



European
Ocean
Observing
System

Operations Committee

European GOOS National Focal Points Survey: Funding and Coordination across Ocean Observing and Marine monitoring in Europe

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Executive summary

This report is an analysis of the survey responses provided by the Global Ocean Observing System (GOOS) National Focal Points for Europe on coordination and funding for ocean observing and marine monitoring from a national perspective across Europe. A total of 27 GOOS national focal points for Europe responded to a multiple-choice survey. We purposely distinguished between “marine monitoring” and “ocean observing” and defined them as follow:

Ocean observing: *“The sustained, coordinated and systematic collection and delivery of ocean data to a wide range of users across climate, forecast and hazard warnings, and ocean health applications, for example as coordinated under GOOS to support a diversity of stakeholders.”*

Marine monitoring: *“The regular, coordinated and systematic collection of ocean data undertaken at the request of a statutory agency for a specific purpose and against a defined end-point (or target). It is mostly done with the intent to aid in management by providing relevant information against predefined targets and thresholds that can trigger a management response (e.g. MSFD, Water Framework Directive, Common Fisheries Policy, Marine Spatial Planning Directive)“.*

Key findings:

Funding uncertainty for ocean observing and marine monitoring is broad, despite the benefits nations extract from ocean observations and statutory requirements from some of these activities.

Currently, national investment in ocean observing and marine monitoring is uncertain for the majority of the nations, and the funding structure is complex;

- National core government funds over 70% of marine monitoring but less than 50% of ocean observing.
- National research funds 15% of ocean observing, but it is not an important source for marine monitoring funding.
- The EU and international funding are an important source for 22% of ocean observing and 11% of marine monitoring.
- Only 48% of ocean health, 42% of ocean climate and 37% of operational services observations have access to medium (3-5 years) or long-term funding (6-10 years).
- There are no existing mechanisms to access long-term funding (6-10 years) for over 55% of marine monitoring and 63% of ocean observing.
- In cases where there is access to long-term funding, this is through legal instruments, as part of large-scale European research infrastructure or as part of long-term research programs

Drivers behind 65% of ocean health, ocean climate and operational services observations include policy, management, real-time decision making and statutory requirements. However, these vary by theme:

- Statutory requirements are the most prominent driver (25%) for ocean health observations.
- Research is the most significant driver (30%) for ocean climate observations.
- Real-time decision making and research are the largest drivers (23%) for operational service observations.

These drivers help explain why the different sectors invest in these thematic observations, with research investing primarily in ocean climate and national core government investing mainly in ocean health. Nevertheless, despite the legal requirements for marine monitoring observations, particularly for ocean health, it does not guarantee long-term funding in most nations.

The importance of ocean observations needs to be recognised by the different sectors to secure long-term funding. Overall, there seems to be low awareness by the general public, industry and government in most nations. By contrast, policymakers (i.e., resource/environmental managers) appear to be aware of their importance.

Regional trends are also evident with these four sectors around the Baltic Sea and most nations in the North West Shelf recognising the importance of ocean observing, but not in countries around the Mediterranean Sea.

There is some coordination at a pan-European scale; however, fragmentation increases nationally where the complexity in the ocean observing and marine monitoring landscape is intricate.

- Approximately 4-10 organisations undertake ocean observing in 52% of the nations surveyed, and over 10 organisations in 11%.
- Approximately, 4-10 organisations undertake marine monitoring in 52% of the nations, and over 10 organisations in 4%
- National government is the largest participant in marine monitoring (46%) while research and education are the largest participant in ocean observing (44%).

Nevertheless, there are encouraging signs in national coordination and information sharing in ocean observing and marine monitoring within and between nations.

One way to measure the level of information shared by nations is looking at data availability, and most nations make their data publicly available, except for a few. [EMODnet](#) is the most broadly used data aggregator and National Oceanographic Data Centres are the second most preferred data aggregators.

This report provides some insights into the state of play of national ocean observing and marine monitoring. Recommendations were formulated at the first [EOOS Operations Committee](#) meeting, and many are relevant concerning this report to improve coordination and funding sustainability of ocean observing and marine monitoring.

Long-term funding:

- Learning from ERICs and other national committees about pre-conditions (requirements) for setting up sustained resources.
- Bespoke communication outlining the societal benefits of ocean observing at global to local level and articulating the potential risks from losing these capabilities. Examples of success stories and benefits that sustained infrastructure.
- Use existing initiatives ([UN Ocean Decade](#) and [EC ocean observing initiative](#)) to advocate for sustained funding in ocean observing, including the imperative to do it now.

Coordination:

- Creation of National Committees that bring multiple sectors and stakeholders together to define requirements, improve coordination and development of national observing systems, including the advocacy for sustained funding for ocean observing.
- Opportunities for information exchange (learning and sharing) across nations, sectors (monitoring-research-industry), infrastructures and networks to identify commonalities and opportunities to improve the efficiency of ocean observing activities through cooperation.

Introduction to EOOS and the survey motivation

Sustained ocean observing is fundamental to managing our oceans underpinning the scientific knowledge needed to support decision-making and deliver the information and services essential for our wellbeing. The ocean observing landscape in Europe is complex, with multiple organisations, sectors and stakeholders participating in ocean observing to address different needs. Significant investment has been made in ocean observing infrastructure by European nations to deliver operational services, support and progress research, innovation, data management and technology development. However, many of these investments are short to medium term and limited in scope, geography or community focus. Nevertheless, connections and partnerships at all levels have been created, albeit in an ad hoc manner, to understand the different aspects of our oceans and to serve different purposes such as ocean research and policy-driven monitoring ([Muñiz Piniella & Heymans, 2020](#)). Therefore, existing partnerships and communities must be supported, reinforced, and brought together in a more cohesive and coordinated manner to develop an integrated fit-for-purpose European ocean observing system.

Even though ocean observing occurs at national, regional, continental and international scales, it remains the responsibility of individual nations and responds to various priorities and interests ranging from operational oceanography, research, environmental assessments and blue economy, among others ([Mackenzie et al., 2019](#), [Muniz Piniella and Heymans, 2020](#)). To improve cross-border collaboration, leverage existing coordination structures, and foster and strengthen integration, we need to understand how each nation coordinates, integrates and invests in ocean observing. Importantly, this will allow us to identify specific activities that we could undertake to promote long-term investment and improve collaboration.

To that end, the European Ocean Observing System ([EOOS](#)) was established as a coordinating framework focused on connecting the full diversity of European ocean observing and monitoring. The framework promotes systematic and collaborative ocean observing to understand the state and variability of our oceans. It seeks to align and integrate European in-situ ocean observing by connecting capabilities, services and stakeholders. Moreover, through better coordination, EOOS aims to highlight opportunities for synergy to maximise the value and benefits of a coordinated ocean observing system for Europe and help secure long-term financial investment in ocean observing.

The recently established Operations Committee is one of the EOOS governance structures set up to assist in implementing it. Through its membership, EOOS builds on the experience provided by coordination groups such as [EuroGOOS](#), [ROOS](#) and [Task Teams](#), European ocean observing infrastructure and earth observation agencies. It also connects EOOS with individual nations via the Global Ocean Observing System (GOOS) National Focal Points for Europe.

The GOOS National Focal Points are nominated via one of three channels: IOC National Focal Point, Ministry of Foreign Affairs or Permanent Delegation to UNESCO – see [here](#). Their remit is:

- To promote the work of GOOS, publicise opportunities for engagement, and advocate for investment in sustained ocean observing system activities at a national level.
- To report to IOC on the status of national ocean observing system activities that contribute to GOOS.
- To promote regional and national coordinated strategies for implementing a sustained ocean observing system that delivers information to a range of users, including suggesting pilot projects, and ensuring that national needs and gaps are brought to the GOOS programme's attention.

The GOOS National Focal Points are the appropriate contact points in each Member State for affairs regarding the GOOS implementation at national and global levels. An initial request for nominations for GOOS National Focal Points was made via IOC Circular [Letter 2666](#) sent on 1 June 2017. Other nominations have been made as contacts change, or for example, EOOS highlighting the need for focal points in particular nations.

A starting point to help the EOOS Operations Committee work is understanding the current status of ocean observing, including coordination status, drivers, focus and investment in each nation. This will enable us to identify where coordination and collaboration can be improved and potential weak points.

Methods

GOOS National Focal Points for Europe that are members of the EOOS Operations Committee, were surveyed to collect information about national ocean observing and marine monitoring activities.

The survey was conducted online in September 2020 and encompassed 59 questions (see Appendix), most of which were multiple-choice, to get information on:

- Funding sustainability
- Drivers and focus
- Level of integration in their ocean observing and marine monitoring activities
- Main organisations undertaking these activities
- Data sharing and data management practices

For this survey, we distinguished “marine monitoring” and “ocean observing” as two distinct activities as defined below:

Ocean observing: “The sustained, coordinated and systematic collection and delivery of ocean data to a wide range of users across climate, forecast and hazard warnings, and ocean health applications, for example as coordinated under GOOS to support a diversity of stakeholders.”

Marine monitoring: “The regular, coordinated and systematic collection of ocean data undertaken at the request of a statutory agency for a specific purpose and against a defined end-point (or target). It is mostly done with the intent to aid in management by providing relevant information against predefined targets and thresholds that can trigger a management response (e.g. MSFD, Water Framework Directive, Common Fisheries Policy, Marine Spatial Planning Directive).”

