



Feasibility Study On An Observatory For The Blue Economy And The Sea Satellite Accounts For The European Union

Final report

Deloitte.

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UNIVERSITY & RESEARCH

Study Team	
<i>Deloitte Consulting</i>	<i>Stichting Wageningen Research</i>
Vincent Viool MBA – Director Strategy E-mail: vviool@deloitte.nl	Maggie Skirtun Aquaculture specialist E-mail: maggie.skirtun@wur.nl
Dr Indra Vonck – Manger E-mail: ivonck@deloitte.nl	Dr Jamal Luka Roskam Senior Researcher E-mail: jamal.lukaroskam@wur.nl
Gurvinder Arora – Senior Consultant E-mail: gurvarora@deloitte.nl	David Verhoog Senior data scientist Email: david.verhoog@wur.nl
Paulien Zhu – Consultant E-mail: paulzhu@deloitte.nl	Dr Sander van den Burg Senior Researcher Email: sander.vandenBurg@wur.nl
Yi Gong – Consultant E-mail: ygong@deloitte.nl	

EUROPEAN COMMISSION

European Climate, Infrastructure and Environment Executive Agency
Unit D.3 – Sustainable Blue Economy

Contact: Unit D.3 – Sustainable Blue Economy

E-mail: CINEA-EMFAF-CONTRACTS@ec.europa.eu

European Commission
B-1049 Brussels

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NOTE TO THE READER

The study report can be divided into three distinct sections to assist the reader.

1. Review of the available data to understand the feasibility for setting up an Observatory and a Sea Satellite Account. The review is covered in **chapter 2 and chapter 3** where a detailed assessment on the existing data is conducted by reviewing the relevant sources and databases. A deep dive into the available data is then conducted for 3 pre-selected case study countries; Spain, France and Sweden to understand the national accounting systems and data accounting mechanisms for the Blue Economy sectors.
2. The actual setup of the Blue Observatory and a roadmap for phased implementation of the Observatory. The setup and the roadmap for a Blue Observatory are covered in **chapter 4**. This chapter discusses the possibility of an EU-wide Blue Observatory, its function, setup and potential cost implications for such an endeavour. It is important to note that the costs for setting up the Observatory also include the sea-satellite account costs as it is one of the major set of activities for the observatory.
3. The actual setup of a Sea Satellite Account, independent of an observatory and the underlying effort to set it up per Member State. This is covered in **chapter 5** which discusses the possibility of a Sea Satellite Account for each Member States, key activities, its setup and potential cost implications. This chapter is useful for readers that are interested in understanding the needs and role of a Sea Satellite Account as a standalone initiative, independent of an Observatory.

EXECUTIVE SUMMARY

The Blue Economy comprises all those activities that are marine based or marine-related. It consists of sectors that have been a salient part of the Blue Economy for many years (e.g. Fisheries and aquaculture, Maritime transport) and sectors that have more recently gained prominence, either due to their accelerated growth (Off-shore wind energy) or due to their importance towards sustainability (Bio-Economy, Ecosystem services). The growth of the Blue Economy sectors brings new opportunities for investment and hold huge potential for the future development of coastal communities.

The established sectors are already monitored quite extensively through data sources such as the European System of Statistics, Fisheries and aquaculture data (under the EU Data Collection Framework), Eurostat data from Structural Business Statistics (SBS), PRODCOM, National Accounts and tourism statistics. Overall, they directly employed over four million people and generated €658 billion of turnover and €180 billion of gross value added in 2017. The emerging sectors, on the other hand, have limited data availability in publicly available data sources with majority of data being dispersed over multiple smaller data collection initiatives and services. Gradually, more data is becoming available so that an attempt is being made to find comparable and consistent ways of monitoring and measuring these sectors.

The main objective of this study is to assess the feasibility of an observatory on the Blue Economy and a Sea Satellite Account (SSA). The study enables a comprehensive and integrated approach to measuring the impacts of the Blue Economy, expanding the sources currently in existence with complementary sources. To conduct the feasibility assessment, four tasks were performed over the course of the study:

- identification of Blue Economy sectors and database;
- data collection for selected case study countries;
- feasibility analysis - observatory of the Blue Economy;
- feasibility analysis - National/ EU Sea Satellite Accounts.
-

The **identification of Blue Economy sectors and databases** was conducted based on a comprehensive literature review and benchmark of existing reports to identify the classifications of the sectors. A detailed approach is described in chapter 2. The output of the exercise on data source identification and checking for availability at a subsector level indicated that most of the sub-sector and industry classifications in NACE rev 2.0¹ do not have any provision to distinguish between marine vs. non-marine proportions of the underlying data. This entails that even if the data for countries is collected at a detail of 4 digits, an external mechanism to extract the marine proportion may be required.

Furthermore, some maritime activities refer to the economic activities not classified elsewhere. The approach to build upon the Blue Economy taxonomy was preferred and a six-step approach was followed for sector allocation to established or emerging sectors.

This list of sector and sub-sectors developed in task 1 that goes beyond the Blue Economy report and includes additional sectors, sub-sectors and industries. Ecosystem services has been added to the emerging sectors due to its growing importance. As noted by the OECD (2019)², valuing marine ecosystems needs to be done in a transparent and evidence-based manner.

¹ NACE is the "statistical classification of economic activities in the European Community" and is the subject of legislation at the European Union level, which imposes the use of the classification uniformly within all the Member States. NACE is the acronym for "Nomenclature statistique des activités économiques dans la Communauté européenne". Refer <https://ec.europa.eu/eurostat/documents/3859598/5902521/KS-RA-07-015-EN.PDF>

²<https://www.oecd.org/cfe/tourism/tourismsatelliteaccountrecommendedmethodologicalframework.htm>

The data collected in task 1 formed the **basis of task 2**, where macro-level (top-down) and micro-level (bottom-up) data were combined to identify all potential data sources for the case study countries; Spain, France and Sweden. Using a combination of both the approaches, sectoral insights and relevant data were collected on all three countries from publicly available and licensed data sources. Based on a comparison between Spain's and France's data, the industries which are complete at NACE rev 2.0 as marked in task 1 have higher consistency across multiple data sources. However, for the sectors (such as Cargo handling) where the portion contribution from the maritime activities is not calculated from the non-maritime activities, (that comprise of Partial I in completeness of data), differences between the reported values were observed across the Blue Economy report 2019, National statistics offices and independent data sources.

The differences in values are observed due to:

- aggregation of maritime proportions directly from non-marine data;
- incomplete reporting of company data by private and public data sources;
- no data availability in case of a few sectors.

For calculating the portion of the sector that contributes to the Blue Economy, it was observed that there is a lack of information available to calculate the share of the Blue Economy in the overall data as this is a highly academic and technical exercise. This lack of exact coefficients to provide the portion of industry attributed to the Blue Economy, results in inaccurate reporting of indicators such as, the number of companies, turnover, GVA, and the number of employees.

Additionally, during the interviews conducted with the statistics offices and industry organisations, it was observed that most of the industry organisations relied on publicly available and published databases for sectoral information. Very few organisations publish the data on their sectors with most organisations opting for a need-based reporting system by hiring data research firms. Some organisations attributed the misreporting/underreporting of data at NACE level to the structural differences in the setup of the sectors compared to NACE classification.

Once the data was consolidated, the next step was to conduct the feasibility analysis for observatory. Existing marine and non-marine observatories were benchmarked on several characteristics. Based on the outcome of the benchmark, preliminary activities of an observatory were aggregated and categorised into six categories; gathering, structuring, aggregating, disseminating, supporting activities and miscellaneous.

The activities were then grouped in line items for the purpose of resource allocation based on interviews conducted with a few observatories and national statistics organisations engaged in marine accounting. Besides the activities, the focus and the setup of the observatory were the main elements in the feasibility analysis. Focus is determined by assessing each sector based on indicators, to decide whether it should be included as a core or adjacent sector. Periodisation indicators were defined based on the following guiding principles:

- the economic importance of the sector to the EU's and individual Member States' economy;
- the current and the future economic growth potential of the sector;
- the impact of the sector on the long-term plans of the EU;
- the level of data that currently exists on the key indicators for the sector.

The setup, on the other hand, is dependent on the cost structure, which is determined whether the observatory will be a *non-physical* or *physical* organisation. For a non-physical observatory, main cost items and resource allocation were benchmarked from the European Market Observatory for Fisheries and aquaculture (EUMOFA) project implementation plan and resource allocation guidelines. Furthermore, additional resource allocation information was collected from Cogea, the external service provider for

EUMOFA. The cost breakdown thus calculated had approximately 90% of variable costs including:

- data purchase costs (12%);
- human resources (78%).

In addition to the variable cost, the fixed costs were calculated at 10% consisting of IT costs and overheads.

For a physical observatory, a list of main cost items and resource allocation was identified based on Dutch Statistics (CBS) and French marine observatory. The cost breakdown thus calculated has approximately 20% of fixed cost including:

- overhead costs, which in this case include location cost, such as rent and utilities;
- IT costs to set up and maintain the infrastructure.

As the fixed cost is higher, the portion of variable costs reduces 80% of the overall costs. Therefore, the proportion of human resources and data purchase cost within the variable costs is 69% and 11% respectively.

Irrespective of the *non-physical* or *physical* setup, the roll-out of the observatory is dependent on three dimensions: activity, sectors and geography. A phased approach is proposed to roll-out the observatory activities to ensure smooth scale-up and management in the early stages. The overall implantation is distributed over 4 phases, roughly 1 year each, with a slow ramp up of activities from phase 0 all the way to full function of the observatory. Due to the number of variables to calculate the costs of setup, a tool has been developed to provide estimation of costs. The input on sectors, activities and number of Member States can be input into the tool to provide an estimate of setup costs. Using this approach, it is made accessible to re-visit the cost estimates at a later stage and re-evaluate the cost feasibility.

Using the case study countries, a calculation is demonstrated based on whether the observatory will be physical or non-physical and a fixed prioritisation of sectors over phases. Based on the calculation, a fully functional *non-physical* observatory will cost ~€8.6 million to implement, whereas a fully functional *physical* observatory will cost ~€6.5 million to implement (see section 4.3.8). Both the cost estimates include the effort needed to setup a centralised Sea Satellite Account. A detailed breakdown of only setting up the Sea Satellite Account is discussed in detail in the next part.

The last part of the study focussed on the feasibility analysis for the Sea Satellite Account. Like the previous task, the first step here was to benchmark marine and non-marine satellite accounts that exist or are in development. Based on the benchmark, the general methodology to structure SSAs was created as shown below:

- conceptual phase to determine **scope** of sectors and economic activities that fall under the Blue Economy;
- compilation and analysis to measuring the value of economic activities, marine ecosystems and indirect and induced sectors;
- monitoring of **emerging sectors** under the scope of the Blue Economy, revision of **splitting coefficients** as new or better data becomes available.

Additionally, cross-cutting activities for the setup of the Sea Satellite Account are proposed as:

- collaboration and coordination with other government agencies (e.g. national statistical offices, offices responsible for various overarching sectors like labour, transport etc.);
- consultation with industry and market experts, as well as industry associations or private firms undertaking independent surveys;

- stakeholder engagement at all levels, incl. international and regional bodies to ensure consistency in approach and structure to the satellite accounting (e.g. participation on international forums and dialogues).

During the research, interviews and data collection, it was identified that a Sea Satellite Account can be setup in conjunction to the observatory based on:

- **the observatory takes a central role:** in data collection and compilation;
- **the observatory takes a coordination role:** in providing guidelines and assisting Member States.

The feasibility and accuracy of Sea Satellite Accounts are very much determined by the maturity of national accounting framework i.e. the level of detail available within commodity and economic activity indexing. The greater the number of classification codes or the finer the sub-classification of activities and commodities, the more likely maritime industries and activities are uniquely identifiable. In general, a detailed or mature national accounting framework also provides more information to a country in establishing splitting coefficients for the maritime sector.

For the cost analysis of setting up an SSA, a weighted average was applied to the resource breakdown reported by interviewed respondents based on the level of detail in the final economic account of activities related to the sea produced. The estimated cost of a pilot study corresponds to €385,853 but represents mostly an upper bound value. Extending the cost calculation to the whole EU, it is estimated that the overall cost for constructing a SSA for each Member State will be in the region of €6,459,891 to €9,250,511 for the initial setup.

The key challenge in setting up a Sea Satellite Account is conceptual – i.e. the decisions on what is to be accounted. This requires extensive expert consultations with various agencies. A well-established communication chain and good cooperation are key in ensuring accurate reflection of activities in a Sea Satellite Account.

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LIST OF ABBREVIATIONS

BEA	Bureau of Economic Analysis (US)
CPA	Classification of Products by Activity
DG MARE	Directorate-General for Maritime Affairs and Fisheries
DK	Denmark
EASME	Executive Agency for Small and Medium-sized Enterprises
EMFF	European Maritime and Fisheries Fund
EMODNET	European Marine Observation and Data Network
EMSA	European Maritime Safety Agency
EMSO	European Multidisciplinary Seafloor and water-column observatory
ENMC	European network of Maritime Clusters
ESPO	European Sea Ports Organisation
EUMOFA	European Market observatory for Fisheries and aquaculture products
GVA	Gross Value Added
GWI	Global Water Intelligence
ICPC	International Cable Protection Committee
IOOS	The U.S. Integrated Ocean Observing System
ISIC	International Standard Industrial Classification
NACE	Statistical Classification of Economic Activities in the European Community
NACF	Statistical Classification of Economic Activities for France
NCA	National Competent Authorities
NGO	Non-Governmental Organisation
NOAA	National Oceanic and Atmospheric Administration
NSO	National Statistics Office
OECD	Organisation for Economic Co-operation and Development
PRODCOM	Production Communautaire (Community Production)
RO-RO units	Roll-on/roll-off units
SBS	Structural Business Statistics
SME	Small Medium Enterprise
SNA	System of National Accounts
SSA	Sea Satellite Accounts
TEU	Twenty-foot-Equivalent Unit (measure of volume in units of twenty-foot long containers)

1. INTRODUCTION

The present document is the draft final report for the assignment “Feasibility Study on Setting an observatory for the Blue Economy and the Sea Satellite Accounts for the European Union”.

1.1. THE CONTEXT

The Blue Economy is growing. The EU Blue Economy report provides an initial approach to the concept and size of the Blue Economy. According to the report, the Blue Economy comprises all those activities that are marine based or marine-related³. It is split up in established sectors and emerging sectors, of which the emerging sectors bear new opportunities for investment and hold huge potential for the future development of coastal communities.

The established sectors include Marine living resources, Marine extraction of non-living resources, Maritime transport, Port activities, Shipbuilding and repair and Coastal tourism. These sectors are already monitored quite extensively through data sources such as the European System of Statistics, Fisheries and aquaculture data (under the EU Data Collection Framework), Eurostat data from Structural Business Statistics (SBS), PRODCOM, National Accounts and tourism statistics. Overall, they directly employed over 4 million people and generated €658 billion of turnover and €180 billion of gross value added in 2017. GVA data shows an acceleration in the growth of all sectors from 2013 onwards except for the Extraction of non-living resources.

The Blue Economy emerging and innovative sectors include blue energy, i.e. offshore wind energy, ocean energy (wave and tidal), blue bio economy and biotechnology, marine minerals, desalination and maritime defence. The 2019 Blue Economy report states that:

- offshore wind is the most well-established of the emerging and innovative sectors where employment continues to grow significantly and is estimated at 183,000 in 2017 and 210,000 for 2018;
- ocean energy is at 2,250 people and cumulative investments of €3.5 billion in R&D, the Blue bio economy, such as biotechnology and biofuels is still a very fragmented sector. Current data draws particular attention to macro- and micro-algae and attempts have been made to explain and compile available information and data.
- seabed marine minerals exploration could contribute in ensuring future supply of raw materials but is still in early stages of development;
- data on desalination is limited to the current status and trends in the sector, and the investment outlook for the Member States but may prove to be a key sector, given that some countries and cities are already experiencing water shortages;
- the Maritime defence sector employs an estimated 78,000 FTEs but extensive comparable data is unavailable even though the sector is not emerging as such.

While the EU Blue Economy Report provides an indication of the size of the Blue Economy, it also has some limitations. These include the use of limited number of data sources and limited consideration of interactions of the identified sectors with other industries. Also, the list of sectors considered, particularly the emerging sectors, could be expanded if appropriate data sources would be identified. One of the key sectors that has become relevant is Ecosystem services due to its continued acknowledged importance in economic and ecological processes. Although the Blue Economy report

³ All data listed in this section originates from the Blue Economy report 2019 - <https://op.europa.eu/en/publication-detail/-/publication/676bbd4a-7dd9-11e9-9f05-01aa75ed71a1/language-en/>

2020⁴ addresses the importance of Ecosystem services, there are currently no comprehensive account of marine ecosystems within SSAs to date. Through this study, an initial view to measure Ecosystem services, based on current research is provided.

