (BSIS) for

⁵⁹ Black Sea Commission: <http://www.blacksea-commission.org/>

⁶⁰ <http://www.blacksea-commission.org/convention.asp>

⁶¹ <http://www.blacksea-commission.org/Official Documents/Black Sea Strategic Action Plan 2009/>

supporting the decision making processes of the BSC. There is also a more specific database only for pollution monitoring data managed by Pollution Monitoring and Assessment Activity Center located in Odessa, Ukraine.

The choice of parameters to monitor is related to the main environmental problems in the Black Sea and is re-evaluated every 5 years based on BSC reports. Generalized requirements for data to be included in the monitoring programme have been partially formulated on the basis of EEA methodologies for indicator calculation and on specific needs to meet the obligations of the MSFD in EU-member states, however, they are not always completely compatible with MSFD requirements, as EU regulations are not legally binding in all Black Sea countries. Data from monitoring activities are reported annually to the BSC on an annual basis and include data on pollution, eutrophication, fisheries, biodiversity, several climate-related indicators, port reception facilities, marine protected area extent, recreational use of the marine environment, bathing water quality, aquatic biota etc. There are no infringement procedures for non-reporting contributing to gaps in regularity of reporting and data coverage. There are also gaps in the national monitoring systems in terms of organization/strategy and compliance with commitments, problems with data accessibility, compatibility and suitability to produce indicators and standardisation of indicators, e.g. nutrient load is assessed using two different indicators.

There is no general standardisation of data collection, however there are quality assurance guidelines for data submitted as part of the programme relating to the quality assurance of chemical and biological analyses and tests, with inter-comparisons where necessary, and to the sampling and assessment procedures, which should have a sound statistical basis. Results of quality assurance procedures must be reported to the BSC. Sampling, analyses, the submission and validation of data must comply with agreed guidelines, otherwise results are not included in the assessments. A further challenge is to harmonize the four quality objectives for the Black Sea with the 11 descriptors of the MSFD. A state of environment (SoE) report is published approximately every 5 years, although the last report was in 2015 as it has been difficult for countries to reach consensus on this decision. A 10-year assessment is planned to be published in 2025. There is no specific online tool for sharing and coordinating national plans for marine monitoring.

Key partnerships to deliver the JMP

There is active collaboration between the Black Sea Commission and the Danube Commission (ICPDR). Together they report yearly based on the template table agreed for data reporting. There are also six advisory groups (AGs) that provide technical expertise to the BSC based on pollution monitoring, land-based sources, biodiversity, fisheries, shipping and ICZM data. However, AGs have not been operational since 2018 due to lack of consensus, which hampers the communication between different Black Sea countries in terms of monitoring activities. Previously these groups would meet regularly on annual basis to coordinate and discuss all issues, projects and obstacles in the Black Sea countries. Now the people involved in these advisory groups still meet within the context of different projects, so they still discuss coordination of activities despite the lack of formal meetings. Bulgaria and Romania still have bilateral mechanisms to coordinate between themselves, specifically related to the MSFD. Georgia, Turkey and Ukraine have now signed an agreement with the EU on the MSFD which will help harmonization of regional efforts.

Recommendations for improving JMP / interest in EC Ocean Observation initiative

- Development of new indicators;
- Improve the existing EEA indicator specifications to make them more suitable for Black Sea assessments;
- Harmonize GES identification and wider assessments in EU and non-EU member states;
- Align the state of the environment for the Black Sea more closely with the MSFD and UN objectives and following the format of reports from other Regional Sea Conventions. To achieve this the BSC needs increased collaboration and connections to other RSCs;
- Facilitate communication between Black Sea Advisory Groups;
- Improve standardization in data collection following protocols from EMODnet.

3.4.1.3 Regional data services

Key data services

While there is no central data service for the Black Sea region, there is a Pollution database (Odessa, Ukraine)⁶² that serves as a focal point for data collection in the Black Sea region. This database receives data transfers from the Black Sea Regional Activity Centre for Pollution Monitoring and Assessment (RAC PMA) in Ukraine, reinforcing the pollution data base's role as a key repository for environmental data.

Additionally, the Black Sea Commission has six advisory groups (AGs), which contain technical experts. These advisory groups report their dedicated data to the Black Sea Convention once per year (summer). Within the Black Sea Integrated Monitoring and Assessment programme, BSIMAP, there is an annual reporting requirement for the member countries which they collect in a 'Short Reporting Template' via email or diplomatic channels. This data is later on fed into the pollution database (Odessa) for processing technically and producing regional reports. It was noted that no data alterations is carried out by the Black Sea Commission's Permanent Secretariat.

Key data flow national – regional – Europe (EMODnet)

The monitoring programme (BSIMAP) has six different tables with annual reporting requirements from member countries. The tables have specific requirements that are not always compatible with MSFD. Tables are provided to the Permanent Secretariat to the Commission on the Protection of Black Sea Against Pollution every year (by emails or diplomatic channels). This data is then submitted to the pollution database in Odessa for processing technically and producing regional reports.

The Odessa regional activity centre was a partner in project EMBLAS⁶³ (2013-2015) for which a data portal was created.