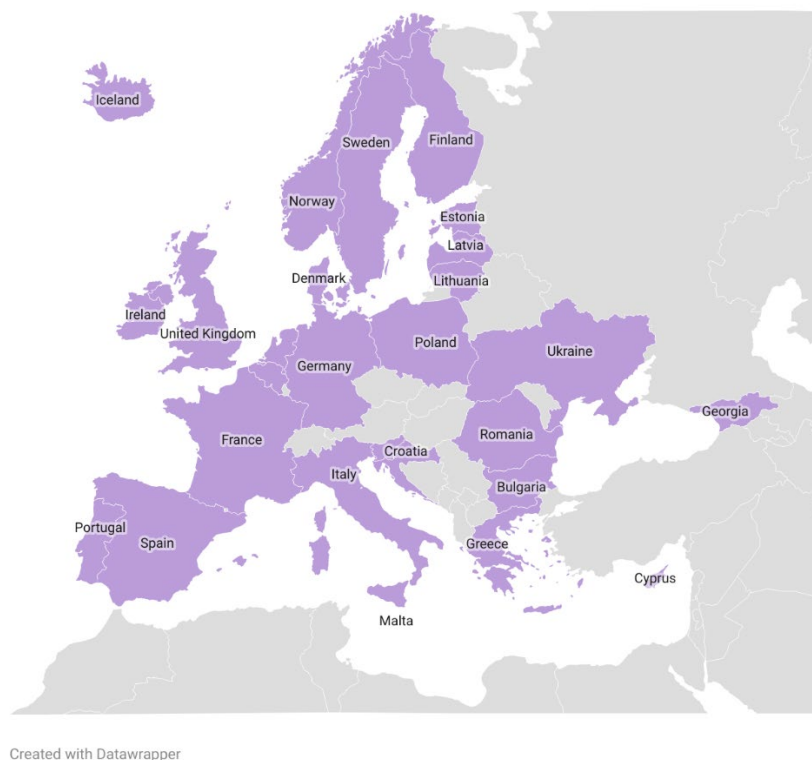


Figure 1. GOOS National Focal Points from European nations that responded to the survey in purple. All other countries in grey did not participate in the survey when the report was prepared.

A total of 27 GOOS National Focal Points for Europe responded to the survey (Fig.1). Their responses reflect their perspective and understanding about the current state of ocean observing and marine

monitoring in their countries, based on their experience and knowledge. In some cases, National Focal Points submitted revised responses after discussing with relevant national organisations.

The survey's key findings are summarised in the following sections, and the funding structure, sectors, drivers, and thematic focus derived from individual National Focal Point's responses are included as an Annex.

Funding: structure, source, and sustainability

Ocean observing and marine monitoring in Europe are driven by the needs and requirements specific to each nation. If we look at the sectors that invest in these activities and the focus and drivers behind them, we can draw a picture of what motivates countries to undertake ocean observing and marine monitoring and how they support these activities through investment. This picture can provide clues about what could and should be done to improve coordination and investment in European ocean observing and marine monitoring.

Table 1. ^Funding ministries

Color coding: Blue funds only ocean observing, green funds only marine monitoring, purple funds both. Countries in red denote government does not fund ocean observing and orange denotes government does not fund ocean observing or marine monitoring.* denotes a mix of federal/regional funding. # Only two nations have dedicated national ocean ministries

Country	DEVELOPMENT/ ECONOMY	ENVIRONMENT	SCIENCE AND EDUCATION	ARGRICULTURE / FISHERY	DEFENCE	#OCEAN	FOREIGN AFFAIRS	ENERGY	TRANSPORT	OTHER
Belgium*	Blue	Green	Blue	Green						Blue
Bulgaria			Blue	Green						
Croatia	Green	Purple	Blue	Green						
Cyprus		Green	Green							
Denmark		Purple	Purple					Purple		
Estonia	Blue	Purple	Blue	Purple						Purple
Finland		Purple							Purple	
France		Purple	Purple		Purple	Purple				
Georgia	Green	Green								
Germany	Purple	Blue	Purple						Purple	
Greece	Purple	Purple	Blue							
Ireland	Blue	Green		Blue						Blue
Iceland		Purple		Purple					Blue	
Italy	Blue	Green	Blue	Purple	Purple				Blue	Green
Latvia		Purple	Purple		Purple					
Lithuania		Purple	Blue	Purple						
Malta										
Netherlands			Blue	Purple	Purple					Purple
Norway	Purple	Purple	Purple	Purple	Purple		Purple	Purple		Purple
Poland		Green	Blue							Green
Portugal		Purple	Purple		Purple	Purple				
Romania	Blue	Purple	Blue	Purple						
Slovenia		Purple	Purple							
Spain*		Green	Purple	Purple					Blue	
Sweden		Purple								Purple
Ukraine			Blue							
United Kingdom*	Purple	Purple	Blue							Purple

*The table shows the number of ministries that provide some funding for marine monitoring and ocean observing. It does not include information about long-term investment. National ministries were grouped into overarching categories that fitted their description. However, for some nations ministries may straddle more than one category and this table should be taken as indicative only.
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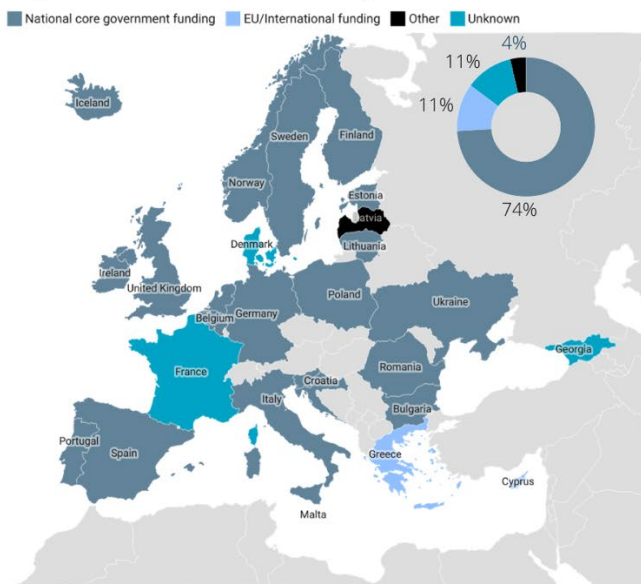
Key findings – structure

The national funding structure for ocean observing and marine monitoring in many countries is intricate, with multiple sectors, including government, private industry, research, and international organisations, participating and funding these activities. This complexity is also reflected at a government level, where more than one ministry is responsible for financing different elements of ocean observing and/or marine monitoring in most nations, potentially related to their specific mandate. For example, ministries with a mandate in science and education fund mostly ocean observing, while those with ministerial mandates in the environment and primary industries are more likely to fund marine monitoring to aid management and meet statutory requirements (Table 1). Of the 27 GOOS National Focal Points that responded to the survey, only two indicated their countries fund ocean observing and marine monitoring through one ministry, Bulgaria and Poland. Georgia and Cyprus's governments do not invest in ocean observing, and Malta's government does not invest in either (Table 1).

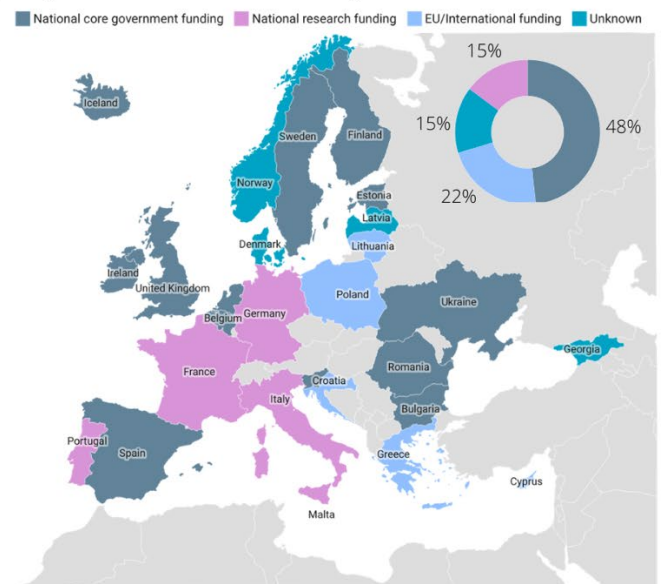
Key findings – source

When comparing ocean observing and marine monitoring investment, differences become apparent. National core government funds over 70% of marine monitoring in Europe, but less than 50% of ocean observing (Figure 2a & b). Another important difference is national research's role as a major funding source for 15% of ocean observing while having no prominent role as a major funder for marine monitoring. Also of note is the role of the EU and international organisations as a funding source, particularly for ocean observing, representing a major funding source for 22% of ocean observing and 11% of marine monitoring.