The added value of this project is therefore to strengthen the availability and timeliness of data through the development of an observatory on the Blue Economy and Sea Satellite Account. Through the gathering, analysis and dissemination of economic knowledge. This in turn will generate:

- an increased availability of data;
- deeper insight of the impact of ocean related activities;
- EU-harmonised figures on the ocean economy;
- reduction of the time lag in the reporting of structural data (particularly for innovative sectors) due to the use of a Sea Satellite Account.
-

1.1.1. MEASURING TRADITIONAL BLUE ECONOMY SECTORS

The European System of National Accounts (2010 SNA) is an internationally compatible accounting framework for a systematic and detailed description of a total economy, its components and its relations with other total economies. It is broadly consistent with the System of National Accounts of the United Nations (2008 SNA), regarding definitions, accounting rules and classifications. Furthermore, the concepts and classifications in the ESA 2010 (e.g. Statistical classification of economic activities in the European Union NACE rev.2) are harmonised with those of the United Nations (e.g. the International Standard Industrial Classification of All Economic Activities (ISIC)). The aggregation of sectors is specific to the domain and type of production or service – e.g. agriculture, forestry and fishing; mining; construction; transportation and storage; education; arts, entertainment and recreation; and so forth (ISIC 2008). The aggregation of sectors under NACE rev. 2 do not go further to measure economic contributions from interrelated activities or emerging activities carried out within a segment of the economy, such as tourism or the Blue Economy. Consequently, it will be necessary to develop methods to determine how much of turnover, value added, and employment can be attributed to the interrelated activities. We will do this by using national and if available regional Input Output Tables.

Tourism was the first activity to have worldwide standards established, as approved by the United Nations (UN) in March 2000, standardising the system of measuring all contributions to national economies from related sectors and sub-sectors. The sectors and sub-sectors that fall under tourism spans across various industries in the national accounting framework, from transportation to accommodation, food and beverage services, recreation, entertainment, travel agencies and so forth. Guidelines for the recommended methodological framework was last updated in 2008 and details the classification of products and services by industries related tourism and their aggregation (chapter 4, UNWTO 2008).

To date, there are no international guidelines or standards for a Satellite Account of all marine activities within the Blue Economy. A number of countries have produced national marine Satellite Account reports, including Australia (Allen Consulting Group 2004, AIMS 2010), the Philippines (Philippine Statistics Authority 2016) and Portugal (Statistics Portugal 2016). More recently, the United States (NOAA 2018) and the OECD (OECD 2019) have made steps to explore guidelines for the construction of an Ocean Economy Satellite Account.

1.1.2. DETERMINING THE IMPACT OF EMERGING SECTORS

The Blue Economy is interconnected with many other activities in the economy and its impact goes beyond the sectors mentioned above. Current research in the matter gives quite a comprehensive indication of the direct economic effects of the Blue Economy,

⁴Blue Economy report 2020

particularly of the traditional sectors but more insights in the indirect and induced effects and a structured approach on data collecting and measurement for the emerging sectors in still lacking. Some Blue Economy sectors generate significant indirect and induced economic effects. These have been outlined in the current EU Blue Economy reports as case studies.

Gradually, more data is becoming available so that an attempt is being made to find comparable and consistent ways of monitoring and measuring these sectors.

1.2. OBJECTIVES OF THE STUDY

The objective of this study is to assess the feasibility of an observatory on the Blue Economy and a Sea Satellite Account. The study enables a comprehensive and integrated approach to measuring the impacts of the Blue Economy, expanding the sources currently in existence with complementary sources. These could include national accounts, balance of payments, reports and financial accounts of companies, surveys on industrial production, household budget surveys, labour force survey, other surveys, statistics from professional associations and federations, structure business statistics, tourism statistics, production statistics.

The goal of the observatory is to:

- gather, analyse and disseminate economic knowledge and data for a better understanding the EU Blue Economy along the value chain;
- expand the data collection on the EU Blue Economy with a view to fill in the current data gaps, particularly for interrelated activities and emerging sectors of the EU Blue Economy;
- process, harmonise and analyse data;
- provide periodical surveys of latest trends of the emerging sectors of the EU Blue Economy;
- deliver ad-hoc market, financing and business studies on emerging sectors and high-tech established sectors of the EU Blue Economy.

The goal of the Sea Satellite Account is to:

- reduce the lead time for information dissemination of structural data, in particular for the fast moving emerging sectors;
- provide a framework linked to the central (national or regional) accounts allowing standardised reporting;
- generate flexibility in the System of National Accounts by rearranging concepts from the central framework to allow an economic impact estimate of the Blue Economy (including emerging sectors).

1.3. PROGRESS ON THE TASKS

Figure 1 below recollects the approach highlighting the conducted tasks as well as the outputs that have been produced.

Tasks	Sub-tasks	Main expected output	Assessment of data availability
1 Identification of sectors and database	1.1 Identify existing and emerging sectors 1.2 Determine availability and scope of data 1.3 Identify data sources and organizations	<ul style="list-style-type: none"> • List of all related sectors, sub-sectors within the Blue Economy • List of data sources and organisations for the identified sectors, sub-sectors for EU27 	
2 Data collection (Select countries through Task 1)	2.1 Define approach for data collection 2.2 Reach out to identified organizations 2.2 Collect data for Spain, France and Sweden	<ul style="list-style-type: none"> • Finalized approach of macro-level and bottom-up data collection • Interviews output with relevant stakeholders on the current level of data availability • Populated spreadsheet per member state 	
3 Observatory of the Blue Economy - feasibility analysis	3.1 Identify the main functions of observatory 3.2 Identify benefits per user group 3.3 Cost analysis and feasibility	<ul style="list-style-type: none"> • List of benchmarked observatories with activities groups • Identified benefits for user groups • Feasibility assessment based on cost and output of task 1 and 2 	
4 National / EU Sea Satellite Accounts - feasibility analysis	4.1 Define structure and data needs for SSA 4.2 Evaluate sources that may contribute to SSA 4.3 Methodology to structure the sources 4.4 Verify the options for SSA setup 4.5 Cost analysis for the SSA	<ul style="list-style-type: none"> • List of benchmarked observatories with activities groups • Structure of the sea-satellite account • Feasibility assessment based on cost and output of task 1 and 2 	

Figure 1 Tasks overview

Based on the approach a summary of the progress by the consortium includes:

- in task 1, sectors and databases at the EU level were identified to understand the availability of data on established and emerging sectors for the Member States;
- in task 2, data was collected for the selected Member States (Spain, France and Sweden) based on the desk research (task1) and reach-out conducted per outputs of task 1. This ensured that a wide range of activities was covered while searching for data;
- the data collected from task 1 and 2 along with the desk research in task 3 forms the basis feasibility analysis of activities, setup, focus, roll-out strategy and benefits of the observatory;
- additionally, the data sets from task 1 and 2 along with the desk research in task 4 forms the basis to conduct the feasibility analysis of focus, setup, options to implement and points to consider for the Sea Satellite Accounts (SSA).

2. TASK 1 IDENTIFICATION OF SECTORS AND DATABASES

The approach to task 1 is structured as follows:

- comprehensive identification of existing and emerging sectors and sub-sectors (see Appendix 1);
- extensive investigation of database availability and scope for each of the activities identified in Tables 1 and 2, including and not limited to: databases on companies, industry or sector associations, official national statistics, port and marina authorities, commercial statistics, clubs and membership organisations, etc.;
- identification of organisations and data sources with the assessment of data availability;
- challenges encountered during the tasks and the recommendations.

To complete the sub-tasks, a range of data collection methods are used:

- desk research and literature review of existing documents and databases;
- online survey;
- interviews;
- benchmarking existing data gathering and accounting systems;
- direct observations.

2.1. IDENTIFY EXISTING AND EMERGING SECTORS

The desk research and literature review are built upon data already available in the public domain. Figure 2 shows the flowchart that served as the basis for the data collection approach.

Publicly available databases such as structural business statistics (SBS), PRODCOM and national accounts data available in the EUROSTAT, were treated as principal databases for data collection. In addition to the data available from the principal sources, the consortium utilised supplementary sources of private and commercial databases available to each consortium partner. These supplementary data sources focused on the sectors where the data is not available in principal databases.

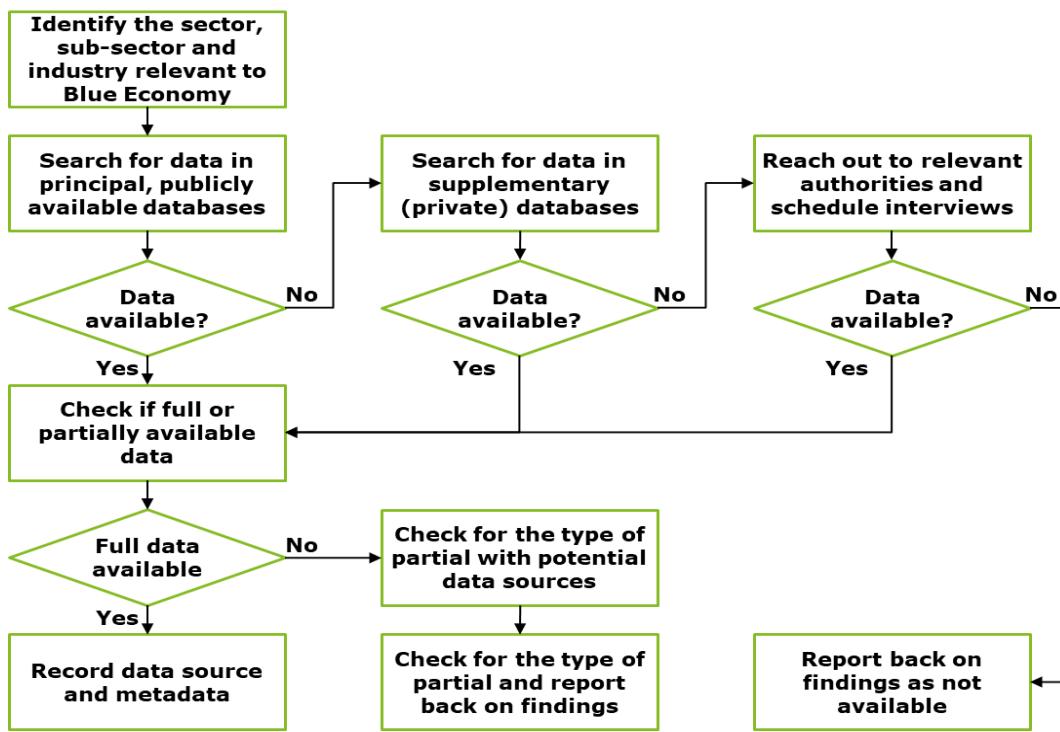


Figure 2 General approach of task 1

For a structured classification, the identified sectors were split into established and emerging sectors. The definition of established and emerging sectors is adopted from the Blue Economy report to ensure consistency. However, the identified sectors themselves were re-evaluated against these definitions to assess whether their positions have changed over time:

- the Blue Economy report defines **established sectors** as sectors with long-term proven contribution to the economy;
- the Blue Economy report defines **emerging sectors** as new sectors showing high potential for future development.

For creating a list of sectors that will setup the baseline for the entire subsequent analysis, two approaches to consolidate the list of sectors and subsectors were considered:

1. **Using the same taxonomy of sectors as the Blue Economy reports⁵⁶** – The benefit of using this approach is that the Blue Economy reports (BE) clearly defines established and emerging sectors. This creates an existing reference point for the consortium to build upon and use the methodology of the report in “as-is” format. On the other hand, a closer inspection of the sectors and subsectors highlights the presence of sectors like “Maritime security and Defence” in the emerging sectors. However, it does not clearly fit as per definition of emerging sector as it has been an active sector with long term contribution to the economy.
2. **Improving upon the Blue Economy report taxonomy by comparing with other existing overviews of Marine sectors**– The benefit of using this approach would be to leverage the taxonomy framework set up by the Blue Economy report, while exploring other sectors. The consortium can then extend the taxonomy or suggest modifications by comparing it with other existing overviews of the sector.

⁵⁶Blue Economy Report 2019 - <https://op.europa.eu/en/publication-detail/-/publication/676bbd4a-7dd9-11e9-9f05-01aa75ed71a1/language-en/>

⁶ Blue Economy Report 2020 - https://blueindicators.ec.europa.eu/sites/default/files/2020_06_BlueEconomy-2020-LD_FINAL-corrected-web-acrobat-pro.pdf

The challenge of using this approach is that it may require additional time to go through existing systems and reaching out to relevant experts.

Based on the above discussion presented above as well as keeping in mind the guidance provided in the Terms of Reference of the study, Option 2 was selected to attempt and improve upon the taxonomy provided in the Blue Economy reports. A six-step approach was followed to create a comprehensive list of established and emerging sectors and sub-sectors:

1. Sectors and subsectors were identified, in the first instance, by examining the classifications set out in the Blue Economy (BE) report 2019. In particular, the established sectors identified with a maritime component described in Annex II: a methodological framework for the established sectors of the BE report.
2. The list of sectors and sub-sectors was then compared with the breakdown provided in the Portuguese Sea Satellite Account methodological report to fill in any missing sectors. The Portuguese Sea Satellite Account⁷ elaborated on a detailed number of sectors that not only operate on the sea but also those that do not technically operate on the sea but rely on the sea for the viability of the sector. These go well beyond those included in the BE 2019 report and formed the basis of the sectors considered in this study.
3. A further comparison was made with other Sea/Ocean Satellite Accounts and guidelines, from beyond Europe, to ensure comprehensive coverage of sector inclusion. These include Ocean Economy Satellite Account by the US National Oceanic and Atmospheric Administration (NOAA), the Australian accounting of contributions from maritime industries, the Caribbean Blue Economy Satellite Account, and the OECD guide to Sustainable Ocean Economy and linking the Ocean Economy to a system of national accounts (United States⁸, Australian⁹, Caribbean¹⁰, OECD¹¹).
4. An extensive list of sectors and sub-sectors, classified and categorised per the reports mentioned in step 2 and step 3, was then created for both established and emerging sectors of the Blue Economy.
5. Subsequently, the Blue Economy report 2020 was reviewed, to compare with the 2019 edition for any significant changes in the methodology of data collection and any potential addition or modification of the sector lists for established and emerging sectors. This confirmed that the list of sectors and sub-sectors remains relevant and appropriate.
6. Lastly, the feedback received through expert consultation session and the individual interviews with the National Statistics offices of France, Spain, Sweden, Portugal, Netherlands, along with the experts at National Oceanic and Atmospheric Administration (NOAA) and Bureau of Economic Analysis (BEA) in the US was used to come to a final list of sectors and sub-sectors.

The tables below provide a consolidated overview of the established and emerging sectors identified through the above six steps. The overview includes sectors and the respective sub-sectors that potentially link to the sectors based on the described approach. Comparing the established sectors in the Table1 to the Blue Economy report 2020, it is observed that Infrastructure and Maritime works have been characterised as an additional sector, constituting of underwater pipelines, cables, and other sea projects.

⁷Refer to Portuguese Sea Satellite Account methodology report
2016https://www.ine.pt/ngt_server/attachfileu.jsp?look_parentBoui=300613867&att_display=n&att_download=y

⁸ https://www.bea.gov/data/special-topics/ocean-economy

⁹ Refer to the Australian Government report: http://environment.gov.au/systems/files/resources/ce4cf41d-8ffe-470b-898a-2c0f84eac483/files/marine-economic.pdf

¹⁰https://issuu.com/caribank/docs/measuring_the_blue_economy

¹¹https://doi.org/10.1787/9789264311053-en

In the Blue Economy report 2020, underwater cables have been included as part of emerging sectors, whereas in this report they are part of established sectors. The difference in categorization surfaced during the data collection phase, where it was identified that the underwater sea cables sector is a relatively established sector for multiple decades.

Table 1 Consolidated list of established sectors (refer Appendix 1 for details)

Established sectors	Sub-sector
Marine living resources	Primary production Processing and distribution Offshore drilling, oil, and gas
Marine non-living resources	Other minerals (incl. seabed mining) Processing and distribution Ports and wharfs
Port activities	Biosecurity ¹² Warehouse and storage Shipping and freight
Maritime transport, logistics, and storage	Passenger transport Support services
Shipbuilding and repairs	Shipbuilding and engineering Repairs and maintenance Accommodation Transport
Coastal tourism and recreation	Tour services Recreational activities Other expenditures Traffic control and safety Insurance and financial services
Maritime Services	Provisioning services Associations and organisations Other services Water projects Underwater sea cables
Infrastructure and maritime works	Oil and gas pipelines Other infrastructures (incl. maritime equipment) Support services Film entertainment Photography Events
Entertainment	Amusement parks and aquariums Professional sport competitions and related sectors Cultural tourism and cultural (market) values
Maritime security and defence	Naval and related defence activities Shipbuilding and weaponry Repair and maintenance
Research and education	Research and development

¹² "Biosecurity" refers to all activities related to the monitoring, prevention and eradication of invasive marine species as well as those traded through ports. For example, it includes random biosecurity checks at ports to ensure shipments of BLAH does not contain foreign pests or animals that could endanger local floral fauna (e.g. exotic fruit flies, termites, invasive mussels attached to vessel hulls etc.)

Established sectors	Sub-sector
	Governance and data
	Education

Additionally, the Blue Economy report 2020 updates the categorization of Marine Renewable energy, specifically, offshore wind energy to be part of the established sectors. In the classification proposed by the consortium, renewable wind energy has still been included in Emerging sectors along with other forms of energy for consistency purposes.