The Black Sea Commission reports yearly to the International Commission on protection of Danube river (ICPDR).

Recommendations for improving marine data/knowledge value chain to EMODnet

Recommendations for improving the marine data/knowledge value chain to EMODnet from the Black Sea Commission involve enhancing existing collaborations. The Black Sea Commission primarily engages with EMODnet Chemistry through a Memorandum of Understanding (MoU) established seven years ago, committing to data exchange. While some interaction occurs with other EMODnet themes such as Biology and Human Activities, the focus has primarily been on Chemistry.

To strengthen the marine data and knowledge value chain, an essential step is updating and expanding the current MoU. The expansion should encompass various thematic areas beyond Chemistry, broadening the collaboration's scope and fostering a more comprehensive exchange of data.

Addressing issues related to data sharing with RAC PMA in Odessa, Ukraine is crucial, and the Black Sea Commission should be encouraged to provide monitoring data to EMODnet, particularly when officially requested.

Maximizing the utilization of EMODnet data is of utmost importance, especially in the context of preparing the next Black Sea State of Environment Report. This ensures the accuracy and comprehensiveness of the data used in the assessment.

For future Black Sea Integrated Monitoring and Assessment Programme (BSIMAP) activities, it is essential to share data with EMODnet. Aligning with national and regional reporting templates can facilitate the seamless integration of relevant data into the European marine data framework.

⁶² Black Sea Commission. (n.d.). Black Sea Commission - Activity Centers: Pollution Monitoring and Assessment.

<http://www.blacksea-commission.org/activitycenters-pma.asp>

⁶³ <https://emblasproject.org/wp-content/uploads/2016/03/EMBLAS-1-Fin-reportFinDraftSept2015-v14-FinalRed.pdf>

A key recommendation involves expanding the incorporation of socioeconomic data. Building on the success of the latest State of the Environment Report (SoE Report), this expansion will contribute to a more holistic understanding of marine conditions and support the objectives of the Black Sea Commission.

3.5 Arctic Ocean

It is noted that for this section, there were no interviews or surveys completed. The information is based solely on public information available online.

3.5.1 Short introduction to Arctic Ocean Council

In the Arctic region, the Arctic Council⁶⁴ acts as an intergovernmental forum that promotes cooperation, coordination and interaction among the Arctic States, Arctic indigenous communities and other Arctic inhabitants on common Arctic issues, in particular on sustainable development and environmental protection in the Arctic.

Some Regional Sea Conventions, namely OSPAR and HELCOM, have Contracting Parties with jurisdiction in or close to the Arctic Ocean.

3.5.2 Joint monitoring and ocean observation

The implementation or enforcement of guidelines, assessments or recommendations, and research and coordination projects and initiatives, is the responsibility of the individual Arctic States. The Arctic Council's Arctic Marine Strategic Plan (AMSP) 2015-2025⁶⁵ guides actions to protect Arctic marine and coastal ecosystems, including the goal to strengthen the collection, observation, monitoring and dissemination of relevant data on the Arctic marine environment. In addition, the Arctic Council and the International Arctic Science Committee (IASC), a non-governmental organisation encouraging and facilitating cooperation in Arctic research, established the joint initiative Sustaining Arctic Observing Networks (SAON) in 2011, which aims to strengthen multi-national engagement in pan-Arctic observing. The SAON Strategy 2018-2028⁶⁶ aims to create a roadmap to a well-integrated Arctic Observing System, and ensure sustainability of Arctic observing.⁶⁷

3.5.3 Regional data services

Although there is no official convention set up for the Arctic region, there are still several initiatives and data services in place for arctic marine data.

- The Arctic Regional Ocean Observing System (ROOS) serves as a platform where national agencies, research institutes, universities, and commercial entities collaborate to exchange information and collaboratively enhance the Arctic Ocean observing system. As a regional branch of the European Global Ocean Observing System (EuroGOOS), its primary aim is to align operational oceanography efforts across Europe⁶⁸.
- The Arctic Data Centre is a comprehensive data repository that serves as a centralized hub for Arctic research data. It is managed by the National Centre for Ecological Analysis and Synthesis (NCEAS) and supported by the National Science Foundation (NSF). The ADC stores a wide range of data related to the Arctic environment, including oceanographic data, ecosystem data, and climate data⁶⁹;

⁶⁴ <https://arctic-council.org/>

⁶⁵ <https://oaarchive.arctic-council.org/handle/11374/413>

⁶⁶ https://www.arcticobserving.org/images/pdf/Strategy_and_Implementation/SAON_Strategy_2018-2028_version_16MAY2018.pdf

⁶⁷ Source: <https://www.marineboard.eu/publications/report-initiatives-strategies-and-roadmaps-contribute-foresight-ocean-observation>

⁶⁸ EuroGOOS. Arctic ROOS. <https://eurogoos.eu/roos/arctic-roos/>

⁶⁹ National Center for Ecological Analysis and Synthesis. Arctic Data Center. <https://www.nceas.ucsb.edu/arctic-data-center/>