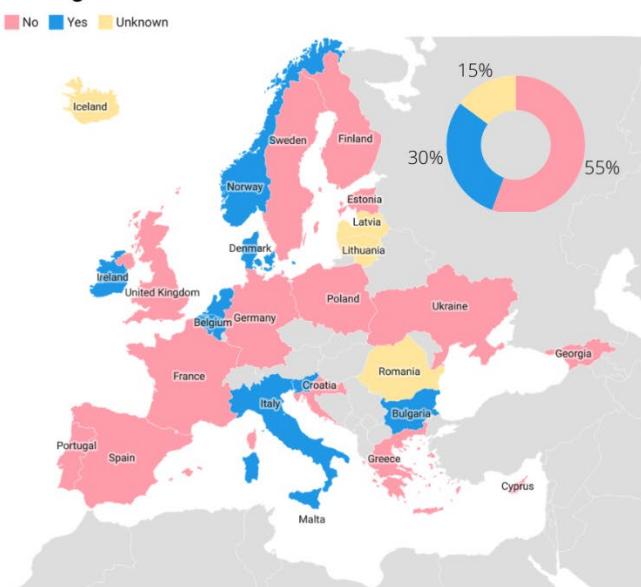
a) Major funder for marine monitoring



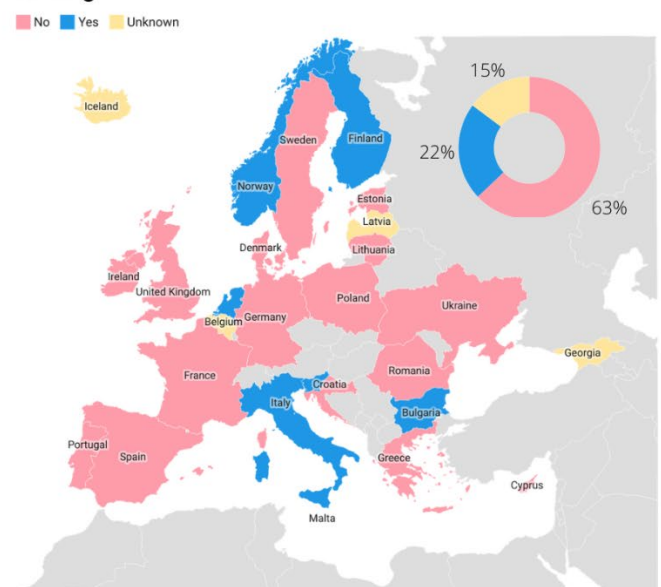
b) Major funder for ocean observing



c) Mechanisms for marine monitoring long-term (6-10 years) funding



d) Mechanisms for ocean observing long-term (6-10 years) funding



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Figure 2. Funding in Europe showing major funders for a) marine monitoring and b) ocean observing, and available long-term funding mechanisms for c) marine monitoring and d) ocean observing.

Investment in either ocean observing, or marine monitoring may reflect national structure and/or their specific interest, focus and drivers. For example, marine monitoring alone covers 45% of ocean health observations but less than 20% of ocean climate and operational services observations. By contrast, ocean observing alone covers 22% of ocean climate and 18% of operational services but no ocean health observations (Fig. 3 a, d & g). If we look at the drivers behind thematic data

collection, the first thing to note is that policy, management, and statutory requirements drive over 60% of ocean health observations, with statutory requirements as the largest driver (25%). On the other hand, research is the most significant driver for ocean climate observations (30%) and real-time decision making and research (23%) for operational service observations (Fig 3 c, f & i). These drivers may explain investment in these thematic observations by the different sectors, with research investing primarily in ocean climate (Fig. 3 b, e & h). It also illustrates the role that national research funds play in ocean observing (Fig. 2 b).

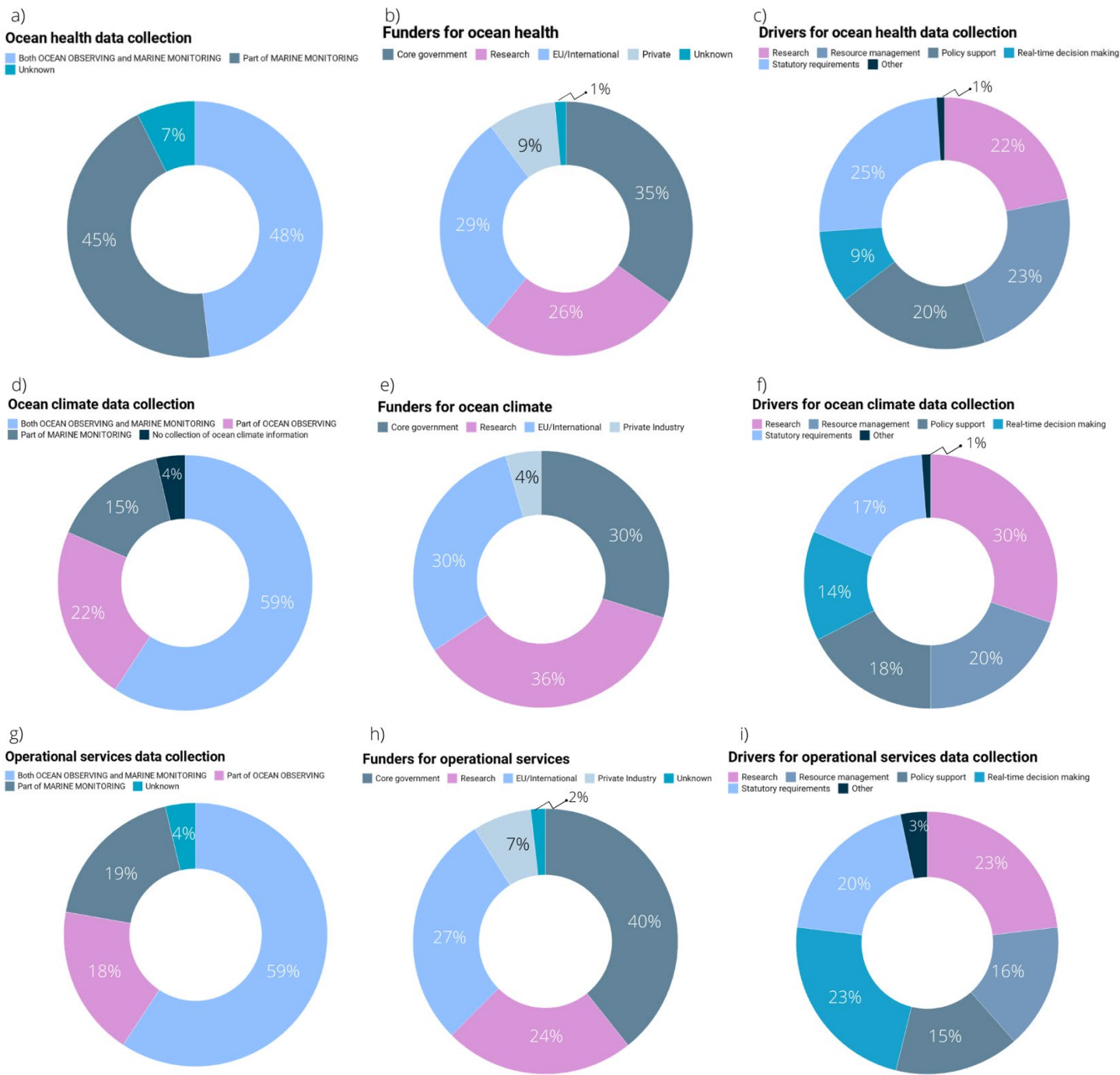


Figure 3. Thematic observations collected as part of ocean observing (pink), marine monitoring (dark grey) or both (light blue) (a, d & g), funding source from core government (dark grey), research (pink), EU/International (light blue), private industry (light grey) (b, e & h), and drivers such as research (pink), resource management (lighter grey), real-time decision making (dark blue) and statutory requirements (light blue) (c, f & i).

Key findings – sustainability

Over 50% of countries have no access to long-term (6-10 years) funding for marine monitoring and over 60% for ocean observing (Fig. 2 c & d). This means that despite having statutory requirements as a major driver for marine monitoring, particularly for ocean health, there is no guaranteed long-

term funding for these activities. Moreover, many of the drivers behind both ocean observing and marine monitoring underpin important economic, safety, and societal benefit aspects such as managing resources, real-time decision-making, and policy.

For those countries with access to long-term funding, mechanisms include:

- Activities classified as part of large-scale European research infrastructure.
- Forming part of long-term research programs or projects.
- Existence of a legal instrument requiring their funding (e.g., Legal Act), this is particularly the case for marine monitoring.
- Designation as part of a national road map for research infrastructure.

There is some uncertainty about medium (3-5 years) to long-term (6-10 years) investment for ocean health, ocean climate and operational services observations, with less than 50% of these activities having access to medium and/or long-term funding (Fig. 4). Of note is that only 37% of operational services have access to medium and/or long-term funding despite providing observations essential for search and rescue, maritime activities, and other important services, and is primarily funded by government (Fig. 4c).