The classification proposed in this report goes beyond the BE report, insofar, as to attempt a categorization of the emerging sectors and the potential sub-sectors that could be included. Ecosystem services have been proposed as an additional emerging sector due to its continued acknowledged importance in economic and ecological processes.

Table 2 Consolidated list of emerging sectors

Emerging sectors	Sub-sector
Blue energy	Renewable energy
Blue Bioeconomy	Pharmaceuticals Agriculture, livestock, veterinary products, and aquaculture Bioplastics Biofuel and bio-refined chemicals
Water treatment and supply	Water supply Desalination
Eco-system services	Regulating Cultural (non-market)

2.2. AVAILABILITY AND SCOPE OF DATA

Based on the desk research in the previous section, the Blue Economy sectors were further subdivided into sub-sectors for task 1 and later into industries for task 2. A first version of the overview was provided in the inception report of the project. The interim report builds on it by providing the status of data availability at the sector and sub-sector level. The definition of data availability is consistent with the definition in the inception report. The status of data availability was either one of the four data groups:

- **full data availability in NACE¹³:** the data and figures reported in Eurostat by the national statistics offices are the full proportion of the Blue Economy;
- **partial 1:** when economic activities from a sector, that are attributable to the Blue Economy, is only a sub-portion of the data reported in Eurostat. For example, *Marine living resources > processing and distribution > Manufacture of oil and fats*, where the oil and fats manufacturing industry spans beyond the Blue Economy and includes production from animals and crops. Therefore, only a proportion of its economic contributions occurs within Marine living resources;

¹³ The Statistical classification of economic activities in the European Community, abbreviated as NACE, is the classification of economic activities in the European Union (EU); the term NACE is derived from the French Nomenclature statistique des activités économiques dans la Communauté européenne. Various NACE versions have been developed since 1970. NACE is a four-digit classification providing the framework for collecting and presenting a large range of statistical data according to economic activity in the fields of economic statistics (e.g. production, employment and national accounts) and in other statistical domains developed within the European statistical system (ESS)

- **partial 2:** when the data reported in Eurostat is only a sub-portion of the total economic contributions attributable to the Blue Economy. This applies mostly to sectors where data reported in Eurostat does not capture the entire non-market value of these sectors;
- **no data available:** no data is currently available on this sector in Eurostat.

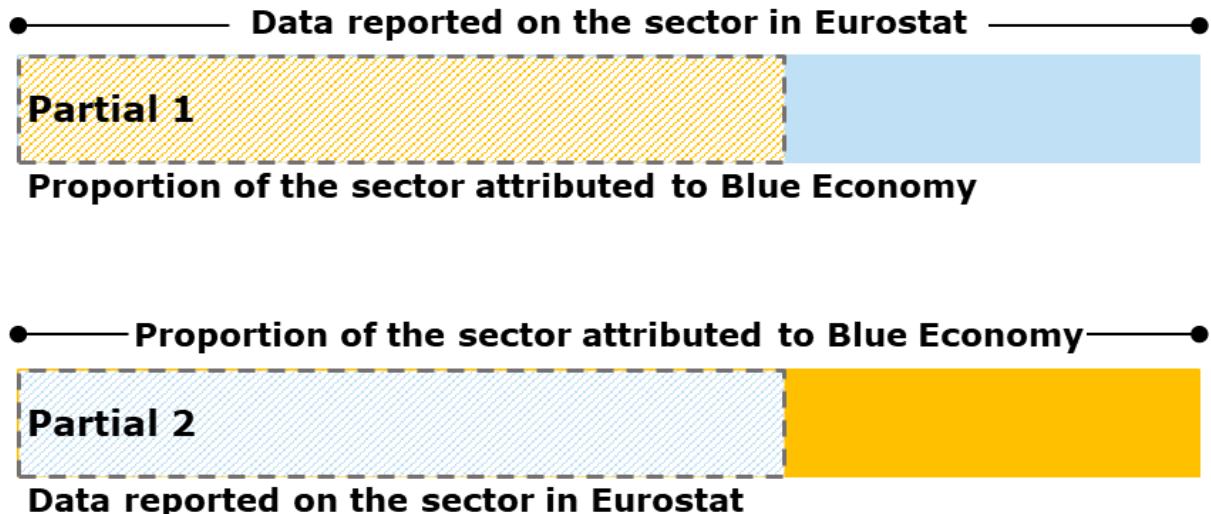


Figure 3 Visualization of the data availability

For the identification of data sources, as mentioned in the inception report, sectors with no data availability were prioritised. For the industries in the Partial 1 category, the search for data was based on the size of the industry. Structural business statistics (SBS) reported under NACE v2 as part of the system of economic classifications are used as the primary and overarching data structure used in this report. The reason for this is multi-fold:

- NACE classifications are part of **an integrated system of statistical classifications** developed in line with the United Nations ISIC, and as such provides consistency internationally in data classification for Sea or Ocean Satellite Accounting;
- related to this, data reported under NACE is also **available and comparable across the EU27**. This ensures the minimum level of data accounting for a European Sea Satellite Account;
- both the **BE report** and **Portuguese SSA** have utilised the data reported **under NACE** in their accounting of activities in maritime sectors;
- the linkage between ocean economic activities and international classifications (i.e. ISIC) is **made directly in the OECD guide** to accounting for the Blue Economy.

Structural Business Statistics (SBS) has an important role to play in promoting and achieving the collection and dissemination of consistent and comparable statistics on the Blue Economy:

- first, SBS works as a source for the uniform classification of the sectors and industries included in the concept of Blue Economy, as well as for data extraction. SBS is based on the Statistical Classification of Economic Activities called NACE REV.2, which classifies each enterprise in terms of its main line of business, up to a four-digit level, covering all industries of the economy. Therefore, this classification enables the closer investigation and identification of activities, which have different relationships to the sea;
- second, it represents the most reliable data for the comparison and measurement of the structure and performance of different parts of the economy, including maritime activities;

- third, SBS is coherent with many other statistical sources and aggregate data (e.g. such as PRODCOM and tourism statistics). Thus, for some partial maritime classes of activities, SBS can be leveraged with these data sources to estimate maritime proportions, at a relatively low cost and reduced response burden.

In SBS, some NACE codes contain clearly and exclusively activities considered as maritime. Thus, their contribution to the Blue Economy statistics would be simple, direct and not too costly to obtain. In addition, the statistical output in terms of value added and other available variables would be perfectly consistent, replicable and comparable, both across countries as well as across different sectors and time-periods.

Other NACE codes comprise both maritime and non-maritime components. In order to estimate the maritime share, additional sources or criteria are implemented on the data. The maritime proportion of the economic activity can be measured by using PRODCOM codes, which provide more detailed information about the production of manufactured goods, however; these statistics do not provide any data on purchases of goods and services or turnover. Thus, it assumes in the calculation method that the ratio estimators are homogenous and valid for all the economic variables. These ratios are based on values of the production value, and likely do not represent the correct estimates of employment and other structural variables as these macro-indicators do not necessarily exist in the same proportion.

Sometimes, detailed data is sought from sectorial reports, studies, and surveys as proxies of the maritime share of a certain activity. However, these alternative sources are based on different concepts and definitions than those applied in SBS, or presents estimates at level of aggregation, which does not conform to the requirements of the Blue Economy statistics.

EUROSTAT does not produce any structural data on the primary sectors (capture Fisheries and aquaculture). Therefore, statistical information on fisheries sector is collected and produced under "Data Collection Framework". This data may not be consistent in terms of data requirements, concepts, definitions and methods with SBS data. Producing Blue Economy statistics following the current compartmentalised approach, where a separate legal framework outside Eurostat covers fishing sector may result in a series of deficiencies such as lack of methodology consistency, quality of data, reduced relevance and responsiveness of statistics.

The marine service sector such as marine education, research and development, maritime insurance, emerging sectors are pure maritime activities, but due to lack of these data in SBS, these activities remain not considered with sufficient detail in the Blue Economy Report produced by DG-Mare. Such inadequate coverage could lead to the undermining of produced statistics in terms of relevance, consistency, quality and costs over time. Many users would remain dissatisfied and may cover their information needs outside official statistics, which makes a reliable measurement of the economic importance of this Blue Economy sector difficult.

For instance, the tourism sector includes a variety of economic activities, not specifically maritime, but nonetheless important for the travelling sector. These activities are regarded geographically as part of coastal tourism and consist of accommodation providers, food and beverage activities, as well as travel agency and tour operator activities. The methodology used to compile the data on this sector in the Blue Economy, which includes accommodation expenditure, transport expenditure and other expenditure revealed a significant inconsistency. However, the SBS data does not distinguish by tourist versus non-tourist, nor between overnight tourist and same-day visitors. Therefore, using SBS tourism statistics for trips with overnight stays would

potentially lead to a significant underestimation for the tourism accommodation expenditure made during same-day visits.¹⁴

Tables 3 and 4 present the availability of data at the sector, sub-sector and the industry level for both Established and Emerging sectors as identified by the consortium. The assessment for the sectors was conducted by detailed review of the NACE rev2.0 codes for each of the sectors manually. The identified NACE rev 2.0 codes were then checked in the EUROSTAT SBS database to see if the underlying data and categorise the industries as complete, partial 1 and partial 2. If the underlying NACE codes included only marine data, the industry was attributed as "complete". If the underlying NACE data included both land and marine data, it was attributed as "Partial 1". Furthermore, the last column maps the industry to the exact NACE rev 2.0 codes of EUROSTAT where the data may be located.

Let us consider the Established sector "Marine living resources" as an example. For the sub-sector "Processing and distribution", there are industries that are indicated as complete, such as the "Processing and preserving of fish, crustaceans and molluscs". The industry is attributes as complete as all the products under this industry are obtained from the sea. This is not the case for another industry under this sub-sector such as "prepared foods (incl. meals and dishes)". This industry is marked partial 1 because a prepared meal may have elements that are not directly obtained from the sea, such as rice or flour. Therefore, the scope of the industry "prepared foods (incl. meals and dishes)" goes beyond the activities associated with sea.

Another example can be considered from the established sector of "Port activities". The subsector "Ports and Wharfage" has the industry "port activities" marked as complete. This is considered compete as the port activities are primarily associated in the vicinity of the sea. However, the same cannot be assumed for the industry "cargo handling", which is marked as partial 1. Cargo handling can partially be accounted in the port area; however, cargo moves to and from the port area by multiple modes, including land and rail. Therefore, the scope of "cargo handling" is not limited to activities in the vicinity of the sea.

Using the above logic, all the industries that have been identified under established sectors and sub-sectors are thoroughly reviewed and then verified with the Structural Business Statistics unit of Eurostat to arrive at the comprehensive overview provided in the tables below and in the Appendix 1.

Table 3 Results of the availability assessment (established)

Established sector	Sub-sector	Industry	Coverage EUROSTAT	NACE-codes
Marine living resources	Primary production	Commercial marine fishing sector (inc. ornamental fish)	Complete	A 03.1
		Marine aquaculture sector	Complete	A 03.2
	Processing and distribution	Processing and preserving of fish, crustaceans and molluscs	Complete	C 10.2
		Manufacture of oils and fats	Partial 1	C 10.41
		Prepared food	Partial 1	C 10.85 & C

¹⁴It is important to note that the insights and comments related to the Structural business statistics units were received as part of the interview conducted with representatives of SBS division of EUROSTAT

Established sector	Sub-sector	Industry	Coverage EUROSAT	NACE-codes
Marine non-living resources		products (incl. meals and dishes)		10.89
		Processing and preserving of fisheries products not fit for human consumption (incl. bait, feed, pet food etc.)	Partial 1	C 10.91 & C 10.92
		Processing of other fisheries products (incl. pearls and jewellery)	Partial 1	C 32.12
		Wholesale of fisheries products	Partial 1	G 46.38
		Retail sale of fisheries products	Complete	G 47.23
	Offshore drilling, oil and gas	Extraction of crude petroleum	Partial 1	B 06.1
		Extraction of natural gas	Partial 1	B 06.2
		Support activities for petroleum and natural gas extraction	Partial 1	B 09.1
		Harvesting of gravel, sand, clay and kaolin	Partial 1	B 08.12
	Other minerals (incl. seabed mining)	Extraction of salt	Complete	B 08.93
		Extraction of peat	Partial 1	B 08.92
		Mining of chemical and fertiliser minerals (e.g. phosphate)	Partial 1	B 08.91
		Quarrying of ornamental stones (e.g. limestone) and gravel and sand	Partial 1	B 08.11
		Mining of other non-ferrous metal ores	Partial 1	B 07.29
		Manufacture of refined petroleum products	Partial 1	C 19.2
	Processing and distribution	Manufacture of industrial gases	Partial 1	C 20.11 & C 35.21
		Manufacture of dyes and pigments	Partial 1	C 20.12
		Manufacture of fertilisers and nitrogen compounds	Partial 1	C 20.15
		Manufacture of perfumes and toilet preparations (e.g. ambergris)	Partial 1	C 20.42
		Manufacture of other	Partial 1	C 20.59

Established sector	Sub-sector	Industry	Coverage EUROSAT	NACE-codes
Manufacturing, mining and quarrying	Manufacturing	chemical products N.E.C.		
		Manufacture of ceramic products	Partial 1	C 23.3 & C 23.4
		Manufacture of lime and plaster	Partial 1	C 23.52
		Cutting, shaping and finishing of stone	Partial 1	C 23.7
		Precious metals production	Partial 1	C 24.41
		Lead, zinc and tin production	Partial 1	C 24.43
		Copper production	Partial 1	C 24.44
		Other non-ferrous metal production	Partial 1	C 24.45
		Distribution of gaseous fuels through mains	Partial 1	D 35.22
		Wholesale of solid, liquid and gaseous fuels and related products	Partial 1	G 46.71
		Wholesale of metals and metal ores	Partial 1	G 46.72
		Wholesale of chemical products (incl. industrial salt)	Partial 1	G 46.75
		Agents involved in the sale of fuels, ores, metals and industrial chemicals	Partial 1	G 46.12
		Support activities for other mining and quarrying	Partial 1	B 09.9
		Port activities	Complete	H 52.22
		Cargo handling	Partial 1	H 52.24
Port activities	Ports and wharfage	Supply of electricity to port	Partial 1	D 35.13
		Supply of water to port	Complete	E 36
		Cleaning and de-biofouling activities	Partial 1	N 81.29
		Laboratory examination and checks	Partial 1	M 71.2
	Biosecurity	Quarantine provision and custom services	Partial 1	O 84.13
		Warehousing	Partial 1	H 52.1
		Cold stores	Partial 1	H 52.1
	Warehouse and storage	Sale of containers, (incl. dry, reefer, oil etc.)	Not available	Not available
		Lease of containers, (incl. dry, reefer, oil	Partial 1	N 77.39

Established sector	Sub-sector	Industry	Coverage EUROSAT	NACE-codes
Maritime transport, logistics and storage		etc.) Repair of fabricated metal products (incl. R&M of containers)		
		Sea and coastal freight water transport (water transport)	Partial 1	C 33.11
	Shipping and freight	Inland freight water transport	Complete	H 50.4
		Sea and coastal passenger water transport (water transport)	Complete	H 50.1
		Inland passenger water transport	Complete	H 50.3
	Passenger transport	Renting and leasing of water transport equipment	Complete	N 77.34
		Service activities incidental to water transportation	Complete	H 52.22
	Support services	Building of ships and floating structures	Complete	C 30.11
		Building of pleasure and sporting boats	Complete	C 30.12
		Dismantling of wrecks	Complete	E 38.31
Shipbuilding and repairs		Repair and maintenance of ships and boats	Complete	C 33.15
		Repair of machinery	Partial 1	C 33.12
		Repair of communication equipment	Partial 1	S 95.12
		Repair of electronic and optical equipment (incl. navigation, aeronautical and nautical equipment)	Partial 1	
	Repairs and maintenance	Repair of electrical equipment (incl. electrical motors)	Partial 1	C 33.14
		Repair of other equipment (incl. fishing nets, shipping drums etc.)	Partial 1	C 33.19
		Hotels and similar accommodation	Partial 1	I 55.1
		Holidays and other short-stay accommodation	Partial 1	I 55.2
		Camping grounds,	Partial 1	I 55.3
Coastal tourism and recreation	Accommodation			

Established sector	Sub-sector	Industry	Coverage EUROSAT	NACE-codes
Transport		recreational vehicle parks and trailer parks		
		Other accommodation	Partial 1	I 55.9
		Passenger air transport	Partial 1	H 51.1
		Sea and coastal passenger water transport	Complete	H 50.1
		Passenger rail transport, Interurban	Partial 1	H 49.1
		Boat chartering	Partial 1	N 77.21
		Urban and suburban passenger land transport	Partial 1	H 49.31
		Retail sale of automotive fuel in specialised stores	Partial 1	G 47.3
		Renting and leasing of cars and light motor vehicles	Partial 1	N 77.11
		Taxi operation	Partial 1	H 49.32
Tour services		Travel agency activities	Partial 1	N 79.11
		Tour operator activities	Partial 1	N 79.12
		Other reservation service and related activities	Partial 1	N 79.9
		Activities of sport clubs (e.g. game fishing clubs, yacht and sailing clubs etc.)	Partial 1	R 93.12
Recreational activities		Other sports activities (incl. recreational fishing)	Partial 1	R 93.19
		Activities of other membership organisations (e.g. service activities to promote game fishing, surfing tournaments etc.)	Partial 1	S 94.99
		Other amusement and recreation activities (incl. activities of marinas)	Partial 1	R 93.29
		Retail sale of cultural and recreation goods in specialised stores (e.g. souvenir shops)	Partial 1	G 47.78
Other expenditures		Retail sale of other	Partial 1	G 47.64 & G