- The sustainable Arctic Observation Networks (SOAR) maintains information about Arctic observational data and observing assets. The information is available in a series of inventories/catalogues;
- The International Arctic Buoy Program (IABP) is a long-standing international initiative that deploys drifting buoys equipped with sensors in the Arctic Ocean. These buoys collect data on sea ice drift, atmospheric pressure, and other oceanographic parameters. The collected data are made available to the scientific community and the public, contributing to our understanding of sea ice dynamics and climate⁷⁰;
- The Arctic Science and Technology Information System is a database managed by the Arctic Institute of North America. It contains information on Arctic research projects, including oceanographic research, and provides access to scientific publications, reports, and datasets related to the Arctic region⁷¹;

4 Concluding remarks and recommendations

Joint monitoring programmes

The governance and operations of the Regional Sea Conventions (RSC) in European seas are different from each other, as they were agreed and signed for different purposes, in different periods and face different diplomatic realities, and as such, challenges and opportunities differ as well. In the section above, recommendations based on the feedback received are listed for each RSC included in this study.

RSC Contracting Parties (member states) have well established monitoring programmes providing the basis of their regional assessments. Joint and integrated monitoring consists mainly on the provision of guidelines, procedures and common indicators and tools at the level of the RSC, developed by the Contracting Parties and laid out by formal agreements. Some online tools for viewing planned monitoring activities exist (at RSC or national level), but in most cases, this information needs further digitalization and visualization efforts. All consulted RSC representatives agreed that efficiency could be improved in how Contracting Parties report on their monitoring programmes but formal agreements and approval (and resources) need to be sought for implementing new activities. An example of a successful practice to improve efficiency is the common agreement and interest to follow or align monitoring programmes to the objectives to achieve Good Environmental Status under the EU Marine Strategy Framework Directive. Collaboration between contracting parties for joint monitoring exist on certain areas, but not at high-strategic level (Contracting Parties meetings). RSCs play a role in helping these kinds of collaboration and in trying to find solutions to bottle-necks within the remit of the RSC.

There are thematic collaboration and data exchange efforts with other organizations and the RSCs (e.g. marine litter), and they are also aware of each other's technical groups' activities and progress. Currently there are no formal agreement for collaboration at strategic level – and high-level exchange occurs mainly during meetings with other global RSCs.

The main contact points for joint monitoring depends on specific topics (mostly covering the whole chain, from negotiations and dialogue with Contract Parties to review of assessments, etc.) so there are no specific contacts covering only joint monitoring for the RSC.

Marine data services and dataflow

The examination of various Regional Sea Conventions revealed the complex landscape of data repositories and services that contribute to the sustainable management of marine environments across the different European sea basins. The focus extended to key regional organizations, including OSPAR for the North-East

⁷⁰ University of Washington, Applied Physics Laboratory. International Arctic Buoy Program (IABP) Data.

<https://iabp.apl.uw.edu/data.html>

⁷¹ Arctic Institute of North America. (n.d.). Arctic Science and Technology Information System (ASTIS).

<https://www.aina.ucalgary.ca/astis/>

Atlantic, HELCOM for the Baltic Sea, the Black Sea Commission for the Black Sea, ICES as an intergovernmental marine science organization, and UNEP-MAP for the Mediterranean Sea region. Each organization brings unique approaches and challenges to marine data collection, management, and collaboration.

Most of the Regional Sea Conventions have several well-established data services. OSPAR relies on the OSPAR Data & Information Management System (ODIMS) as a central hub for accessing environmental data. Regular assessments and publications by the OSPAR Commission contribute to the understanding of the North-East Atlantic's state and health. HELCOM operates the HELCOM Map and Data Service (MADS), offering access to a wide range of spatial data and maps related to the Baltic Sea environment. HELCOM actively contributes to EMODnet, enhancing the pool of available information on diverse topics. While lacking a central data service, the Black Sea region utilizes the Odessa Pollution database as a focal point for data collection, receiving data from the Black Sea Regional Activity Centre for Pollution Monitoring and Assessment (RAC PMA) in Ukraine. Recommendations for collaboration with EMODnet Chemistry and expanding thematic areas aim to maximize data utilization and improve the accuracy of assessments. The ICES Data Centre manages a number of large dataset collections⁷² related to the marine environment that are made available to the public through the ICES Data Portal⁷³. These data portals are used to produce end products for ICES working groups. UNEP-MAP utilizes INFO/RAC as the main service for data collection and managing the IMAP Info System. Ongoing collaboration with EMODnet, particularly in Chemistry, involves efforts to expand thematic areas, enhance data sharing, and address interoperability challenges.

In conclusion, these Regional Sea Conventions and organizations play pivotal roles in data collection, management, and collaboration, contributing to marine assessments and decision-making processes. Challenges, including interoperability, data sharing, and thematic coverage remain but are actively addressed through recommendations for enhancing collaboration and expanding the incorporation of diverse datasets. The collective commitment to the sustainable management of marine environments is evident across different European seas.

5 Annex

Annexes have been removed from the published version of the deliverable.

⁷² Dataset Collections: <https://www.ices.dk/data/dataset-collections/Pages/default.aspx>

⁷³ ICES Data Portal: <https://data.ices.dk/view-map?area=35>