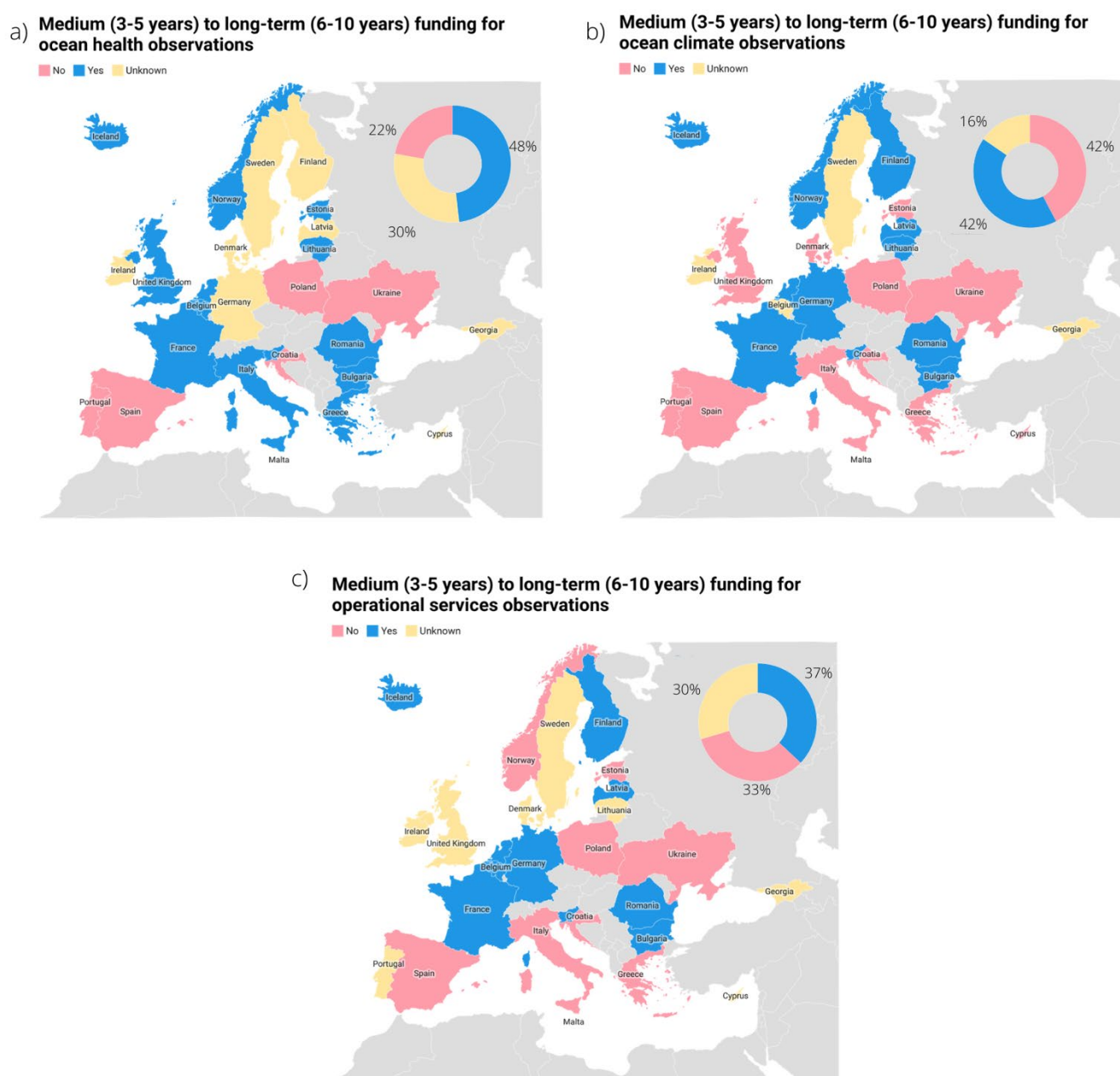


Figure 4. National access to medium to long-term investment by thematic focus; a) ocean health, b) ocean climate, and c) operational services. The overall proportion is shown in the top right corner

The lack of certainty around funding, and in some cases medium-term (thematic observations), for marine monitoring and ocean observing has previously been noted. The Copernicus Sustainability Survey for in situ observing networks (2019) found 53% of in situ ocean observing networks facing financial problems and 9% facing severe problems in the short-term.

Unfortunately, uncertain funding for ocean observations (including marine monitoring) is not unique to Europe; it is ubiquitous to ocean science. The recently published Global Ocean Science Report 2020 found that despite the importance of ocean science to society, its funding is largely inadequate, with only ~ 1.7% of national research budgets allocated to ocean science. A small proportion compared to the benefits we extract from the ocean (IOC-UNESCO, 2020). Ocean observations deliver essential services, and we need to raise the profile of the role ocean observations play in providing services on which we depend and the consequences of losing them.

The importance of ocean observing

The trends from this analysis reflect the opinion of the National Focal Points, based on their knowledge and experience, and should be interpreted as such.

Key findings

Securing long-term funding is likely influenced by the level of awareness key stakeholders have concerning ocean observing, e.g. their understanding of the importance of ocean observing for the services they need.

Overall, the perceived importance of ocean observing to the general public, industry and government is average to low, particularly for industry. By contrast, importance to policymakers is higher, generally with rates from average to very high (Fig. 5).

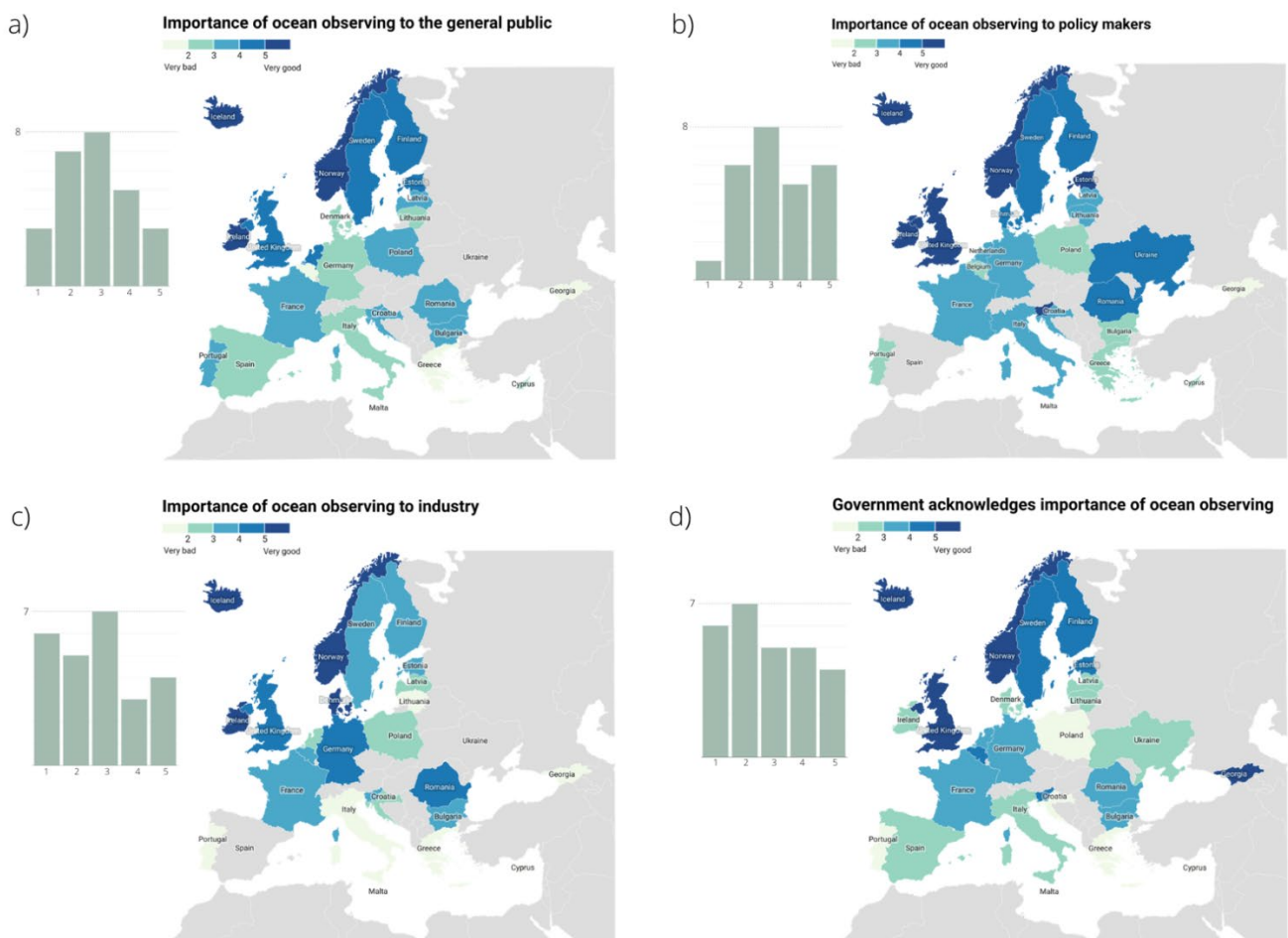


Figure 5. Perceived importance of ocean observing to different sectors: a) general public, b) policymakers, c) private industry and d) government. The maps show the rating from 1 (very bad, white) to 5 (very good, dark blue) that each National Focal Point gave to their nation. The bars represent the overall rating, grey signifies no response.

These perceived attitudes also show regional trends, with policymakers, the general public and government around the Baltic Sea and most nations in the North West Shelf recognising the importance of ocean observing. However, nations around the Mediterranean Sea rated this as average to bad, particularly for industry and government (Fig. 5a & d). Understanding how countries with high sector awareness like the UK, Iceland, Slovenia, and Norway have engaged this awareness level could give insight into how to improve this in other regions.

In the case of Norway and Slovenia, this may have translated in ocean observing and marine monitoring long-term investment, but not in the UK (Fig. 2 c & d). Ireland is a notable case where despite industry, policymakers and the general public recognising the importance of ocean observing, this isn't fully acknowledged by the government and access to long-term funding for ocean observing does not exist, although it does for marine monitoring. Italy is another nation to note, with access to long-term investment in ocean observations despite none of the sectors acknowledging the importance of ocean observing. They have achieved this by classifying ocean observing as national or institutional infrastructure to get investment through regular government funds. Understanding the reasons behind these differences may help discern what drives long-term funding.

The information provided by the European GOOS National Focal Points about the perceived attitudes from the different sectors towards ocean observing in their country, while subjective, provides valuable information that can enable us to identify examples of nations that are successful in attracting long-term funding for analysis. This need to be accompanied by an understanding of each nation's specific requirements, the services and products derived from ocean observing, and how well is ocean observing coordinated within and between nations.