Established sector	Sub-sector	Industry	Coverage EUROSAT	NACE-codes
Maritime services	Traffic control and safety	goods in specialised stores (e.g. sports equipment; outdoor or special clothing/gear such as swimsuits, dive gear; fishing and bait shops)		47.71
		Food and beverage service activities (incl. restaurants and catering)	Partial 1	I 56.1 to I 56.3
		Renting and leasing of recreational and sports goods	Partial 1	N 77.21
		Provision of wireless and satellite communication services	Partial 1	J 61.2 & J 61.3
		Manufacture of railway locomotives and rolling stock (incl. signalling and traffic control equipment for inland waterways)	Partial 1	C 27.9
		Electrical installation (incl. of illumination and signalling systems)	Partial 1	F 43.21
	Insurance and financial services	Maritime traffic controllers (incl. lighthouses)	Complete	H 52.22
		Vessel tracking and e-monitoring services	Complete	H 52.22
		Water police, coast guards and other rescue support services	Partial 1	O 84.24
		Lifeguards	Partial 1	R 93.29
	Other maritime services	Property or other non-life insurance	Partial 1	K 65.12 & K 65.2
		Finance & lending	Partial 1	K 64.9
		Accountancy, bookkeeping and consultancy	Partial 1	K 66.3 & M 69.2
		Employment agencies for recruitment services	Partial 1	N 78.1
		Real estate services (e.g. buying and leasing of buildings and plants)	Partial 1	L 68

Established sector	Sub-sector	Industry	Coverage EUROSAT	NACE-codes
Business services	Provisioning services	Maritime law services (e.g. to challenge fines or defend oil spill lawsuits)	Partial 1	M 69.1
		Public relations and marketing services	Partial 1	M 70.21
		Sale of machinery, industrial equipment, ships and aircraft	Partial 1	G 46.14
		Sale of food, beverages and tobacco (e.g. for victualling on fishing vessels and suppliers to cruise ships)	Partial 1	G 46.17
	Associations and organisations	Supply of marine diesel and fuel bunkering services	Partial 1	G 46.71
		Activities of business and employer's membership organisations (e.g. fishing and aquaculture industry associations)	Partial 1	S 94.11
		Cleaning services for yachts, cruises and ships (excl. de-fouling services)	Partial 1	N 81.29
	Other services	Septic and waste disposal service for boat homes and ships	Partial 1	E 38.11
		Weather forecasting and ocean monitoring services	Partial 1	M 74.9
		Construction of water projects (incl. harbours, marinas and dikes etc.)	Complete	F 42.91
Infrastructure and maritime works	Water projects	Construction of seawalls, offshore breakers and artificial headland etc.	Complete	F 42.91
		Construction of utility projects for electricity and telecommunications (incl. submarine cables)	Partial 1	F 42.22
	Underwater sea cables	Installation of tubes, pipes and hoses	Partial 1	C 33.2

Established sector	Sub-sector	Industry	Coverage EUROSAT	NACE-codes
Construction	Other construction activities	maintenance of tubes, pipes and hoses		
		Oil and gas pipelines	Construction of oil and gas pipelines	Partial 1 F 42.99
		Construction of roads and motorways (incl. surface work on bridges and in tunnels)	Construction of roads and motorways (incl. surface work on bridges and in tunnels)	Partial 1 F 42.11
		Construction of bridges and tunnels	Construction of bridges and tunnels	Partial 1 F 42.13
		Construction of utility projects for fluids (incl. canals, pipelines, water well drilling)	Construction of utility projects for fluids (incl. canals, pipelines, water well drilling)	Complete F 42.21
	Support services	Other specialised construction activities (incl. subsurface work, waterproofing treatment, outdoor swimming pools etc.)	Other specialised construction activities (incl. subsurface work, waterproofing treatment, outdoor swimming pools etc.)	Partial 1 F 43.99
		Renting and leasing of construction and civil engineering machinery and equipment	Renting and leasing of construction and civil engineering machinery and equipment	Partial 1 N 77.32
		Renting and leasing of other machinery, equipment and tangible goods	Renting and leasing of other machinery, equipment and tangible goods	Partial 1 N 77.39
		Film entertainment	Motion picture, video and television programme production activities	Partial 1 J 59.11
		Photography	Photographic activities	Partial 1 M 74.2
Entertainment	Events	Organisation of festivals, conventions and trade shows	Organisation of festivals, conventions and trade shows	Partial 1 N 82.3
		Botanical and zoological gardens and nature reserves activities	Botanical and zoological gardens and nature reserves activities	Partial 1 R 91.04
	Amusement parks and aquariums	Activities of amusement parks and theme parks (e.g. water parks, esp. aqua parks on lakes and sea)	Activities of amusement parks and theme parks (e.g. water parks, esp. aqua parks on lakes and sea)	Partial 1 R 93.21
		Professional	Operation of sports	Partial 1 R 93.11

Established sector	Sub-sector	Industry	Coverage EUROSAT	NACE-codes
Maritime security and defence	sport competitions and related sectors	facilities (incl. organisation of sport events for professionals e.g. marine Olympic sports and other racing events)		
		Gambling and betting activities	Partial 1	R 92
	Cultural tourism and other cultural (market) values	Artistic creation	Partial 1 & Partial 2	R 90.03
		Physical well-being activities (e.g. wellness retreats)	Partial 1	S 96.04
		Museums activities	Partial 1	R 91.02
	Naval and related defence activities	Defence activities	Partial 1	O 84.22
	Shipbuilding and weaponry	Manufacture of military vehicles (incl. ship building of submarines, aircraft carriers etc.)	Partial 1	C 30.4
		Manufacture of maritime weapons and ammunition	Partial 1	C 25.4
		Manufacture of specialised maritime military equipment (incl. communications, navigation, sonar and radar etc.)	Partial 1	C 25.5 & C 26
	Repair and maintenance	Repair of specialised maritime military equipment	Complete	C 33.15
		Repair of fabricated metal products (incl. R&M of weapons and weapon systems)	Partial 1	C 33.11
Research and education	Research and development	Research and experimental development on biotechnology	Partial 1	M 72.11
		Research and experimental development on social sciences and humanities	Partial 1	M 72.2
		Other research and experimental development on natural sciences and engineering	Partial 1	M 72.19

Established sector	Sub-sector	Industry	Coverage EUROSAT	NACE-codes
Established sector	Manufacturing	Engineering activities and related technical consultancy	Partial 1	M 71.12
		Seabed exploration survey and mapping	Partial 1	M 71.12
		Technical testing and analysis	Partial 1	M 71.2
		Repair of electronic and optical equipment (incl. lab equipment)	Partial 1	C 33.13
		Activities of professional membership organisations (e.g. IIFET, EAFFE etc.)	Partial 1	S 94.12
	Governance and data	Business and other management consultancy activities (incl. fish stocks management)	Partial 1	M 70.22
		Data and information services	Partial 1	J 63.11
		Digitalisation services	Partial 1	J 62
	Education	Technical and vocational secondary education (incl. tuition for ship licences, lifeguard and survival training)	Partial 1	P 85.32
		Post-secondary non-tertiary education	Partial 1	P 85.41
		Tertiary education (e.g. marine biology, naval engineering etc.)	Partial 1	P 85.42
		Sports and recreation education (incl. instructor training for sports and recreation activities, e.g. surf, diving, and professional athletes)	Partial 1	P 85.51

Like the Established sectors, the table below provides a similar overview of the sectors that are identified and marked as Emerging sectors during this study. As a first observation, fewer industries have "complete" coverage under EUROSAT. For instance, under the Emerging sector "Water treatment and supply", the subsector "Water supply" has the industry "Water collection, treatment and supply" marked as complete. However, the industry "Remediation activities and other waste management services" is marked as

Partial 1. As the waste management activities can include urban waste management, it covers only a part of the activities that may occur close to the sea.

Additionally, as Emerging sectors must include the sectors that will be important in the future, Ecosystem services has been included in the list along with the relevant sub-sectors and industries that will be part of the sector. The current NACE rev 2.0 does not account for Ecosystem services, therefore now data is available now with EUROSTAT on the topic.

Table 4 Results of the availability assessment (emerging)

Emerging sector	Sub-sector	Industry	Coverage by Eurostat	NACE-codes
Blue energy	Renewable energy	Wind farms	Partial 1	D 35.11 & D 35.12
		Ocean energy and hydro industries	Partial 1	D 35.11 & D 35.12
		Solar farms at sea	Partial 1	D 35.11 & D 35.12
		Other energy	Partial 1	D 35.11 & D 35.12
Blue Bioeconomy	Pharmaceuticals	Manufacture of pharmaceutical products	Partial 1	C 21.1 & C 21.2
		Wholesale and retail of pharmaceutical goods	Partial 1	G 46.46 & G 47.73
		Manufacture of marine bio-based cosmetics	Partial 1	C 20.42
		Wholesale and retail of marine bio-based cosmetics	Partial 1	G 46.45 & G 47.75
		Manufacture of veterinary pharmaceuticals (incl. antibiotics)	Partial 1	C 21.1 & C 21.2
	Agriculture, livestock, veterinary products, and aquaculture	Manufacture of pesticides and other agrochemical products	Partial 1	C 20.2
		Manufacture of plastic plates, sheets, tubes and profiles (i.e. bioplastics)	Partial 1	C 22.21
		Manufacture of plastic packaging goods	Partial 1	C 22.22
		Wholesale of bio-plastic goods	Partial 1	G 46.76
	Biofuel and other bio-refined	Manufacture of biofuel and other chemical products	Partial 1	C 19.2

Emerging sector	Sub-sector	Industry	Coverage by Eurostat	NACE-codes
Water treatment and supply	Water supply	chemicals	chemical products (incl. industrial salt)	
		Water collection, treatment and supply	Complete	E 36
		Remediation activities and other waste management services	Partial 1	E 39
		Test drilling and boring	Partial 1	F 43.13
	Regulating	Desalination	Complete	E 36
		Climate regulation (incl. carbon sequestration)	Not available	Not available
		Nutrient cycling	Not available	Not available
		Water purification	Not available	Not available
		Waste treatment	Not available	Not available
		Coastal and flood protection	Not available	Not available
Ecosystem services	Cultural (non-market)	Erosion control and sediment retention	Not available	Not available
		Climate regulation	Not available	Not available
		Biological control and habitat provisioning	Not available	Not available
		Aesthetics value (e.g. higher house or apartment values)	Not available	Not available
		Non-market cultural values (incl. biodiversity, species preservation, cultural heritage etc.)	Not available	Not available
		Other non-use values: existence/bequest value	Not available	Not available

Although there are no comprehensive account of marine ecosystems within SSAs to date, it is important to consider the values of such ecosystems to the Blue Economy in order to inform decision makers based on fairer comparisons with economic information on industry (OECD 2019). Especially since many Ecosystem services from the marine environment directly impact the performance of commercial sectors (e.g. fisheries, tourism, oil and gas, blue biotechnology etc.). The consideration of marine ecosystems and potential accounting approaches, as well as information gaps, should be deliberated during the conceptual phase.

There are several classification systems for identification, differentiation and categorisation of ecosystem system services generated by ecosystem assets, including the Millennium Ecosystem Assessment (MA 2005), the Economics of Ecosystem and Biodiversity (TEEB 2010), and the Common International Classification for Ecosystem services (CICES v5.1, European Environmental Agency)¹⁵. All three classification systems can be helpful in conceptualising ecosystem goods and services that need to be valued in a comprehensive satellite account of the maritime economy. For example, the Millennium Ecosystem Assessment (MA 2005) provides the basic framework for assessing the avenues through which ecosystems contribute to human wellbeing, through goods and services provided¹⁶. It also ties in the concept of total economic value (TEV) to the broad set of economic values associated with Ecosystem services, matching services with the typology of values provided by Ecosystem services (i.e. direct use values, indirect use value, option value and non-use value).

2.3. IDENTIFICATION OF ORGANISATIONS AND DATA SOURCES WITH ASSESSMENT OF DATA AVAILABILITY

As a next step to the project, the consortium conducted extensive desk research to identify relevant organisations which represent and are potential data sources for established and emerging sectors. During the desk research, the scope of data availability was not limited to GVA, turnover, and employment, but included sources for technical, service and production data. For example, OSPAR database reports ecological and physical data while SolarPowerEurope publishes an annual report on the assimilation of solar technologies in addition to the production data. This resulted in identifying technical sectoral data sources identified along with relevant organisations' published reports and contact details.

Table 5 and Table 6 below indicate the list of organisations identified for established and emerging sectors along with the primary data collected from them. The detailed list along with the summary of data availability and access can be found in Appendix 1 (see attached Excel).

Table 5 Sample of identified organisations (established)

Established Sector	Organisation	Data collected
Marine living resources	Sustainable Pearls	http://www.sustainablepearls.org/pearl-farming/pearl-farming-world-map/
	Institut français de recherche pour l'exploitation de la mer (IFREMER ¹⁷)	http://data.ifremer.fr/pdmi/portalssearch/main
Marine non-living resources	Energy Peat (Swedish Peat Association)	https://unstats.un.org/unsd/energystats/methodology/documents/IRES-web.pdf
	EU Offshore Authorities Group	https://euroag.jrc.ec.europa.eu/node/63#_ftn1

¹⁵<https://cices.eu/cices-structure/>

¹⁶MA (2005), *Ecosystems and human well-being: biodiversity synthesis*, Millennium Ecosystem Assessment Series, World Resources Institute, Island Press, Washington, D.C., USA

¹⁷<https://wwz.ifremer.fr/>

Established Sector	Organisation	Data collected
	EU Dredging Association	https://www.emodnet-humanactivities.eu/blog/?p=785
	Central Dredging Association	ThinkNature_Handbook_110919.indd (european-dredging.eu) Resources Central Dredging Association Central Dredging Association
	EU Salt Producers Organisations	Analysis of EU salt markets
	International Seabed Authority	Economic considerations in Mining - https://www.isa.org.jm/documents/mining-cobalt-rich-ferromanganese-crusts-and-polymetallic-sulphides
Port activities	European community ship owner's association	Port Data base - https://www.porteconomics.eu/portdatabase/2017-2/
	European Sea Ports Organisation	ESPO - Facts and Figures - https://www.espo.be/fact-and-figures

The organisations were easily identifiable for established sectors at the industry level. However, searching for organisations and databases for emerging sectors proved to be challenging with most organisations identified at sector or sub-sector level. The key reason is attributed to the unavailability of marine proportions for most of the sectors in organisational reporting. A more detailed discussion on this topic is covered in task 2. The table below shows the key data points that were received from the organisations during the reach-out process. It is important to note that the during this phase, the data received was not limited to economic data only, and included technical data related to the sectors. Few consolidated datasets at sector level were identified as majority of the sectors and sub-sectors listed under Emerging are not as organised as the Established sectors. In task 2 a more in-depth data collection was conducted for the case study countries where data was identified for individual industries, sub-sectors and sectors.

Table 6 Identified organisations (emerging)

Emerging sector	Organisation	Data Collected
Blue Energy	Wind Europe	Annual offshore statistics - https://windeurope.org/wp-content/uploads/files/about-wind/statistics/WindEurope-Annual-Offshore-Statistics-2019.pdf

Emerging sector	Organisation	Data Collected
Blue Bioeconomy		Local Impact - https://windeurope.org/wp-content/uploads/files/about-wind/reports/WindEurope-Local-impact-global-leadership.pdf
	Ocean Energy Europe	Europe key trends and statistics - http://www.oceanenergy-europe.eu/wp-content/uploads/2019/04/Ocean-Energy-Europe-Key-trends-and-statistics-2018_web.pdf
		International activities - https://report2018.ocean-energy-systems.org/international-activities/
	SolarPowerEurope	Neutral Europe - https://www.solarpowereurope.org/wp-content/uploads/2020/04/SolarPower-Europe-LUT_100-percent-Renewable-Europe_mr.pdf?cf_id=11587
Water treatment and supply	OSPAR	Data repository - https://odims.ospar.org/odims_data_files/
	French Spirulina association	https://www.eumofa.eu/blue-bioeconomy-report-2020-edition-is-online
	European Joint Research Centre	EMODNET database- https://ec.europa.eu/jrc/en/science-update/new-dataset-algae-production-europe
	European Algae Biomass Association	Algae biomass production data - https://ec.europa.eu/jrc/en/science-update/algae-biomass-production-bioeconomy
	European Marine Biological Research Centre	http://www.ehu.eus/PIE/index.php/whats-pie/networking/embr/
	GWI water data	https://www.gwiwaterdata.com/
	Desaldata	https://www.desaldata.com/

Note: the organisations' names have embedded links in the table above.