Integration and coordination

The ocean observing landscape in Europe is complex and diverse, with many organisations and stakeholders from multiple sectors participating in these activities. There is already some level of coordination, mainly specific to one region or infrastructure. At a pan-European scale, ocean observing research infrastructures are coordinated through European Research Infrastructure Consortia (ERIC) and initiatives like JERICO, European Network of Marine Stations, European Research Vessels Operators and EuroGOOS Task Teams. Regionally EuroGOOS Regional Operational Oceanographic Systems represent basin-scale coordinating bodies with an operational oceanography focus. However, national coordination and integration of ocean observing and marine monitoring are more fragmented, likely related to the number of organisations and sectors that participate in them, e.g. the higher the number of organisations, the harder it is to coordinate.

Key findings – types or organisations involved

Nationally, approximately 4-10 organisations undertake ocean observing in 52% of the nations surveyed, and over 10 organisations in 11% of the nations. Similarly, 4-10 organisations undertake marine monitoring in 52% of the nations, but only 4% of the nations with over 10 organisations performing marine monitoring (Fig. 6 a & b). Breaking these into sectors, the national government is the largest participant in marine monitoring (46%), and research and education are the largest in ocean observing (44%) (Fig. 6 c & d). This suggests that statutory requirements drive government participation in marine monitoring while research drives most ocean observing. This is consistent with the finding regarding funding, as reflected in the funding structure for both ocean observing and marine monitoring, as discussed previously.

Key findings – coordination

An ocean observation can serve many purposes, it can be used to make decisions in real-time and predict the weather, or it can be used for research and process understanding or environmental reporting. However, coordination is essential to make efficient use of ocean observations for as many purposes as possible. Looking at the level of national coordination between ocean observing

and marine monitoring and how this information is shared nationally enable us to identify weak points where improvements could be made.

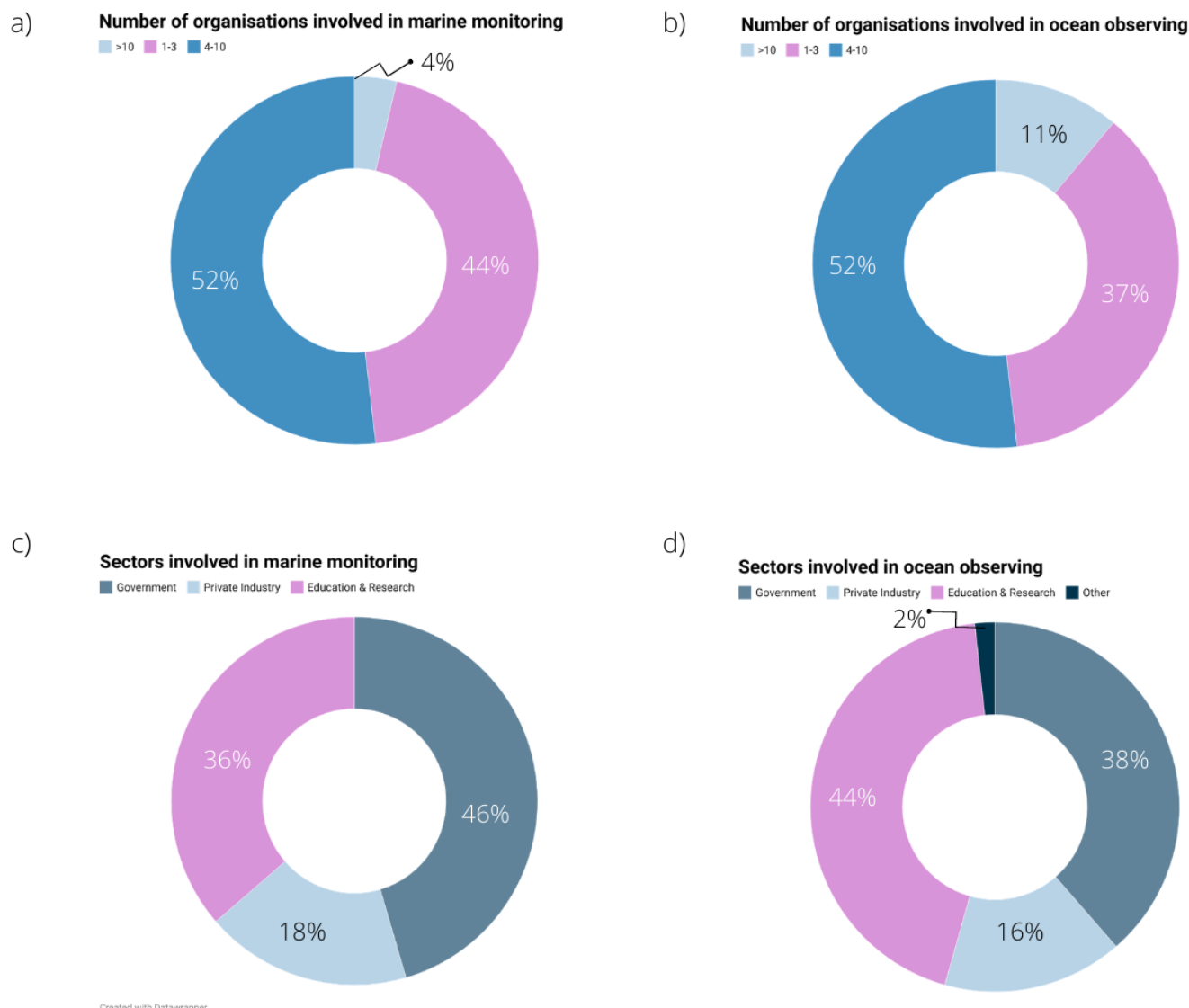


Figure 6. Number and type of organisations participating in ocean observing (a & c) and marine monitoring (b & d) at the national level.

The perceived level of national coordination between both marine monitoring and ocean observing varies from nation to nation, with most nations rating it average and with no evident regional trends. However, it is encouraging to see that some level of national coordination between ocean observing and marine monitoring exists according to the National Focal Points' knowledge (Fig. 7a).

By contrast, coordination of different marine monitoring activities (e.g. environmental monitoring and fisheries) is perceived as averaged to low by most nations, and regional trends become evident, with the Black Sea countries outperforming all other regions rating marine monitoring coordination average to very high (Fig. 7b).

Information sharing about ocean observations and marine monitoring within each nation is good for the most part, although sharing of ocean observing information nationally is slightly better than marine monitoring (Fig. 7 c & d). Efforts to improve information sharing at a national scale could help improve coordination.

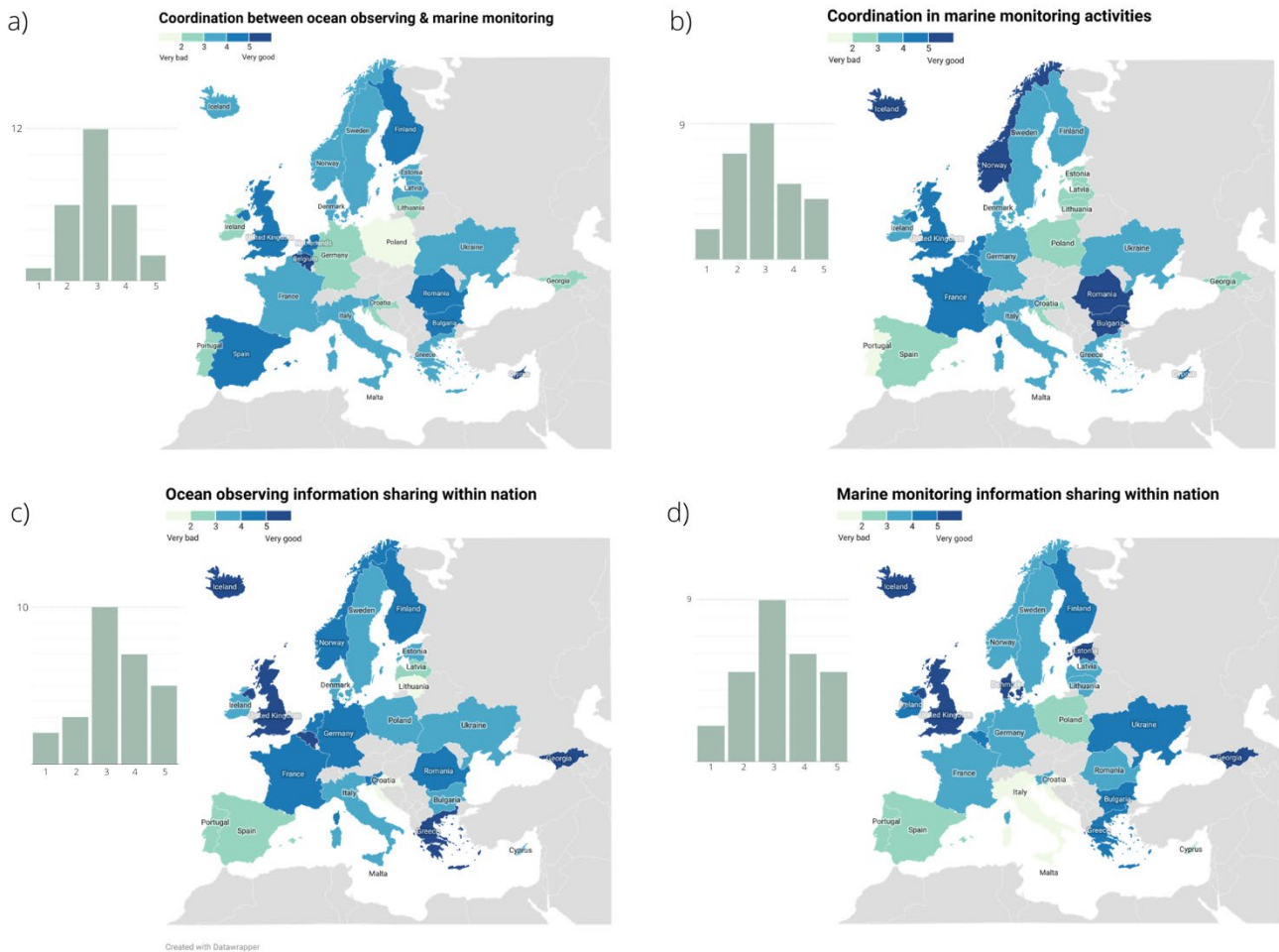


Figure 7. Level of national coordination of ocean observing and marine monitoring activities (a & b) and information sharing (c & d). The maps show the rating from 1 (very bad, white) to 5 (very good, dark blue) that each National Focal Point gave to their nation. The bars represent the overall rating.

Cooperation, collaboration, and information sharing of ocean observing between countries is good except for a few countries (Fig. 8a & b). This is also the case for marine monitoring with most nations rating information sharing with neighbouring nations as good to very good (Fig. 8c). Notably, when we compare coordination within and between nations, it is national coordination that needs strengthening, particularly in marine monitoring.

This survey provides only an initial look at national coordination in ocean observing and marine monitoring, based on the respondents' knowledge. Nevertheless, this information is useful to identify where additional work could help to connect different communities and improve coordination and collaboration.

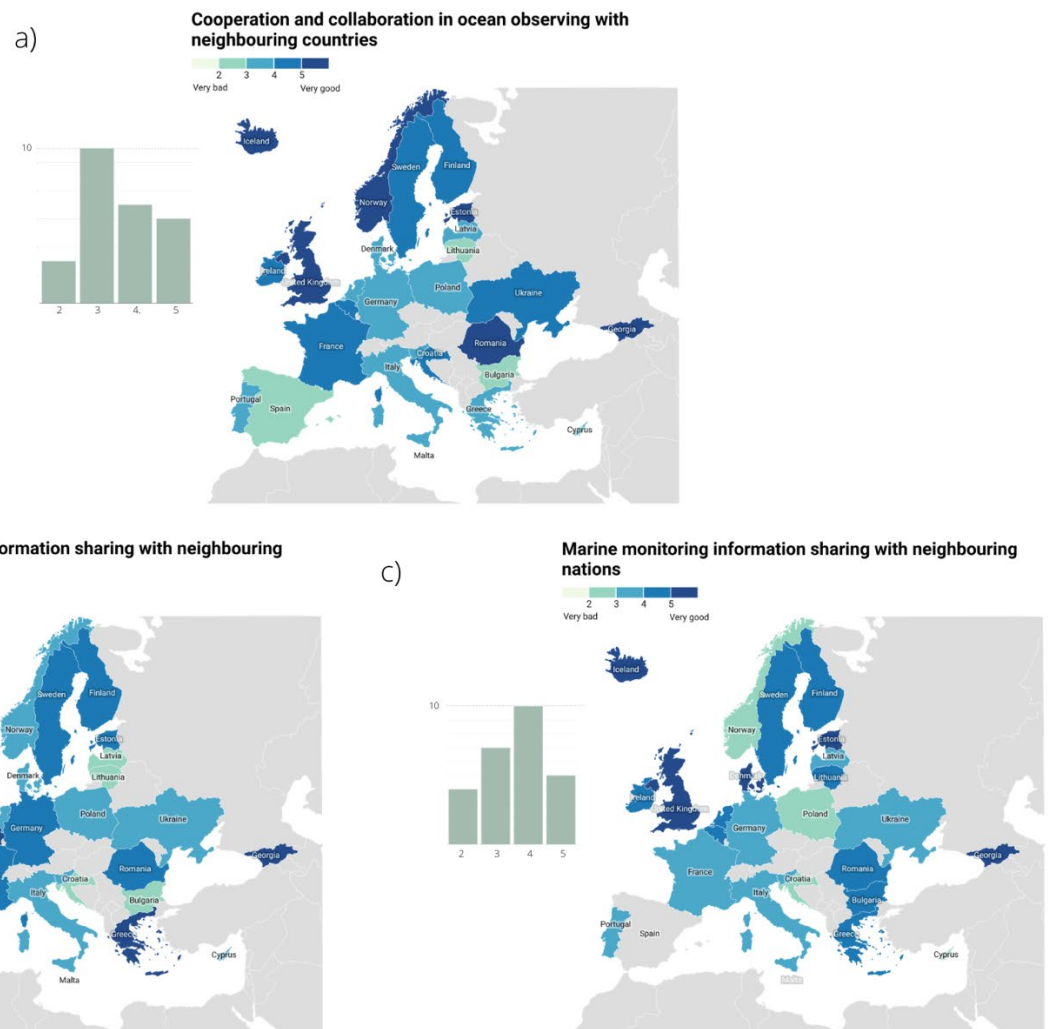


Figure 8. Ocean observing coordination and collaboration with neighbouring nations (a) and information sharing of ocean observing and marine monitoring with neighbouring nations (b & c). The maps show the rating from 1 (very bad, white) to 5 (very good, dark blue) that each National Focal Point gave to their nation. The bars represent the overall rating, grey signifies no response.

Data availability

Publicly available and easily discoverable data is paramount and fundamental in ocean observing to enable analyses, applications and services. Indeed, it is the main legacy of ocean observing, providing the basis to assess the state of our oceans and to shape and develop policies to use and manage them sustainably now and in the future.

Data needs to be made available unrestricted, free, and on time to integrate, analyse and use ocean observations for different purposes. Many challenges exist associated with good management of ocean data, such as using different formats, wide diversity of data sets, disparate data management structures, among others ([Tanhua et al., 2019](#)). However, to tackle these issues, first and foremost, nations need to share data and information in an open and an easily discoverable way.

Data centres have been developed regionally and globally for many decades, not only as data repositories but also as service providers ([Bourtzis, 2015](#)). National Oceanographic Data Centres and specialised repositories are the most common form, providing services to marine scientists and other ocean practitioners.

Key findings – data availability

Most nations make ocean observing data publicly available, although there are still some nations that don't. Of note is Norway which, despite having access to medium to long-term funding, good engagement from industry, policymakers and the general public, well-coordinated activities, and FAIR data management, it falls short in sharing information and making data publicly available at national or international databases (Fig 9 b & c). This issue is not unique to Norway, with several other nations not making all their data publicly available. Understanding the underlying issues that stop nations from making their data available is essential to improve access.

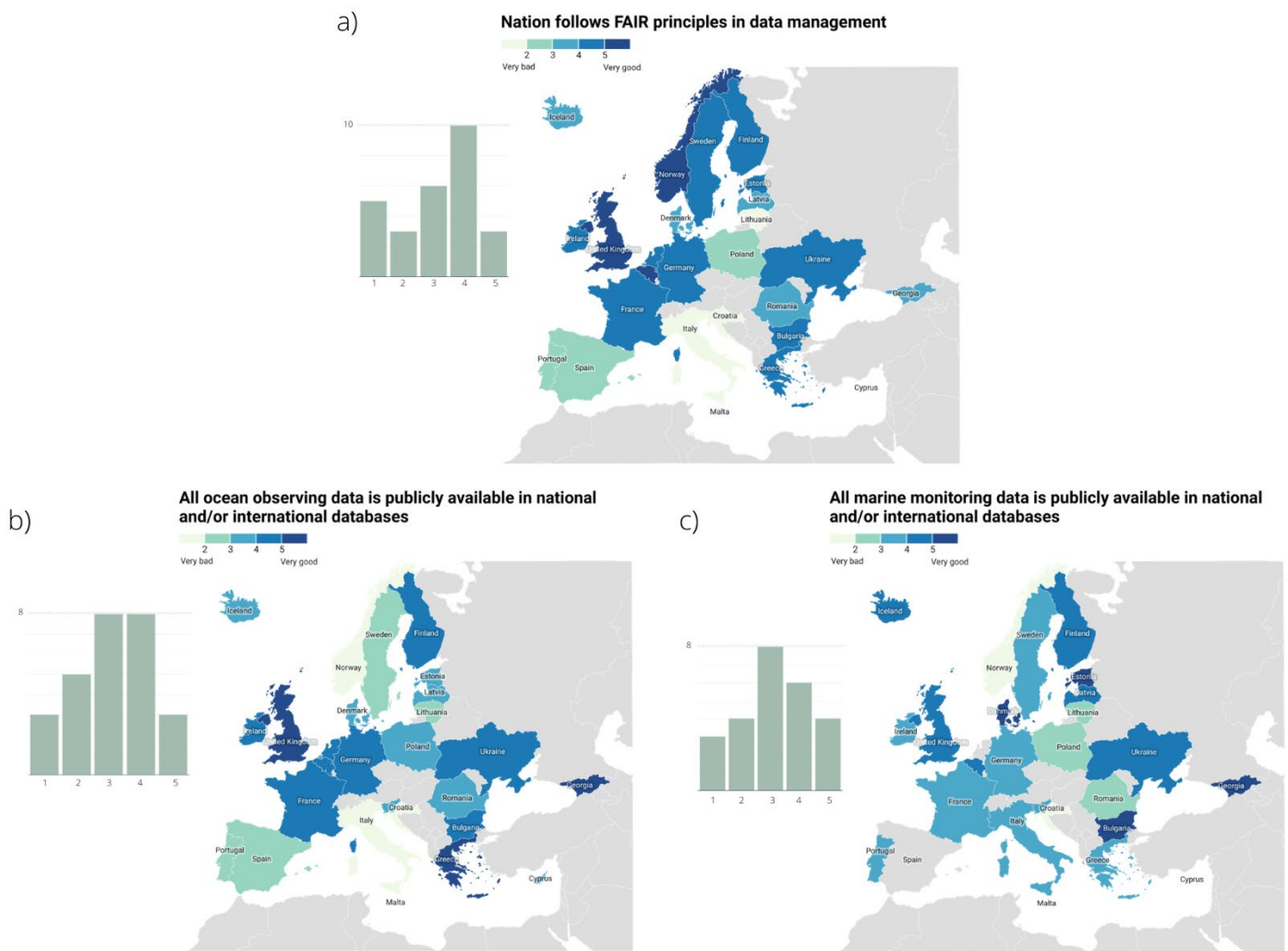


Figure 9. Data management (a) and data availability by country for ocean observing (b) and marine monitoring (c). The maps show the rating from 1 (very bad, white) to 5 (very good, dark blue) that each National Focal Point gave to their nation. The bars represent the overall rating, grey signifies no response.