2.4. CHALLENGES AND RECOMMENDATIONS

The output of the exercise on data source identification and checking for availability at a subsector level indicated that most of the sub-sector and industry classifications in NACE 2.0 do not have any provision to distinguish between Marine vs non-marine proportions even up to 4 digits. This entails that even if the data for countries is collected at 4-digits, an external mechanism to extract the marine proportion may be required. From an operational point of view, Structural Business Statistics (SBS) has its merits in identifying all of the sea-based and coastal activities, but it falls short at this current stage of its development in covering all the relevant data in the Blue Economy statistics. Many of the activities regarded as part of the Blue Economy in the NACE rev 2.0 classification are currently not covered in SBS (e.g. capture Fisheries and aquaculture), or are only partially linked to the maritime (e.g. activities associated with, manufacture or tourism) and thus consist of parts, which cannot be included in the Blue Economy sector as such. Furthermore, some maritime activities refer to the economic activities not classified elsewhere; particularly those related to the development of the resources of renewable energy, marine biotechnology).

SBS remain an important source of information on the Blue Economy. However, there is neither an agreed scope, nor a clear consensus regarding which sectors and economic activities in SBS should be included in the Blue Economy report. In addition, SBS do not distinguish land-based from marine-based activities, which can therefore affect the measurement of the size of the Blue Economy sector. In this context, although DGMARE uses official statistics from SBS and other official statistics for their Blue Economy Report to provide comparable data on the Blue Economy across Member States, the measuring of several maritime sectors is challenging due to the lack of data, or assumptions made to estimate the marine based values of the sector.

Additionally, it may be possible to extract marine data by individually looking at the constituent industries and consolidating the data points (bottom-up), but a more detailed analysis will be conducted in the subsequent chapter with the help of case study countries. Additionally, the relevance of Ecosystem services is growing as part of the Emerging sectors as can be seen in the latest Blue Economy reports. As noted by the OECD (2019)¹⁸, valuing marine ecosystems needs to be done in a transparent and evidence-based manner. The System of Environmental Economic Accounting (SEEA) Central Framework is the internationally accepted standard for environmental accounting, adopted through the United Nations Statistical Commission in 2012. It outlines the key accounting requirements and provides guidelines for developing environmental accounts in line with principles of the 2008 SNA. However, as the SEEA Central Framework focuses on the stock of individual environmental assets, it falls short in accounting for benefits from Ecosystem services that exist only when environmental assets function in combination (OECD 2019). Hence, an extension to the SEEA Central Framework was developed, the SEEA Experimental Ecosystem Accounting (SEEA-EEA), which specifies how ecosystem assets and their provisioning, regulating and cultural services can be accounted for in both physical and monetary terms. This is elaborated in detail in section 5.2.3.

In the next chapter, two possible approaches to extract the marine proportions that were identified and explored with varying degrees of success for the case study countries. This exercise provides valuable insights into the potentially scoping of the activities and feasibility assessment of the observatory and the Sea Satellite Account by providing initial insights on the challenges in data availability.

¹⁸<https://www.oecd.org/cfe/tourism/tourismsatelliteaccountrecommendedmethodologicalframework.htm>

3. TASK 2 DATA COLLECTION

For task 2, based on the initial consultations with the Commission and the steering committee, Spain, France and Sweden were selected as the case study countries. The selection was made considering the following factors for the identified Member States:

- significance/presence of emerging/innovative sectors in Blue Economy;
- type of data sources (National Accounts, sector statistics – detailed output from task 1). It is preferable to select the three Member States such several data source types can be covered via case studies to have comprehensive data for analysing the observatory setup;
- Geographical distribution (coverage of main sea basins).

After the selection of case study countries, the consortium used a step by step approach to structure the sectors, reach out to the organisations and collect data:

- **step 1:** Align sectors and industries as per NACE, CPA and PRODCOM;
- **step 2:** Reach out to identified organisations for additional data on Spain, Sweden, and France;
- **step 3:** Identify data sources with estimates of Marine activities;
- **step 4:** Collect data from bottom-up resources for Spain, Sweden, and France.

The steps mentioned above are in-line with the initial approach highlighted in the inception report. However, slight adjustments were made to the approach based on the findings of task 1 and the regular alignment with the Commission in tri-weekly meetings. The results of executing each step are discussed in detail in this section.

3.1 STEP 1: ALIGN SECTORS AND INDUSTRIES AS PER NACE, CPA AND PRODCOM

As the first step before the data collection, the consortium aligned the proposed classification of established and emerging sectors, sub-sectors and industries as per NACE (4-digits), CPA (6-digits) and PRODCOM (8-digits). As all 3 classifications are well defined within the European data collection framework, aligning the sectors as per these classifications enables the structuring and reporting of the sectors into a satellite account. This would provide consistency in methodology while proposing the account structure in task 4. A brief explanation on the 3 classifications is provided below:

- NACE (4 digits, data for activities encompassing goods and services in the EU);
- CPA (6 digits classification framework for all NACE categories A to U, data might be available for certain countries but not all EU) and;
- PRODCOM (8 digits, data for only goods/outputs from categories B to E).

Table 7 and 8 below present the mapping of sectors and sub-sectors as per NACE, CPA and PRODCOM. It is important to note that multiple NACE codes are shown for a particular sub-sector as each subsector contains multiple industries. All the sectors up to the industry level were mapped to the NACE codes at the 4-digit level.

Table 7 Sectors per NACE, CPA, and PRODCOM (established)

Established sectors	Sub-sector	NACE Codes	CPA and PRODCOM
Marine living resources	Primary production	03.1, 03.2, 10.2	Complete at NACE level
	Processing and distribution	10.41.12, 10.85.12, 10.89.14, 32.12.1146.38.1	Complete at NACE level

Established sectors	Sub-sector	NACE Codes	CPA and PRODCOM
Marine non-living resources	Offshore drilling, oil, and gas	06.1, 06.2, 09.1	Partially complete at NACE level
	Other minerals (incl. seabed mining)	08.12, 08.93, 08.92, 08.91, 08.11, 07.29	Partially complete at NACE level
	Processing and distribution	19.2, 20.11, 35.21, 20.12, 20.15, 20.42, 20.59, 23.3, 23.4, 23.52, 23.7, 24.41, 24.43, 24.44, 24.45, 35.22, 46.71, 46.72, 46.75, 46.12, 09.9	Partially complete at NACE level
Port activities	Ports and wharfs	35.15, 36, 52.22, 52.24	52.22.11 to 52.22.16, 52.24.11, 52.24.13
	Biosecurity	81.29, 71.2, 84.13	71.20.12, 84.13.11
	Warehouse and storage	52.1, 77.39, 33.11	52.10.19, 52.10.11, 77.39.12, 33.11.12
Maritime transport, logistics and storage	Shipping and freight	50.2, 50.4	Complete at NACE level
	Passenger transport	50.1, 50.3	Complete at NACE level
	Support services	77.34, 52.22	Complete at NACE level
Shipbuilding and repairs	Shipbuilding and engineering	30.11, 30.12, 38.31	Complete at NACE level
	Repairs and maintenance	33.15, 33.12, S95.12, 33.13, 33.14, 33.19	33.12.11, 95.12.10, 33.13.11, 33.14.11, 33.10
Coastal tourism and recreation	Accommodation	56, 55.1, 55.2, 55.3, 55.9	Partially complete at NACE level
	Transport	51.1, 50.1, 49.1, 77.21, 49.31, 47.3, 77.11, 49.32	49.10.11, 77.21.10
	Tour services	79.11, 79.12, 79.9	Partially complete at NACE level
	Recreational activities	93.12, 93.19, 94.99, 93.29	93.12.10, 93.19.11, 94.99.16, 93.29.11
	Other expenditures	47.78, 47.64, 47.71, 56.1, 56.3	Partially complete at NACE level
Maritime Services	Traffic control and safety	62.01, 62.02, 62.03, 62.09, 63.11, 63.12,	61.20.30, 61.30.10, 27.90.70,

Established sectors	Sub-sector	NACE Codes	CPA and PRODCOM
Infrastructure and maritime works		61.2, 61.3, 27.9, 43.21, 52.22, 84.24, 93.29, 63.99	52.22.19, 84.24.19, 93.29.11
	Insurance and financial services	65.12, 65.2, 64.9, 64.2, 64.3, 66.3, 69.2, 78.1, 68, 69.1, 70.21	65.12.34, 65.12.35, 65.20.23, 64.91.10
	Provisioning services	46.14, 46.17, 46.71	46.14.12
	Associations and organisations	94.11	Partially complete at NACE level
	Other services	81.29, 38.11, 74.9, 84.1	81.29.13, 74.90.14
Entertainment	Water projects	42.91	Complete at NACE level
	Underwater sea cables	42.22, 33.2, 33.19	Partially complete at NACE level
	Oil and gas pipelines	42.99	Partially complete at NACE level
	Other infrastructures (incl. maritime equipment)	42.11, 42.13, 42.21, 43.99	43.99.10
	Support services	77.32, 77.89	Partially complete at NACE level
Maritime security and defence	Film entertainment	59.11	Partially complete at NACE level
	Photography	74.2	Partially complete at NACE level
	Events	82.3	Partially complete at NACE level
	Amusement parks and aquariums	91.04, 93.21	Partially complete at NACE level
	Professional sport competitions and related sectors	93.11, 92	Partially complete at NACE level
Research and education	Cultural tourism and cultural (market) values	90.03, 96.04, 91.02	Partially complete at NACE level
	Naval and related defence activities	84.22	84.22.11
	Shipbuilding and weaponry	30.4, 25.4, 25.26	Partially complete at NACE level
	Repair and maintenance	33.15, 33.11	33.11.14
	Research and development	72.11, 72.2, 72.19, 71.12, 33.13, 94.12, 84.1	71.12.16, 33.13.11
Governance and data	Governance and data	70.22, 63.11, 63.12	Partially complete at NACE level
	Education	85.32, 85.41, 85.42, 85.51	Partially complete at NACE level

As can be seen from the tables, not all CPA and PRODCOM codes had a consistent mapping to the sub-sectors. Additionally, no mapping codes are available for Ecosystem services under emerging sectors as it is a relatively new sector that was not included in NACE rev 2.0.

Table 8 Sectors per NACE, CPA and PRODCOM (emerging)

Emerging sectors	Sub-sector	NACE Code	CAP and PRODCOMo
Blue energy	Renewable energy	35.11, 35.12	Partiallycomplete at NACE level
Blue Bioeconomy	Pharmaceuticals	21.1, 46.46, 47.73, 20.42, 46.45, 47.75	Partiallycomplete at NACE level
	Agriculture, livestock, veterinary products and aquaculture	10.91, 10.92, 21.1, 20.2	Partiallycomplete at NACE level
	Bioplastics	22.21, 22.22, 46.76	Partiallycomplete at NACE level
	Biofuel and bio-refined chemicals	19.2, 46.75	Partiallycomplete at NACE level
Water treatment and supply	Water supply	36, 39, 43.13	Partiallycomplete at NACE level
	Desalination	36	Complete at NACE level
Eco-system services	Regulating	Not available	Not available
	Cultural (non-market)	Not available	Not available

A detailed list of all the sectors, sub-sectors and industries mapping to the classifications can also be accessed in Appendix 1.

3.2 STEP 2: REACH OUT TO IDENTIFIED ORGANISATIONS FOR DATA ON SPAIN, SWEDEN, AND FRANCE

Once the mapping of the sectors was complete, the next step was to locate the data on the sectors. The first phase of data collection was conducted by reaching out to the identified organisations indicated in task 1. This helped to validate and gather data not readily available online during the preliminary desk research. The Tables 9 and 10 below show the total number of organisations contacted and how many have responded. The cells containing “complete” are either covered by Eurostat and complete at NACE level. The cells containing “none identified.” are not identified due to the limited size of the sector for case study countries.

Table 9 Organisations identified and responded per sub-sector (established)

Established sectors	Sub-sector	Organisations identified and reached out	Organisations responded
Marine living resources	Primary production	Complete	Complete
	Processing and distribution	2	1
Marine non-living resources	Offshore drilling, oil, and gas	4	0
	Other minerals (incl. seabed mining)	10	3
Port activities	Processing and distribution	none identified	none identified
	Ports and wharfage	4	2
	Biosecurity	none identified	none identified.
Maritime transport, logistics, and storage	Warehouse and storage	6	1
	Shipping and freight	1	0
	Passenger transport	Complete	Complete
Shipbuilding and repairs	Support services	Complete	Complete
	Shipbuilding and engineering	Complete	Complete
	Repairs and maintenance	Complete	Complete
Coastal tourism and recreation	Accommodation	2	0
	Transport	5	1
	Tour services	3	0
	Recreational activities	4	2
	Other expenditures	2	0
Maritime Services	Traffic control and safety	4	2
	Insurance and financial services	none identified	none identified
	Provisioning services	none identified	none identified
	Associations and organisations	none identified	none identified
	Other services	none identified	none identified
Infrastructure and maritime works	Water projects	Complete	Complete
	Underwater sea cables	4	1
	Oil and gas pipelines	none identified	none identified
	Other infrastructures	none identified	none identified
	Support services	none identified	none identified
Entertainment	Film entertainment	none identified	none identified
	Photography	none identified	none identified
	Events	none identified	none identified
	Amusement parks and aquariums	4	4
	Professional sport competitions and related sectors	3	1
Maritime security and defence	Cultural tourism and cultural (market) values	none identified	none identified
	Naval and related defence activities	none identified	none identified
	Shipbuilding and weaponry	1	0
	Repair and maintenance	Complete	Complete
Research and education	Research and development	1	0
	Governance and data	1	1
	Education	2	0

Out of the 50+ organisations contacted during this phase, 26 organisations responded positively to our requests and 9 shared data sources not available on the websites. In total 20 relevant data sources were identified that have been included in Appendix 1.

The summary of the reach out process and the responses of the organisations have been recorded in Appendix 2.

It is important to note that if data needs to be requested periodically from the industry organisations, an agreement may be required between the organisation and the institute collecting the data (for example, Blue Observatory) and these organisations in the form of a mandate. How the organisations can support the data collection by a Blue Observatory will be discussed in detail in chapter 4 and chapter 5.

3.3 STEP 3: IDENTIFY DATA SOURCES WITH ESTIMATES OF MARINE ACTIVITIES

The next phase of the data collection was conducted through desk research for data on different countries. In this phase, the consortium exhausted several public and private databases. However, there were two possible approaches that could be adopted. These approaches are described below:

- collecting the **macro-level**(top-down) data and calculating the Marine proportions from the overall data using coefficients;
- collecting **micro-level** (bottom-up) marine data through directed reach out to industry associations and online private and public data sources.

The benefits and limitations of both the approaches have been discussed in section 3.5 To be exhaustive with the search for data, the consortium applied both the macro approach and the bottom-up approach to be able to create and present a complete picture of the available data. However, priority in time spend was given to bottom-up data collection as macro data was readily available with Eurostat and the national statistics offices.

The Blue Economy report uses parts of the macro-level data collection approach in its methodology to calculate data on sectors where the macro-level reporting includes both Marine and non-marine sectors.

For both approaches, data was collected for the following variables:

- number of enterprises;
- total turnover;
- Gross Value Added (defined in the dataset as added value at factor cost);
- the number of employees.

The next section details the data collected and the challenges identified in the process.

3.4 STEP 4: COLLECT DATA FROM BOTTOM-UP DATA SOURCES FOR SPAIN, FRANCE, AND SWEDEN

Data for the case study countries for the established and emerging sectors was collected using both desk research and targeted stakeholder interviews.

1) Desk research

To record the relevant information (industry size: # of companies, turnover, and # of employees), detailed desk research was conducted. In all the searches in the public and private databases, relevant filters were applied to find the proportion of the industry which is directly applied to the established and emerging Blue Economy sectors. However, it was observed that all supplementary databases did not always have the required level of detailed information.

The list of public and private databases used for collecting the data have been listed below with key observations. The principle databases were used for macro-level data collection for aggregated industries and sub-sectors. While secondary and private databases were used to look for bottom-up data of companies in the marine sectors. The step by step approach for bottom-up data collection is outlined below in Figure 4.