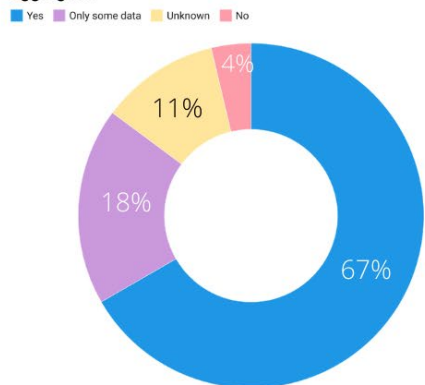
Over 80% of the nations share all or some of the data through data centres, particularly for ocean climate (Fig. 10).

Depending on the nation and the thematic focus, data is made available through different data centres. Overall, [EMODnet](#) is indicated as a primary European data aggregator, used broadly across all themes. [SeaDataNet](#) and national data centres followed in importance for ocean health and ocean climate data, with [ICES](#) also receiving around 15% of these data. [CMEMS](#), EMODnet and national data centres are used equally for operational services (Fig 10).

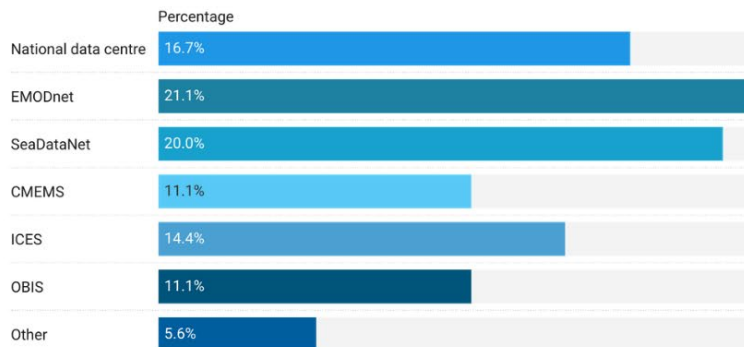
While publicly available data is essential, with many organisations now requesting open data, better consistency among nations in using data aggregators can improve data discoverability, access

and usability. It is encouraging to see the broad use of data aggregators such as EMODnet as a data repository. It would be beneficial for European data aggregators to coordinate to ensure data can be provided in a harmonised and standardise way and interoperability of their systems. Many of the nations surveyed follow the FAIR principles in data management, but there are still improvements needed in this space.

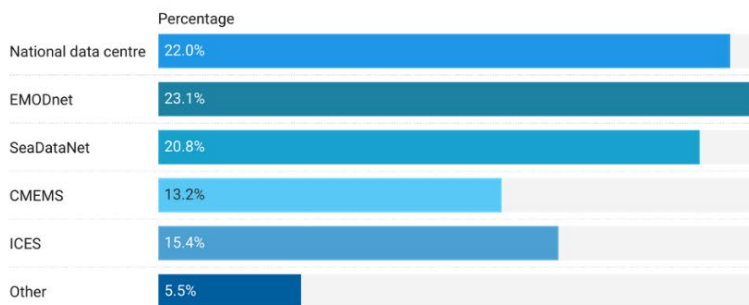
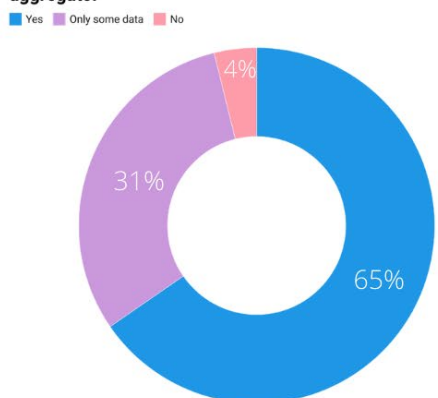
Ocean health data provision to thematic regional data aggregator



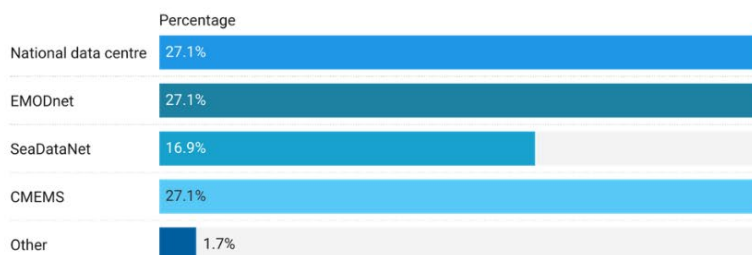
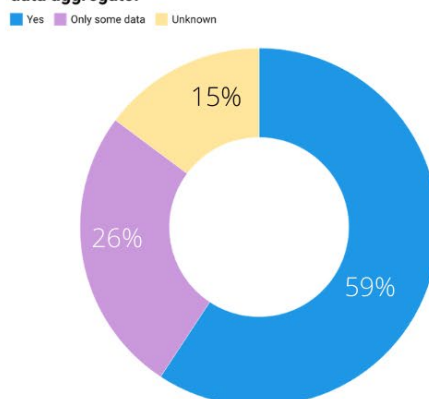
Aggregator



Ocean climate data provision to thematic regional data aggregator



Operational services data provision to thematic regional data aggregator



Created with Datawrapper

Figure 10. Data provision to different data centres by theme.

Conclusions and recommendations

Insights have been gained from this survey about the state of play of ocean observing at a national scale concerning funding, coordination between marine monitoring and ocean observing, perception of value and data availability.

Funding uncertainty beyond short-term (1-2 years) for ocean observing and marine monitoring is broad, despite existing statutory requirements and the benefits nations extract from ocean observations for policy and decision making, managing resources and real-time ocean services. This lack of long-term funding for ocean observations is starting to mobilise the European Commission, which recently undertook public consultation to gauge the need for a more sustained and better coordinated ocean observing in Europe. The potential outcome may improve the currently fractured approach to ocean observing and uncertain funding outlook in Europe.

A low awareness level by the many sectors that benefit from these observations, such as the general public, private industry and in some cases, the government, could be one of the issues. Although, as shown in the Baltic and North West Shelf, where sectors are highly aware of the value of ocean observing and marine monitoring, this does not always translate into long-term funding. Therefore, there may be other issues at play. Another problem could be that ocean observing, particularly in climate and operational services, is mostly dependent on research funding, which is usually linked to short-term cycles.

Where mechanisms exist, these are in the form of long-term planning by governments, legal instruments or forming part of large-scale infrastructure programs, e.g. European Research Infrastructure Consortia. To create a shift towards greater long-term funding, perhaps nations could be convinced to consider that ocean observations are a long-term infrastructure commitment. Awareness needs to be raised about the role ocean observations play in providing essential services, the benefits we extract from them and the risks of losing these capabilities. Demonstrating that we can increase the efficiency of ocean observing and marine monitoring through improved coordination and collaboration could boost the prospects of long-term funding and lower the costs.

The ocean observing and marine monitoring landscape is complex, with many sectors and organisations participating and making it challenging to coordinate. Furthermore, most national governments have an extra layer of complexity, where several ministries are involved in (and fund) marine monitoring and ocean observing. The drivers that motivate the many participants are multiple, from statutory requirements (primarily for marine monitoring) to research and real-time decision making (mostly ocean observing). However, how these sectors connect, share information, and coordinate activities are key to understanding the existing coordination level. To have a cohesive ocean observing system, work is required on a national scale to connect infrastructure, national governments and sectors to improve ocean observing in Europe.

Crucial to an integrated ocean observing system is information sharing, which is average to good and requires improvement. Another measure of information sharing is data availability, and the majority of the nations provide all or some of their data to national data centres or thematic data aggregators, with EMODnet as the most consistently used.

A series of recommendations were formulated at the first EOOS Operations Committee meeting that offer insight into possible lines of action to respond to the gaps indicated by this survey and are included below.

Long-term funding:

- Learning from ERICs and other national committees about pre-conditions (requirements) for setting up sustained resources.

- Bespoke communication outlining the societal benefits of ocean observing at global to local level and articulating the potential risks from losing these capabilities. Examples of success stories and benefits that sustained infrastructure.
- Use existing initiatives ([UN Decade](#) and [EC ocean observing initiative](#)) to advocate for sustained funding in ocean observing, including the imperative to do it now.

Coordination:

- Creation of National Committees that bring multiple sectors and stakeholders together to define requirements, improve coordination and development of national observing systems, including the advocacy for sustained funding for ocean observing.
- Opportunities for information exchange (learning and sharing) across nations, sectors (monitoring-research-industry), infrastructures and networks to identify commonalities and opportunities to improve the efficiency of ocean observing activities through cooperation.

This report provides an initial snapshot of the state of play of national ocean observing and marine monitoring, and it is a good starting point of the EOOS Operations Committee work.