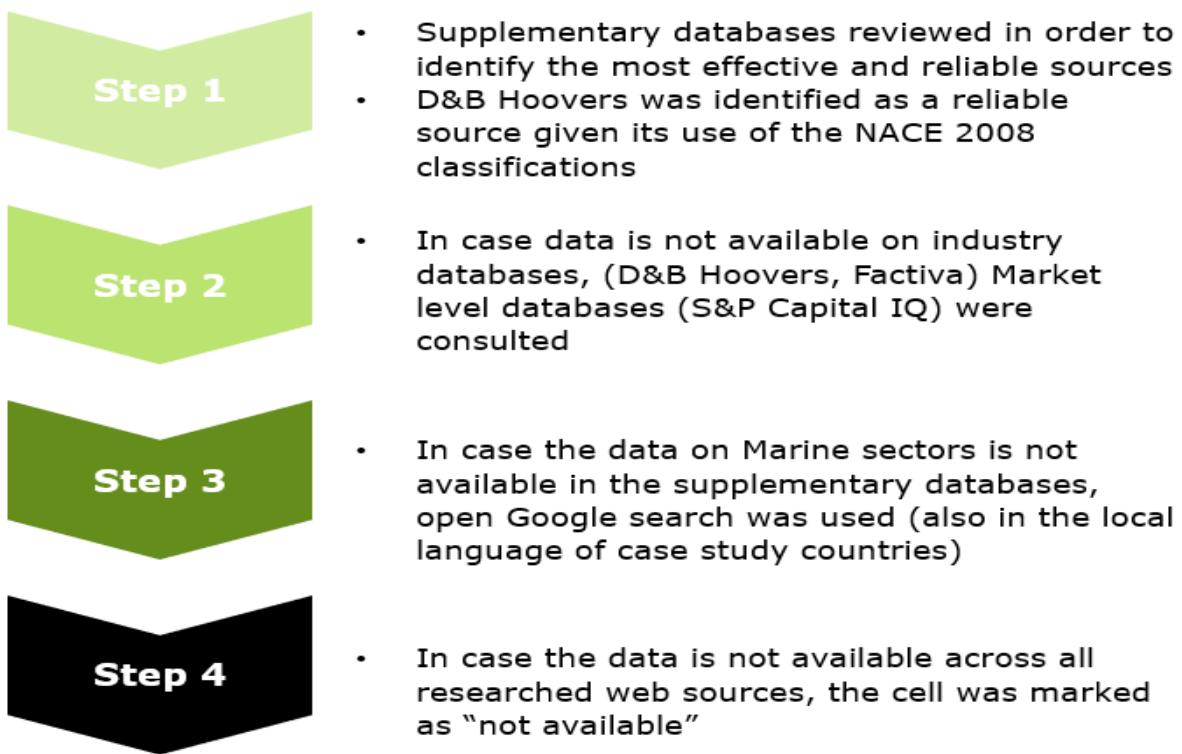


Figure 4 Data collection steps in desk research

If no data was located after going through primary and secondary databases, the corresponding cell was marked with "not available". An overview of the collected data can be found in Appendix 4 (see attached excel).

While searching for individual data-points in the principal databases, it was observed that the data-points were consolidated at the industry level (NACE rev 2.0 4-digits) and did not go beyond for the case study countries. Although the classification of data continues to a more detailed level (6-digits) none of the 3 countries invested resources for data collection at that level. During the interviews with the national statistics offices of the case study countries¹⁹, it was highlighted that EUROSTAT requests data from the countries to be collected at a 4-digit level of detail. Therefore, majority of the countries do not collect granular data. France was observed to collect data at 5-digit level, but the datasets were available only on request. The national statistics offices mentioned that in some cases, more granular data was collected up to 6 digits, but the information is not shared openly as it may contain confidential sectors (defence). However, the data available up-to 4-digit level is publicly accessible on the statistics office websites for the countries and is updated more frequently than the Eurostat website. However, as the level of detail stops at NACE rev 2.0, 4-digit level, it is not possible to split the Marine and non-marine industries to a higher level of detail. In all 3 case study countries, there has never been a mandated exercise conducted by the statistics offices to calculate the exact portion for marine industries, and therefore no such methodology exists at the national level. Conducting such an exercise for each industry beyond a 4-digit level was indicated as an academic process that may require significant time (more than 1 year) and resources (dedicated staff and funding). This is not something that is prioritised by any of the three case study countries.

¹⁹ See Appendix 2 and 3 for summary of interviews

As the data on the exact marine portions of the industries that contribute towards to Blue Economy were not available through Principal databases, the consortium then proceeded to search through supplementary databases as indicated in the table below. However, this process had its own challenges, as all the data is behind paywalls and requires professional license to access. As Deloitte is subscribed to all the below databases, it was possible to access the data without any additional costs. The costs for these databases must be accounted when setting up the observatory if these databases are deemed important. A positive insight related to some of the supplementary databases (D&B Hoovers, Factiva) is that the data is mapped to the NACE rev2.0 classification. This meant that individual industries could be searched manually. However, as the data sources include information only from publicly listed companies, only a fraction of the overall economic value was represented in the databases. The economic value of small and medium enterprises, family owned ventures and other privately held companies was excluded from these databases.

Apart from the above-mentioned observations, Factiva used an older version of the NACE classification, which led to omitting of industries (cold storage) from the databases. Lastly, global databases, such as Capital IQ, which provides very detailed company level financial and industry profile information of publicly listed companies could not be fully utilised as it uses the North American Industry Classification System (NAICS) systems instead of NACE. Due to the above challenges faced, the process of bottom-up data collection was reduced to a manual line-by-line search for individual data points of the industries. An overview of the data collected from this process can be easily accessible in Appendix 4. A more consolidated view of the data captured for all the industries in Spain, France and Sweden is also provided in the section below.

Table 10 Public data sources overview

Type of databases	Public data sources used
Principal databases	Eurostat
	PRODCOM
	National statistics offices
	D&B Hoovers
Supplementary databases	Factiva Companies/Markets
	S&P Capital IQ
	EMIS

2) Interviews with identified organisations

To supplement the desk research, the consortium conducted 11 interviews with the industry organisations identified in task 1 as well as national statistics offices of the case study countries. In addition, a total of 50 organisations were reached out and 26 of them responded positively to the request. Moreover, 12 out of those 50 organisations were able to identify relevant sources which the consortium could try to gather more information.

The Table11 provides a summary of the interviews. For a more detailed overview, refer to Appendix 2 (see attached excel).

Table 11 Interview results

Organisation	Subject of interview
European Boating Industry	Data availability for the European boating industry, recreational sector
Eurostat	Information on data breakdown at EU and national level, according to NACE/SBS and PRODCOM classifications
Desaldata and GWI Data	Data availability for water supply and desalination sector

European Maritime Safety Agency		Data availability on traffic control and safety within Maritime services sector
European network of Maritime Clusters		Data availability on Blue Economy data and current sectors and new sectors including the various subsectors that make the maritime value chain
Arntz van Helden		Data availability for the European maritime surveyors, Governance and data sector
Statistics Sweden		Information on Blue Economy data per sectors, sub-sector and industry at national level, including information on data quality and feasibility in case data is unavailable
Statistics Sweden		Information on Blue Economy data per sectors, sub-sector and industry at national level, including information on data quality and feasibility in case data is unavailable
INSEE - National Institute of Statistics and Economic Studies France		Information on Blue Economy data per sectors, sub-sector and industry at national level, including information on data quality and feasibility in case data is unavailable
Spanish Statistical Office - INE		Information on Blue Economy data per sectors, sub-sector and industry at national level, including information on data quality and feasibility in case data is unavailable
ICPC		Information on submarine cables
Sea Europe		Information on Maritime Defence sector
European Market observatory of Fisheries and aquaculture products (EUMOFA)		Information on the observatory and the Sea Satellite Account
COGEA		Information on the observatory and the Sea Satellite Account
French observatory for the Sea		Information on the observatory and the Sea Satellite Account
Central Bureau of Statistics (NL)		Information on the observatory and the Sea Satellite Account
Statistics Portugal		Information on the observatory and the Sea Satellite Account
National Oceanic and Atmospheric Administration		Information on the observatory and the Sea Satellite Account
Bureau of Economic Analysis		Information on the observatory and the Sea Satellite Account

The questionnaires used for interviews can be found in Appendix 3 of the report (see attached excel). A separate set of questionnaires was used for industry associations and national statistics offices.

In addition to the bottom-up data collection, the consortium reviewed different sources to find the methods to calculate “split coefficients” that can help in separating the contribution of an industry to the Blue Economy from the portion that does not contribute. However, through the interviews, it was highlighted that such a large-scale activity for the Blue Economy had never been undertaken by any of the 3 case study countries. Conducting such an exercise for each industry beyond a 4-digit level was indicated as an academic process that may require significant time (more than 1 year)

and resources (dedicated staff and funding). This is not something that is prioritised by any of the three case study countries. Additionally, the consortium did not come across a non-technical position papers that could facilitate calculating these “split coefficients” with ease. There were, however, robust sources from countries other than Spain, France and Sweden, that have been discussed in detail in chapter 5 when the methodology for setting up the Sea Satellite Account is elaborated. The reflections of this approach are also shared in section 3.5.

Additionally, sector by sector observations encountered by the consortium have been highlighted in the Tables 12 and 13 below.

Table 12 Summary of observations (established)

Established sector	Key observations & summary
Marine living resources	<ul style="list-style-type: none"> The sector is quite complete at NACE level The only industry which required searching for data is “Processing and preserving of fisheries products not fit for human consumption”, data has been downloaded from D&B but there is no split
Marine non-living resources	<ul style="list-style-type: none"> Majority of the industries have relatively small share in the Blue Economy composition for the case studies No data available for the industry “Extraction of peat” as most companies are in the UK For mining and quarrying, data has been downloaded from D&B there is no split
Port activities	<ul style="list-style-type: none"> This sector is complete at NACE level
Maritime transport, logistics, and storage	<ul style="list-style-type: none"> This sector is complete at NACE level
Shipbuilding and repairs	<ul style="list-style-type: none"> Majority of the industries have relatively small share in the Blue Economy composition for the case studies
Coastal tourism and recreation	<ul style="list-style-type: none"> Majority of the industries have relatively small share in the Blue Economy composition for the case studies Data was difficult to gather as the definition of coastal tourism (besides cruise) and recreation around the coastal area is unclear
Maritime services	<ul style="list-style-type: none"> Majority of the industries have relatively small share in the Blue Economy composition for the case studies
Infrastructure and maritime works	<ul style="list-style-type: none"> Majority of the industries have relatively small share in the Blue Economy composition for the case studies

Established sector	Key observations & summary
	<ul style="list-style-type: none"> For "Underwater Sea Cables", it was recommended by experts to exclude tubes, pipes, and hoses as they are irrelevant to submarine cables
Entertainment	<ul style="list-style-type: none"> Data is very difficult to gather as the scope is large and definition is very broad
Maritime security and defence	<ul style="list-style-type: none"> Data is confidential and largely unavailable. However, it can be bought or drawn up because of National acquisition programs
Research and education	<ul style="list-style-type: none"> Definition of the industries are very broad; hence the data is significantly overestimated

Table 13 Summary of observations (emerging)

Emerging sector	Key observations & summary
Blue energy	<ul style="list-style-type: none"> Wind farms data is downloaded from S&P Capital The rest of industry data is downloaded from Irena.org but no turnover has been reported
Blue Bioeconomy	<ul style="list-style-type: none"> EUMOFA reports on Blue Bioeconomy were reviewed for 2018 and 2020²⁰²¹.
Water treatment and supply	<ul style="list-style-type: none"> Limited data availability. Payed databases available through the paid Global Water intelligence database Desaldata.
Ecosystem services	<ul style="list-style-type: none"> Being a relatively new and emerging field, the current level of data available on Ecosystem services is limited and lacks a consistent data collection methodology

To this end, the consortium has identified and collected the data at the industry level to the extent possible and consolidated in the tables after this section. Due to the approach of collecting bottom-up data and top-down data, the consortium created two separate datasets:

- data collected from National statistics databases (macro-level);
- data collected through bottom-up research.

The Blue Economy report 2019 and 2020 data is additionally used to compare the accuracy and reliability of the collected data. The section below discussed some of the observations for each case study country. The data for each country can be found in Appendix 4 (see attached excel). Based on the data collected through all the three sources, differences in data were observed resulting in lower reliability of the data. For

²⁰<https://www.eumofa.eu/blue-bioeconomy-report-2020-edition-is-online>

²¹https://www.eumofa.eu/documents/20178/84590/Blue+bioeconomy_Final.pdf

each of the three case study countries, a sample table of comparison for all the three data sources was created namely: the Blue Economy report, the national statistics office and the data collected from private databases. The purpose of this exercise was to highlight the key differences in data sources that all follow NACE Rev2.0 classification and understand the reasons for these differences.

Additionally, it is important to note that the data collected here is from 2017. This particular year was chosen as the Blue Economy report 2019 uses 2017 data as baseline. This provided with a good basis of comparison between selected industries to check the accuracy of data collection. In the subsequent section, selected industries are compared for all 3 case study countries and key insights are presented.

Spain

As part of the data collection for Spain, the tables below show the level of data that was collected by the Consortium while engaging with the national statistics offices and the other relevant stakeholders. Data is collected for the following variables: number of companies, turnover, GVA (defined in the dataset as added value at factor cost) and the number of employees. For many industries, the data collected does not only apply to the Blue Economy but is a total of all sectors (including the Blue Economy). Desk research was conducted to find out how to split the data that does not only apply to the Blue Economy. There is a lot of qualitative information about the industries, however, an extensive search shows that the share of the Blue Economy is unknown for the industries since quantitative data is missing. As a result, no estimate can be made of a coefficient that can be used to split the data to highlight the exact contribution of the sector to the Blue Economy. There are individual data-points that were missing for some of the industries, as the country may not be collecting this information due to:

- industry is missing from the local data collection framework;
- data was not collected for the particular year.

In Spain, the Structural Enterprises Statistic (SES) covers all the activities mentioned as per the established and emerging sectors defined by the project team, except NACEs 01-03. These codes are covered by the Ministry of Agriculture and Fisheries of Spain. INE (National Statistics Institute) is the organisation responsible for collection and collation of statistics data. The maximum level of detail for the collected data is each whole class, i.e., 4 digits of NACE. The Industrial Products Survey (IPS) released by INE covers NACE sectors C and D sectors, up to 8 digits of PRODCOM products classification. However, there is no exercise undertaken in the past to split the marine and non-marine data as per NACE or PRODCOM sectors.

As per the interview conducted with INE Spain, the Ministry of Fisheries and/or Ministry of Ecologic Transition has some partial information on marine and non-marine sectors. However, collecting this information is not standard practice. Undertaking such an activity as part of a mandate set by an observatory would imply a 'de facto' increase of the maximum detail of the classifications, moreover in a non-standard way. Therefore, a bigger sample size would be necessary, increasing the statistical burden for informants and the costs for INE.

Established sector	Sub-sector	Industry	Companies	Turnover (€m)	GVA (€m)	Employed	
Marine living resources	Primary production	Commercial marine fishing sector (inc. ornamental fish)	Not available	Not available	Not available	Not available	
		Marine aquaculture sector	Not available	Not available	Not available	Not available	
	Processing and distribution	Processing and preserving of fish, crustaceans and molluscs	607	6050.416	814.598	20,367	
		Manufacture of oils and fats	Not available	Not available	Not available	Not available	
		Prepared food products (incl. meals and dishes)	1,472	4217.924	855.005	19,073	
		Processing and preserving of fisheries products not fit for human consumption (incl. bait, feed, pet food etc.)	762	12598.28	1034.609	13,124	
		Processing of other fisheries products (incl. pearls and jewellery)	1,708	512.574	148.166	4,873	
		Wholesale of fisheries products	8,480	21276.946	2117.097	46,882	
		Retail sale of fisheries products	10,163	1701.029	324.346	20,248	
	Offshore drilling, oil and gas	Extraction of crude petroleum	Not available	Not available	Not available	Not available	
Marine non-living resources		Extraction of natural gas	Not available	Not available	Not available	Not available	
		Support activities for petroleum and natural gas extraction	Not available	Not available	Not available	Not available	
Other minerals (incl. seabed mining)	Harvesting of gravel, sand, clay and kaolin	949	841.281	271.309	6,128		
	Extraction of salt	54	134.287	53.28	640		
	Extraction of peat	7	10.977	2.166	38		
	Mining of chemical and fertiliser minerals (e.g. phosphate)	15	434.525	113.156	1,599		
	Quarrying of ornamental stones (e.g. limestone) and gravel and sand	801	714.474	284.428	5,494		
	Mining of other non-ferrous metal ores	44	867.221	421.375	2,001		
	Manufacture of refined petroleum products	13	38125.505	3496.897	8,708		
Processing and distribution	Manufacture of industrial gases	65	1018.391	279.735	2,233		
	Manufacture of dyes and pigments	58	934.408	211.74	2,130		

Established sector	Sub-sector	Industry	Companies	Turnover (€m)	GVA (€m)	Employed
		Manufacture of fertilisers and nitrogen compounds	340	1895.102	383.642	4,888
		Manufacture of perfumes and toilet preparations (e.g. ambergris)	560	4095.858	1151.586	15,785
		Manufacture of other chemical products N.E.C.	440	3547.868	702.878	7,857
		Manufacture of ceramic products	1,320	4614.903	1576.608	23,190
		Manufacture of lime and plaster	77	417.624	146.018	1,560
		Cutting, shaping and finishing of stone	3,224	1999.525	655.566	17,599
		Precious metals production	Not available	Not available	Not available	Not available
		Lead, zinc and tin production	18	1122.755	227.978	1,546
		Copper production	28	5332.705	458.871	1,960
		Other non-ferrous metal production	35	66.344	16.409	307
		Distribution of gaseous fuels through mains	41	1552.94	1248.419	2,080
		Wholesale of solid, liquid and gaseous fuels and related products	1,395	71123.158	2492.382	11,209
		Wholesale of metals and metal ores	1,888	13557.26	984.809	17,452
		Wholesale of chemical products (incl. industrial salt)	4,418	14923.855	1912.529	26,378
	Ports and wharfage	Agents involved in the sale of fuels, ores, metals and industrial chemicals	4,108	364.478	228.178	5,427
		Support activities for other mining and quarrying	15	112.124	42.08	686
		Port activities	872	4626.256	2145.732	18,836
		Cargo handling	708	2243.805	1224.187	17,348
	Biosecurity	Supply of electricity to port	376	6245.956	5606.202	10,422
		Supply of water to port	3,165	8261.414	4153.708	47,604
		Cleaning and de-biofouling activities	3,850	1601.532	1147.15	37,401
Maritime transport,	Shipping and freight	Laboratory examination and checks	10,153	3349.672	2035.267	49,081
		Quarantine provision and custom services	Not available	Not available	Not available	Not available