The membership of the committee benefits from the expertise and experience provided by existing coordinating groups and infrastructures to understand the pre-conditions to attain long-term funding.

Raising the profile of the importance of ocean observing, particularly in the sectors where awareness has been identified as low will require tailored communication. The committee should outline the communication needs to EOOS and GOOS to enable them to create materials that can help raise awareness in their nations and with different sectors.

Some nations have established National Committees and others are in the process of establishing one. Understanding the process these nations have undertaken or are currently undertaking will provide insights to the other National Focal Points and assess what will be needed to establish one.

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APPENDIX

Questionnaire

PART A: Funding sustainability

This section is to gather information about the funding status of each Ocean Observing and Marine Monitoring, as defined above.

1. Approximately how many organisations are involved in OCEAN OBSERVING in your country that you are aware of?

- 1-3
- 4-10
- >10
- I don't know other

2.The organisations involved in OCEAN OBSERVING are: Select all that apply

- Government
- Private industry
- Educational/Research Institutions
- I don't know
- Other

3.Do you think there are more organisations involved in OCEAN OBSERVING that you are not aware of?

- Yes
- No
- I don't know

4.How is OCEAN OBSERVING funded in your country? Select all that apply

- National research funding
- National core government funding
- EU/International funding
- Private funding
- I don't know
- Other

5.If you selected MORE than one, do you know who funds the largest part of OCEAN OBSERVING?

- National research funding
- National core government funding
- EU/International funding
- Private funding
- I don't know
- Other

6.Are there mechanisms to access long-term (6-10 years) funding for OCEAN OBSERVING in your country?

- Yes
- No
- I don't know

7.If YES, which ones?

8.If funding for OCEAN OBSERVING is from core government funding, is this through one ministry?

- Yes
- No
- I don't know
- Funding is not provided by Government

9.If the answer to the above question is NO, how many Ministries do you think are involved in funding OCEAN OBSERVING?

- 1-3
- 4-10
- >10
- I don't know

10. Which Ministry(ies) that you know of is (are) involved in funding OCEAN OBSERVING in your country? If many, please name the top 5

11. Approximately how many organisations are involved in MARINE MONITORING in your country that you are aware of?

- 1-3
- 4-10
- >10
- I don't know

12. The organisations involved in MARINE MONITORING are: Select all that apply

- Government
- Private Industry
- Educational/Research Institutions
- I don't know
- Other

13. Do you think there are more organisations involved in MARINE MONITORING that you are not aware of?

- Yes
- No
- I don't know

14. How is MARINE MONITORING funded in your country? Select all that apply

- National research funding
- National core government funding
- EU/International funding
- Private funding
- I don't know
- Other

15. If you selected MORE than one, do you know who funds the largest part of MARINE MONITORING?

- National research funding
- National core government funding
- EU/International funding
- Private funding
- I don't know
- Other

16. Are there mechanisms to access long-term (6-10 years) funding for MARINE MONITORING in your country?

- Yes
- No
- I don't know

17. If YES, which ones?

18. If funding for MARINE MONITORING is from core government funding, is this through one ministry?

- Yes
- No
- I don't know
- Funding is not provided by Government

19. If the answer to the above question is NO, how many Ministries do you think are involved in funding MARINE MONITORING?

- 1-3
- 4-10
- >10
- I don't know

20. Which Ministry(ies) that you know of is (are) involved in funding MARINE MONITORING in your country? If many, name the top 5

PART B: Focus of ocean observing and marine monitoring

The following questions are to understand what is the main focus of ocean observing and marine monitoring activities in your country, from three key areas: Ocean Health (e.g. ecosystem health, productivity, species diversity, resilience), Operational Services (e.g. ocean-related hazards, marine weather forecasts, search and rescue, HABS) and Climate (e.g. ocean warming, acidification, sea-level rise)

21. Does your country collect OCEAN HEALTH information as part of national OCEAN OBSERVING or MARINE MONITORING activities?

Yes as part of MARINE MONITORING

Yes as part of OCEAN OBSERVING

Yes as part of both OCEAN OBSERVING and MARINE MONITORING

No, we do not collect ocean health/ecosystem information

I don't know

Other

22. What are the main drivers for the collection of OCEAN HEALTH information? Select all that apply)

Research (e.g. understanding biodiversity distribution)

Resource management (e.g. ecosystem based fisheries management) Policy support (e.g. ocean noise due to human activities)

Real-time decision making (e.g. marine heatwaves) Statutory requirements (e.g. MSFD, WFD)

Other

23. Who funds the collection of OCEAN HEALTH information in your country? Select all that apply

National core government funds

National research funds

EU/International funds

Private industry

I don't know

Other

24. Is funding to collect OCEAN HEALTH information sustainable in the medium (3-5 years) to long term (6-10 years)?

Yes

No

I don't know

25. Does your country provide the data on OCEAN HEALTH to a National Oceanographic Data Centre?

Yes

No

Only some data

I don't know

26. Does your country provide the data on OCEAN HEALTH to a thematic regional data aggregator

Yes

No

Only some data

I don't know

27. If you answered YES above, which data aggregator (s)? Select all that apply

National data center

ICES

OBIS

EMODnet

SeaDataNet

CMEMS

Other

28. Does your country collect OCEAN CLIMATE information as part of national OCEAN OBSERVING or MARINE MONITORING activities?

Yes as part of MARINE MONITORING

Yes as part of OCEAN OBSERVING

Yes as part of both OCEAN OBSERVING and MARINE MONITORING

No, we do not collect ocean climate information

I don't know

Other

29. What are the main drivers for the collection of OCEAN CLIMATE information?

Research (e.g. understanding of climate drivers)

Resource management (e.g. shift in fishery stocks distributions)

Policy support (e.g. climate adaptation policies)

Real-time decision making (e.g. natural hazards response)

Statutory requirements (e.g. Paris agreement commitments, EU climate)

Other

30. Who funds the collection of OCEAN CLIMATE information in your country?

National core government funds

National research funds

EU/International funds

Private Industry

I don't know

Other

31. Is funding to collect OCEAN CLIMATE information sustainable in the medium (3-5 years) to long term (6-10 years)?

Yes

No

I don't know

32. Does your country provide the data on OCEAN CLIMATE to a National Oceanographic Data Centre?

Yes

No

Only some data

I don't know

33. Does your country provide the data on OCEAN CLIMATE to a thematic regional data aggregator?

Yes

No

Only some data

I don't know

34. If you answered YES above, which data aggregator (s)? Select all that apply

National data center

ICES

EMODnet

SeaDataNet

CMEMS

Other

35. Does your country collect OPERATIONAL SERVICES information as part of national OCEAN OBSERVING or MARINE MONITORING activities?

Yes as part of MARINE MONITORING

Yes as part of OCEAN OBSERVING

Yes as part of both OCEAN OBSERVING and MARINE MONITORING

No, we do not collect operational service information

I don't know

Other

36. What are the main drivers for the collection of OPERATIONAL SERVICES information?

Research (e.g. model skill assessment and assimilation)
Resource management (e.g. adaptive fisheries management)
Policy support (e.g. planning for flood-prone areas)
Real-time decision making (e.g. HABS)
Statutory requirements (e.g. MSFD, WFD)
Other

37. Who funds the collection of OPERATIONAL SERVICES information in your country?

National core government funds
National research funds
EU/International funds
Private Industry
I don't know
Other

38. Is funding to collect OPERATIONAL SERVICES information sustainable in the medium (3-5 years) to long term (6-10 years)?

Yes
No
I don't know

39. Does your country provide the data on OPERATIONAL SERVICES to a National Oceanographic Data Centre?

Yes
No
Only some data
I don't know

40. Does your country provide the data on OPERATIONAL SERVICES to a thematic regional data aggregator?

Yes
No
Only some data
I don't know

41. If you answered YES above, which data aggregator (s)? Select all that apply

National data center
EMODnet
SeaDataNet
CMEMS
Other

PART C Integration of ocean observing and marine monitoring

The following questions are to help us understand the state of play of ocean observation and marine monitoring in your country. Please select your rating from 1 star (completely disagree/very bad) to 5 stars (completely agree/very good)

42. There is good coordination between OCEAN OBSERVING and MARINE MONITORING activities in my country

43. There is good coordination between different MARINE MONITORING activities (e.g. fisheries and environmental monitoring, etc.) in my country.

44. OBSERVING is very important to policy makers in my country

45. OCEAN OBSERVING is very important to private industry in my country

46. OCEAN OBSERVING is very important to the general public in my country

47. OCEAN OBSERVING is widely used for climate information in my country

48. OCEAN OBSERVING is widely used for ocean health information in my country

49.OCEAN OBSERVING is widely used for operational services in my country

50.The government acknowledges the importance of OCEAN OBSERVING

51.There is cooperation and collaboration in OCEAN OBSERVING activities between my country and neighbouring countries (e.g. knowledge exchange, equipment sharing, use of similar procedures, observing facilities that are complementary to each other; data exchange)

52.Sharing of OCEAN OBSERVING information and data within my country is good

53.Sharing of OCEAN OBSERVING information and data with neighbouring countries is good

54.All data from OCEAN OBSERVING activities are publicly available in national and/or international databases

55.Sharing of MARINE MONITORING information and data within my country is good

56.Sharing of MARINE MONITORING information and data with neighbouring countries is good

57.All data from MARINE MONITORING activities are publicly available in national and/or international databases

58.We follow FAIR (findable, accessible, interoperable, and reusable) principles in data management in my country

59.Are there any other key topics that drive OCEAN OBSERVING in your country?