Established sector	Sub-sector	Industry	Companies	Turnover (€m)	GVA (€m)	Employed
logistics and storage	Passenger transport	Inland freight water transport	10	3.845	1.87	78
		Sea and coastal passenger water transport (water transport)	338	702.484	290.102	3,983
		Inland passenger water transport	59	22.666	14.039	495
	Warehouse and storage	Renting and leasing of water transport equipment	1,692	340.667	196.375	2,537
		Service activities incidental to water transportation	872	4626.256	2145.732	18,836
		Warehousing	1,672	4287.457	2053.656	29,798
		Cold stores	See above	Not available	Not available	See above
		Sale of containers, (incl. dry, reefer, oil etc.)	Not available	Not available	Not available	Not available
		Lease of containers, (incl. dry, reefer, oil etc.)	1,572	317.483	149.131	4,957
		Repair of fabricated metal products (incl. R&M of containers)	207	241.416	118.793	3,024
Shipbuilding and repairs	Shipbuilding and engineering	Building of ships and floating structures	316	1717.708	185.03	9,226
		Building of pleasure and sporting boats	Not available	Not available	Not available	Not available
		Dismantling of wrecks	183	661.768	111.322	2,143
		Repair and maintenance of ships and boats	2,101	1226.855	534.357	12,822
		Repair of machinery	8,675	3532.352	1594.315	40,204
	Repairs and maintenance	Repair of communication equipment	7,772	900.844	439.657	17,191
		Repair of electronic and optical equipment (incl. navigation, aeronautical and nautical equipment)	199	156.482	79.672	2,021
		Repair of electrical equipment (incl. electrical motors)	353	373.577	182.803	4,155
		Repair of other equipment (incl. fishing nets, shipping drums etc.)	217	54.403	27.187	846
		Hotels and similar accommodation	12,619	21347.375	11402.998	256,450
Coastal tourism and recreation	Accommodation	Holidays and other short-stay accommodation	12,408	2455.865	1173.322	38,114

Established sector	Sub-sector	Industry	Companies	Turnover (€m)	GVA (€m)	Employed
Transport		Camping grounds, recreational vehicle parks and trailer parks	957	619.568	341.951	8,842
		Other accommodation	732	346.82	160.297	5,637
		Passenger air transport	104	10815.52	2634.719	28,858
		Sea and coastal passenger water transport	338	702	290	3,983
		Passenger rail transport, Interurban	7	2,377	1,416	13,867
		Boat chartering	1,037	133	47	2,628
		Urban and suburban passenger land transport	241	3,143	2,780	47,595
		Retail sale of automotive fuel in specialised stores	6,184	18,042	1,859	53,952
		Renting and leasing of cars and light motor vehicles	3,678	5,661	2,753	18,986
	Tour services	Taxi operation	Not available	Not available	Not available	Not available
		Travel agency activities	9,689	17,476	1,823	43,018
		Tour operator activities	192	3,667	359	5,304
	Recreational activities	Other reservation service and related activities	14,570	22,080	2,471	58,435
		Activities of sport clubs (e.g. game fishing clubs, yacht and sailing clubs etc.)	7,185	5,362	3,026	48,949
		Other sports activities (incl. recreational fishing)	6,719	1,301	618	21,387
		Activities of other membership organisations N.E.C. (e.g. service activities to promote game fishing, surfing tournaments etc.)	Not available	Not available	Not available	Not available
		Other amusement and recreation activities (incl. activities of marinas)	10,635	2,259	962	58,119
Other expenditures		Retail sale of cultural and recreation goods in specialised stores (e.g. souvenir shops)	23,720	4,586	1,513	66,093
		Retail sale of other goods in specialised stores (e.g. sports equipment; outdoor or special clothing/gear such as swimsuits,	56,783	24,670	5,692	226,732

Established sector	Sub-sector	Industry	Companies	Turnover (€m)	GVA (€m)	Employed
Maritime services	Traffic control and safety	dive gear; fishing and bait shops)				
		Food and beverage service activities (incl. restaurants and catering)	257,772	43,334	16,909	1,016,005
		Renting and leasing of recreational and sports goods	1,037	133	47	2,628
		Provision of wireless and satellite communication services	881	11,584	4,164	12,605
		Manufacture of railway locomotives and rolling stock (incl. signalling and traffic control equipment for inland waterways)	354	1,383	491	11,039
		Electrical installation (incl. of illumination and signalling systems)	Not available	Not available	Not available	Not available
		Maritime traffic controllers (incl. lighthouses)	See above	Not available	Not available	See above
		Vessel tracking and e-monitoring services	See above	Not available	Not available	See above
	Insurance and financial services	Water police, coast guards and other rescue support services	Not available	Not available	Not available	Not available
		Lifeguards	See above	Not available	Not available	See above
	Provisioning	Property or other non-life insurance	Not available	Not available	Not available	Not available
		Finance & lending	Not available	Not available	Not available	Not available
		Accountancy, bookkeeping and consultancy	Not available	Not available	Not available	Not available
		Employment agencies for recruitment services	2,847	600	364	14,717
		Real estate services (e.g. buying and leasing of buildings and plants)	173,532	28,695	15,032	265,341
		Maritime law services (e.g. to challenge fines or defend oil spill lawsuits)	87,674	10,374	6,525	164,898
		Public relations and marketing services	1,093	443	214	4,957
		Sale of machinery, industrial equipment,	5,634	641	424	7,965

Established sector	Sub-sector	Industry	Companies	Turnover (€m)	GVA (€m)	Employed
Infrastructure and maritime works	Services	ships and aircraft				
		Sale of food, beverages and tobacco (e.g. for victualling on fishing vessels and suppliers to cruise ships)	8,480	1,009	524	13,315
		Supply of marine diesel and fuel bunkering services	1,395	71,123	2,492	11,209
	Associations and organisations	Activities of business and employer's membership organisations (e.g. fishing and aquaculture industry associations)	Not available	Not available	Not available	Not available
		Cleaning services for yachts, cruises and ships (excl. de-fouling services)	3,850	1,602	1,147	37,401
	Other services	Septic and waste disposal service for boat homes and ships	1,646	4,198	2,940	72,246
		Weather forecasting and ocean monitoring services	33,518	3,752	2,406	65,822
	Water projects	Construction of water projects (incl. harbours, marinas and dikes etc.)	Not available	Not available	Not available	Not available
		Construction of seawalls, offshore breakers and artificial headland etc.	Not available	Not available	Not available	Not available
	Underwater sea cables	Construction of utility projects for electricity and telecommunications (incl. submarine cables)	Not available	Not available	Not available	Not available
		Installation of tubes, pipes and hoses	518	1,515	645	13,765
		Repair and maintenance of tubes, pipes and hoses	217	54	27	846
	Oil and gas pipelines	Construction of oil and gas pipelines	Not available	Not available	Not available	Not available
	Other infrastructures	Construction of roads and motorways (incl. surface work on bridges and in tunnels)	Not available	Not available	Not available	Not available
		Construction of bridges and tunnels	Not available	Not available	Not available	Not available
		Construction of utility projects for fluids (incl. canals, pipelines, water well drilling)	Not available	Not available	Not available	Not available
		Other specialised construction activities	Not	Not	Not	Not

Established sector	Sub-sector	Industry	Companies	Turnover (€m)	GVA (€m)	Employed
		(incl. subsurface work, waterproofing treatment, outdoor swimming pools etc.)	available	available	available	available
	Support services	Renting and leasing of construction and civil engineering machinery and equipment	3,421	1,647	753	15,482
		Renting and leasing of other machinery, equipment and tangible goods	5,366	2,365	1,065	14,532

For the emerging sectors, a similar view is presented below. In case of Emerging sectors, there are more industries where the information is not readily available. Additionally, Ecosystem services sector is completely empty due to lack of an accepted framework for collection of economic data as an output of Ecosystem services.

Emerging sector	Sub-sector	Industry	Companies	Turnover(€m)	GVA (€m)	Employed
Blue energy	Renewable energy	Wind farms	13	1,835,255	1,611,945	1,761
		Ocean energy and hydro industries	Not available	Not available	Not available	Not available
		Solar farms at sea	Not available	Not available	Not available	Not available
		Other energy	Not available	Not available	Not available	Not available
Blue Bioeconomy	Pharmaceuticals	Manufacture of pharmaceutical products	352	13,541,039	4,653,272	42,653
		Wholesale and retail of pharmaceutical goods	26,084	58,477,584	9,752,223	156,615
		Manufacture of marine bio-based cosmetics	See established	See established	See established	See established
		Wholesale and retail of marine bio-based cosmetics	10,841	10,449,407	1,989,904	57,533
	Agriculture, livestock, veterinary products, and aquaculture	Manufacture of veterinary pharmaceuticals (incl. antibiotics)	Not available	Not available	Not available	Not available
		Manufacture of pesticides and other agrochemical products	78	1,067,188	238,169	2,274
	Bioplastics	Manufacture of plastic plates, sheets, tubes and profiles (i.e. bioplastics)	796	4,011,323	983,758	16,049

Emerging sector	Sub-sector	Industry	Companies	Turnover(€m)	GVA (€m)	Employed
Water treatment and supply	Biofuel and other bio-refined chemicals	Manufacture of plastic packaging goods	715	5,083,864	1,360,811	20,574
		Wholesale of bio-plastic goods				
		Manufacture of biofuel and other chemical products	See established	See established	See established	See established
		Wholesale of chemical products (incl. industrial salt)	See established	See established	See established	See established
	Water supply	Water collection, treatment and supply	See established	See established	See established	See established
		Remediation activities and other waste management services	290	155,057	58,332	1,391
		Test drilling and boring	Not available	Not available	Not available	Not available
	Desalination	Desalination	See established	See established	See established	See established
	Regulating	Climate regulation (incl. carbon sequestration)	Not available	Not available	Not available	Not available
		Nutrient cycling	Not available	Not available	Not available	Not available
		Water purification	Not available	Not available	Not available	Not available
		Waste treatment	Not available	Not available	Not available	Not available
		Coastal and flood protection	Not available	Not available	Not available	Not available
		Erosion control and sediment retention	Not available	Not available	Not available	Not available
		Climate regulation	Not available	Not available	Not available	Not available
		Biological control and habitat provisioning	Not available	Not available	Not available	Not available
		Aesthetics value (e.g. higher house or apartment values)	Not available	Not available	Not available	Not available
		Non-market cultural values (incl. biodiversity, species preservation,	Not available	Not available	Not available	Not available
Ecosystem services	Cultural (non-market)					

Emerging sector	Sub-sector	Industry	Companies	Turnover(€m)	GVA (€m)	Employed
		cultural heritage etc.) Other non-use values: existence/bequest value	Not available	Not available	Not available	Not available

France

As part of the data collection for France, the tables below show the level of data that was collected by the Consortium while engaging with the national statistics offices and the other relevant stakeholders. Data is collected for the following variables: number of companies, turnover, GVA (defined in the dataset as added value at factor cost) and the number of employees. For many industries, the data collected does not only apply to the Blue Economy but is a total of all sectors (including the Blue Economy). It is important to note that for France, economic data up to 5-digits is available with the National Statistics Office (in French) on request. However, a closer inspection of the data highlighted that most industries at 5 digit-level were a repetition of the industries at 4-digit, with only a few industries separated further.

Desk research was conducted to find out how to split the data that does not only apply to the Blue Economy. There is a lot of qualitative information about the industries, however, an extensive search shows that the share of the Blue Economy is unknown for the industries since quantitative data is missing. As a result, no estimate can be made of a coefficient that can be used to split the data to highlight the exact contribution of the sector to the Blue Economy. There are individual data-points that were missing for some of the industries, as the country may not be collecting this information due to:

- industry is missing from the local data collection framework;
- data was not collected for the particular year.

For the emerging sectors, a similar view is presented below. In case of Emerging sectors, there are more industries where the information is not readily available. Additionally, Ecosystem services sector is completely empty due to lack of an accepted framework for collection of economic data as an output of Ecosystem services.

Ministère de la transition écologique (State Environmental Office) is the focal point for all France regarding environmental data and information. "L'Observatoire", the French Observatory of the sea was the organisation in the past responsible for collecting and collating marine data. However, the role of the observatory has changed over the years and it is not a true observatory anymore with only 1 FTE that focuses on all the statistical analysis and management of Sea/Coastline data. It is managed by the State Environmental Office.

The scope of the Observatory in the past was to collect and coordinate economic and environmental data alongside partners who are more specialized in the given topic being studied (ex. pollution, fishing, tourism). The observatory supported in publishing reports as an input into broader initiatives led by Eurostat and the OECD:

- **periodic:** One key report every 4 years with Eurostat, last was in Oct 2019;
- **periodic:** Maintains 23 economic indicators that were constantly updated and used as input for other projects;
- **ad-hoc:** with multiple partners, broad array of questions.

Data in the past was collected by the individual actors who worked with the Observatory; hence, each actor selected their own method/structure as per the internal needs of the department. Geographically, data is collected at the commune level (municipality).

The partners that collaborated periodically with the observatory included:

- INSEE (Institut National de la Statistique et des Etudes Economiques): jobs, added value;
- IFREMER: pollution;
- Conservatoire du littoral: coastal management and risks;
- Agriculture Ministry: fisheries, aquaculture;
- Office Français de la biodiversité: marine protected areas;
- statistic department from other ministries (energy, transport,...).

INSEE is currently responsible for data collection and publishing of yearly statistics in France. The data collected by INSEE is split by numerous activities and products, but those are not unique to sea or land-based sectors. The marine and non-marine splits can be requested from the partners based on the interest and requirements; however, this is not a mandated exercise. During the interview with INSEE, the possibility to setup the Sea Satellite Account was discussed. In the view of INSEE, to support a Sea Satellite Account, they would need to know the extent of the data required (all the codes sectors and products) in order to involve the right national stakeholders and the associated costs. For the economic reporting they mentioned that many assumptions must be defined because the data never exactly fits the call and that reporting on economics is usually more time consuming.

Established sector	Sub-sector	Industry	Companies	Turnover (€m)	GVA (€m)	Employed
Marine living resources	Primary production	Commercial marine fishing sector (inc. ornamental fish)				
		Marine aquaculture sector				
	Processing and distribution	Processing and preserving of fish, crustaceans and molluscs				
		Manufacture of oils and fats	Confidential	Confidential	Confidential	Confidential
		Prepared food products (incl. meals and dishes)	1955	8873.1	2251.2	25657
		Processing and preserving of fisheries products not fit for human consumption (incl. bait, feed, pet food etc.)	304	9113.2	1631	13545
		Processing of other fisheries products (incl. pearls and jewellery)	Confidential	Confidential	Confidential	8386
		Wholesale of fisheries products	786	3669	446.3	5337
		Retail sale of fisheries products	1945	751.2	194.7	2478
	Offshore drilling, and gas oil	Extraction of crude petroleum	37	274.3	171.3	Confidential
		Extraction of natural gas	5	Confidential	Confidential	Confidential
Marine non-living resources	Other minerals (incl. seabed mining)	Support activities for petroleum and natural gas extraction	36	289.8	185.8	495
		Harvesting of gravel, sand, clay and kaolin	524	2768.1	847.6	8469
		Extraction of salt	172	16.4	5.5	82
		Extraction of peat	10	39	10.7	111
		Mining of chemical and fertiliser minerals (e.g. phosphate)	26	84.6	22.2	279
		Quarrying of ornamental stones (e.g. limestone) and gravel and sand	299	561.9	141.4	1570
		Mining of other non-ferrous metal ores	Confidential	Confidential	Confidential	Confidential
		Manufacture of refined petroleum products	24	Confidential	Confidential	Confidential
	Processing and distribution	Manufacture of industrial gases	152	1461.1	505.4	2896

Established sector	Sub-sector	Industry	Companies	Turnover (€m)	GVA (€m)	Employed
Manufacturing	Manufacturing of industrial goods	Manufacture of dyes and pigments	29	763.7	176.3	1343
		Manufacture of fertilisers and nitrogen compounds	105	2581.2	448.3	5662
		Manufacture of perfumes and toilet preparations (e.g. ambergris)	966	16850.8	5540.7	42080
		Manufacture of other chemical products N.E.C.	235	5881.4	1558.2	9048
		Manufacture of ceramic products	3048	2721.6	1029.4	12553
		Manufacture of lime and plaster	19	Confidential	Confidential	Confidential
		Cutting, shaping and finishing of stone	2581	762.8	322.6	5125
		Precious metals production	Confidential	Confidential	Confidential	Confidential
		Lead, zinc and tin production	13	Confidential	Confidential	Confidential
		Copper production	21	1069.6	119.6	2149
		Other non-ferrous metal production	38	650.3	160.5	1457
		Distribution of gaseous fuels through mains	5	Confidential	Confidential	597
		Wholesale of solid, liquid and gaseous fuels and related products	647	54035.1	12199	14424
		Wholesale of metals and metal ores	937	6091.1	936.4	8116
		Wholesale of chemical products (incl. industrial salt)	1399	11133.1	1699.2	13685
		Agents involved in the sale of fuels, ores, metals and industrial chemicals	363	27544	401.9	4363
		Support activities for other mining and quarrying	30	25.1	5.4	94
Port activities	Ports and wharfage	Port activities	321	1415.5	701.1	7081
		Cargo handling	86	1327	493.9	4772
		Supply of electricity to port	138	Confidential	Confidential	Confidential
	Biosecurity	Supply of water to port	2094	11540.4	4370.5	49383
		Cleaning and de-biofouling activities	4028	1375.2	702	10364
		Laboratory examination and checks	11834	8802.2	4477.7	68883
		Quarantine provision and custom services	Not available	Not available	Not available	Not available

Established sector	Sub-sector	Industry	Companies	Turnover (€m)	GVA (€m)	Employed
Maritime transport, logistics and storage	Shipping and freight	Sea and coastal freight water transport (water transport)	91	Confidential	Confidential	6950
		Inland freight water transport	694	Confidential	Confidential	1264
	Passenger transport	Sea and coastal passenger water transport (water transport)	615	1653.3	263.7	4874
		Inland passenger water transport	259	340.9	142.7	2414
	Support services	Renting and leasing of water transport equipment	358	135.5	63.1	Confidential
		Service activities incidental to water transportation	See above	See above	See above	See above
	Warehouse and storage	Warehousing	1376	6693.3	2437.1	32794
		Cold stores	190	649.9	212.2	3005
		Sale of containers, (incl. dry, reefer, oil etc.)	Not available	Not available	Not available	Not available
		Lease of containers, (incl. dry, reefer, oil etc.)	19400	5757.7	1979.9	14163
		Repair of fabricated metal products (incl. R&M of containers)	973	4982.1	1725.4	26808
Shipbuilding and repairs	Shipbuilding and engineering	Building of ships and floating structures	Confidential	6056.8	1616.1	15669
		Building of pleasure and sporting boats	328	1557.2	516.8	7655
		Dismantling of wrecks	551	298.4	93.7	1606
		Repair and maintenance of ships and boats	2307	979.1	309.1	4529
	Repairs and maintenance	Repair of machinery	7781	7314.9	2696.1	33783
		Repair of communication equipment	807	845.6	274	5362
		Repair of electronic and optical equipment (incl. navigation, aeronautical and nautical equipment)	503	1350.9	522.2	5191
		Repair of electrical equipment (incl. electrical motors)	1088	1233.1	495.3	6401
		Repair of other equipment (incl. fishing nets, shipping drums etc.)	530	199.5	80.8	1201

Established sector	Sub-sector	Industry	Companies	Turnover (€m)	GVA (€m)	Employed
Coastal tourism and recreation	Accommodation	Hotels and similar accommodation	21792	18197	8597.6	165198
		Holidays and other short-stay accommodation	23222	5722.9	1543.4	31162
		Camping grounds, recreational vehicle parks and trailer parks	5109	3022.3	1417	19029
		Other accommodation	294	124.2	39.1	3168
	Transport	Passenger air transport	575	Confidential	Confidential	Confidential
		Sea and coastal passenger water transport	Not available	Not available	Not available	Not available
		Passenger rail transport, Interurban	19	24527	16076.4	Confidential
		Boat chartering	Not available	Not available	Not available	Not available
		Urban and suburban passenger land transport	1268	7232.7	5383	74253
		Retail sale of automotive fuel in specialised stores	3094	8429.5	1397.6	13528
		Renting and leasing of cars and light motor vehicles	8191	15650.8	8185.3	23320
		Taxi operation	55314	3872.5	1990.4	Confidential
	Tour services	Travel agency activities	3051	3744.4	794.7	14017
		Tour operator activities	1218	6943.6	947.3	15191
		Other reservation service and related activities	4270	1688.4	329.8	10975
	Recreational activities	Activities of sport clubs (e.g. game fishing clubs, yacht and sailing clubs etc.)	1628	2669.9	1150.7	6881
		Other sports activities (incl. recreational fishing)	8905	1140.5	375.8	3808
		Activities of other membership organisations N.E.C. (e.g. service activities to promote game fishing, surfing tournaments etc.)	131	88.5	22.7	290
		Other amusement and recreation activities (incl. activities of marinas)	27653	1964.5	808.6	15862
	Other	Retail sale of cultural and recreation	38460	16456.8	4541.5	60170

Established sector	Sub-sector	Industry	Companies	Turnover (€m)	GVA (€m)	Employed
Maritime services	expenditures	goods in specialised stores (e.g. souvenir shops)				
		Retail sale of other goods in specialised stores (e.g. sports equipment; outdoor or special clothing/gear such as swimsuits, dive gear; fishing and bait shops)	30356	42799	9938	175962
		Food and beverage service activities (incl. restaurants and catering)	196032	59603.4	26023.3	528140
		Renting and leasing of recreational and sports goods	2753	744	253.3	4155
		Provision of wireless and satellite communication services	269	19989.1	8645.2	26716 + confidential
	Traffic control and safety	Manufacture of railway locomotives and rolling stock (incl. signalling and traffic control equipment for inland waterways)	388	1674.2	577.5	7465
		Electrical installation (incl. of illumination and signalling systems)	55931	34376.5	11654.3	160377
		Maritime traffic controllers (incl. lighthouses)	Not available	Not available	Not available	Not available
		Vessel tracking and e-monitoring services	Not available	Not available	Not available	Not available
		Water police, coast guards and other rescue support services	Not available	Not available	Not available	Not available
	Insurance and financial services	Lifeguards	See above	See above	See above	See above
		Property or other non-life insurance	Not available	Not available	Not available	Not available
		Finance & lending	Not available	Not available	Not available	Not available
		Accountancy, bookkeeping and consultancy	27969	34389	19046	173750
		Employment agencies for recruitment services	972	913	580.1	5352
		Real estate services (e.g. buying and leasing of buildings and plants)	235220	77607.4	42422.8	201100

Established sector	Sub-sector	Industry	Companies	Turnover (€m)	GVA (€m)	Employed
Infrastructure and maritime works	Provisioning services	Maritime law services (e.g. to challenge fines or defend oil spill lawsuits)	65714	24618.9	17842.3	96080
		Public relations and marketing services	21462	2256.2	978.1	8623
		Sale of machinery, industrial equipment, ships and aircraft	21462	2256.2	978.1	8623
		Sale of food, beverages and tobacco (e.g. for victualling on fishing vessels and suppliers to cruise ships)	2305	77628	7023.8	41485
		Supply of marine diesel and fuel bunkering services	647	54035.1	12199	14424
	Associations and organisations	Activities of business and employer's membership organisations (e.g. fishing and aquaculture industry associations)	909	675	297.9	7777
		Cleaning services for yachts, cruises and ships (excl. de-fouling services)	Not available	Not available	Not available	Not available
	Other services	Septic and waste disposal service for boat homes and ships	924	3270.6	1368.8	23605
		Weather forecasting and ocean monitoring services	25333	3789	1514.1	16188
		Construction of water projects (incl. harbours, marinas and dikes etc.)	185	1997.3	592.9	3603
	Water projects	Construction of seawalls, offshore breakers and artificial headland etc.	Not available	Not available	Not available	Not available
		Construction of utility projects for electricity and telecommunications (incl. submarine cables)	550	3784.6	1523.2	21014
	Underwater sea cables	Installation of tubes, pipes and hoses	8159	13015.2	5000.5	59838
		Repair and maintenance of tubes, pipes and hoses	530	199.5	80.8	1201
		Construction of oil and gas pipelines	1667	4120.8	680.3	9312

Established sector	Sub-sector	Industry	Companies	Turnover (€m)	GVA (€m)	Employed
	Other infrastructures	Construction of roads and motorways (incl. surface work on bridges and in tunnels)	844	27507.2	10761.7	123343
		Construction of bridges and tunnels	4	Confidential	Confidential	Confidential
		Construction of utility projects for fluids (incl. canals, pipelines, water well drilling)	701	3566.7	1101.3	17505
		Other specialised construction activities N.E.C. (incl. subsurface work, waterproofing treatment, outdoor swimming pools etc.)	3455	4257.9	1205.6	16855
	Support services	Renting and leasing of construction and civil engineering machinery and equipment	2357	3513.7	1377.9	14903
		Renting and leasing of other machinery, equipment and tangible goods N.E.C.	Not available	Not available	Not available	Not available

Emerging sector	Sub-sector	Industry	Companies	Turnover (€m)	GVA(€m)	Employed
Blue energy	Renewable energy	Wind farms	25345 + confidential	Confidential	Confidential	Confidential
		Ocean energy and hydro industries	Not available	Not available	Not available	Not available
		Solar farms at sea	Not available	Not available	Not available	Not available
		Other energy	Not available	Not available	Not available	Not available
Blue Bioeconomy	Pharmaceuticals	Manufacture of pharmaceutical products	245	45055.4	13658.1	88392
		Wholesale and retail of pharmaceutical goods	25861	94322.8	16397.1	153391
		Manufacture of marine bio-based cosmetics	See established	See established	See established	See established
		Wholesale and retail of marine bio-based cosmetics	6509	9193.6	1978.2	30984
	Agriculture, livestock, veterinary products, and aquaculture	Manufacture of veterinary pharmaceuticals (incl. antibiotics)	Not available	Not available	Not available	Not available
		Manufacture of pesticides and other agrochemical products	48	6371.4	1680.8	9718
	Bioplastics	Manufacture of plastic plates, sheets, tubes and profiles (i.e. bioplastics)	255	4606.8	1166.2	14430
		Manufacture of plastic packaging goods	395	8794	2528.3	28211
		Wholesale of bio-plastic goods	1534	6449	785.8	8023
Water treatment and supply	Water supply	Manufacture of biofuel and other chemical products	See established	See established	See established	See established
		Wholesale of chemical products (incl. industrial salt)	See established	See established	See established	See established
		Water collection, treatment and supply	See established	See established	See established	See established
	Desalination	Remediation activities and other waste management services	381	949.2	347.2	6480
		Test drilling and boring	375	511.5	186.7	2008
		Desalination	See	See	See	See

Emerging sector	Sub-sector	Industry	Companies	Turnover (€m)	GVA(€m)	Employed
Ecosystem services	Regulating	Climate regulation (incl. carbon sequestration)	established	established	established	established
		Nutrient cycling	Not available	Not available	Not available	Not available
		Water purification	Not available	Not available	Not available	Not available
		Waste treatment	Not available	Not available	Not available	Not available
		Coastal and flood protection	Not available	Not available	Not available	Not available
	Cultural (non-market)	Erosion control and sediment retention	Not available	Not available	Not available	Not available
		Climate regulation	Not available	Not available	Not available	Not available
		Biological control and habitat provisioning	Not available	Not available	Not available	Not available
		Aesthetics value (e.g. higher house or apartment values)	Not available	Not available	Not available	Not available
		Non-market cultural values (incl. biodiversity, species preservation, cultural heritage etc.)	Not available	Not available	Not available	Not available
		Other non-use values: existence/bequest value	Not available	Not available	Not available	Not available

Sweden

As part of the data collection for Sweden, the tables below show the level of data that was collected by the Consortium while engaging with the national statistics offices and the other relevant stakeholders. Data is collected for the following variables: number of companies, turnover, GVA (defined in the dataset as added value at factor cost) and the number of employees. For many industries, the data collected does not only apply to the Blue Economy but is a total of all sectors (including the Blue Economy).

Desk research was conducted to find out how to split the data that does not only apply to the Blue Economy. There is a lot of qualitative information about the industries, however, an extensive search shows that the share of the Blue Economy is unknown for the industries since quantitative data is missing. As a result, no estimate can be made of a coefficient that can be used to split the data to highlight the exact contribution of the sector to the Blue Economy. There are individual data-points that were missing for some of the industries, as the country may not be collecting this information due to:

- industry is missing from the localdata collection framework;
- data was not collected for the particular year.

For the emerging sectors, a similar view is presented below. In case of Emerging sectors, there are more industries where the information is not readily available. Additionally, Ecosystem services sector is completely empty due to lack of an accepted framework for collection of economic data as an output of Ecosystem services.

For Sweden, the statistical description of the Maritime Economy is based on register data collected by the statistics office of Sweden. The frame of enterprises is collected from the Swedish Business registry and then has several steps to ensure that all available auxiliary information (collected both by Statistics Sweden and others) can be used to identify an enterprise as maritime. Once the frame has been constructed, which is done for each reference year, information from other register-based surveys are incorporated to give an estimate on turnover, number of employees, and other indicators.

Starting with the NACE classification the industries that are easily identified as maritime (shipyards, fishing activities etc.) are collated. Since the industry classification in some cases is ambiguous, auxiliary information is used to identify the production as "maritime" or "non maritime". The first step is to identify industrial products on CPA (Classification of Products by Activity) as "maritime" or "non-maritime" and then to use that information and the production value in relation to total turnover to identify the enterprise in the same way. The limitation of this method is that several products can be used both for maritime applications and non-maritime applications in which case they are classified as non-maritime.

A good example is the production of maritime engines. That industry is in "NACE 28.11 Manufacture of engines and turbines, except aircraft, vehicle and cycle engines". 28.11 also contains many activities that cover both wind turbines, marine engines and railway engines. By using the CPA Statistics Sweden can identify the specific production of marine engines and can then classify them as maritime. Additional information is also pulled in from industry organisations, such as sea brokers association etc. in order to distinguish the maritime segment of their specific NACE category. The statistics department also has access to information from agricultural surveys and energy surveys. Besides information on product and activities, geographical location is used together with activity to identify the Tourism part of the maritime industry. The methodological robustness of those calculations has been discussed internally and agreed upon. Using a location-based approach comes with the problem of trying to establish mutually exclusive categories and approaching the tourism industry from the production side. In short, the business registry is used and continued to introduce auxiliary information from models until a diminishing return is achieved on the identification of enterprises.

A key challenge is that the data from national accounts, the register-based employment statistics and the foreign trade lacks information on marine or land. A project was commissioned in order to find a method that would meet the statistical quality framework and could be replicated on a yearly basis if needed. The project was done with several stakeholder consultations and a lot of resources was spent on identifying and assessing the quality of different auxiliary data sources (with modelling). However, a data collection exercise tailored to splitting marine and non-marine data of this scale has not been undertaken by the statistics office.

Established sector	Sub-sector	Industry	Companies	Turnover (€m)	GVA (€m)	Employed
Marine living resources	Primary production	Commercial marine fishing sector (inc. ornamental fish)	Not available	Not available	Not available	Not available
		Marine aquaculture sector	Not available	Not available	Not available	Not available
	Processing and distribution	Processing and preserving of fish, crustaceans and molluscs	209	586	90	1,591
		Manufacture of oils and fats	Not available	Not available	Not available	Not available
		Prepared food products (incl. meals and dishes)	155	299	61	920
		Processing and preserving of fisheries products not fit for human consumption (incl. bait, feed, pet food etc.)	97	696	72	824
		Processing of other fisheries products (incl. pearls and jewellery)	1,164	96	29	429
		Wholesale of fisheries products	1,396	2,514	334	3,835
		Retail sale of fisheries products	352	189	53	1,019
		Extraction of crude petroleum	Not available	Not available	Not available	Not available
Marine non-living resources	Offshore drilling, oil and gas	Extraction of natural gas	Not available	Not available	Not available	Not available
		Support activities for petroleum and natural gas extraction	147	96	24	89
		Harvesting of gravel, sand, clay and kaolin	Not available	Not available	Not available	Not available
	Other minerals (incl. seabed mining)	Extraction of salt	Not available	Not available	Not available	Not available
		Extraction of peat	Not available	Not available	Not available	Not available
		Mining of chemical and fertiliser minerals (e.g. phosphate)	75	30	-0	109
		Quarrying of ornamental stones (e.g. limestone) and gravel and sand	Not available	Not available	Not available	Not available
		Mining of other non-ferrous metal ores	Not	Not available	Not available	Not

Established sector	Sub-sector	Industry	Companies	Turnover (€m)	GVA (€m)	Employed
Manufacturing	Processing and distribution	Manufacture of refined petroleum products	available			available
		Manufacture of industrial gases	Not available	Not available	Not available	Not available
		Manufacture of dyes and pigments	90	661	220	1,437
		Manufacture of fertilisers and nitrogen compounds	Not available	Not available	Not available	Not available
		Manufacture of perfumes and toilet preparations (e.g. ambergris)	46	446	95	703
		Manufacture of other chemical products N.E.C.	202	277	82	1,063
		Manufacture of ceramic products	130	1,163	535	2,232
		Manufacture of lime and plaster	Not available	Not available	Not available	Not available
		Cutting, shaping and finishing of stone	16	380	120	722
		Precious metals production	Not available	Not available	Not available	Not available
		Lead, zinc and tin production	Confidential	Confidential	Confidential	Confidential
		Copper production	Confidential	Confidential	Confidential	Confidential
		Other non-ferrous metal production	Confidential	Confidential	Confidential	Confidential
		Distribution of gaseous fuels through mains	Confidential	Confidential	Confidential	Confidential
		Wholesale of solid, liquid and gaseous fuels and related products	762	11,441	462	1,931
		Wholesale of metals and metal ores	498	2,345	294	2,514
		Wholesale of chemical products (incl. industrial salt)	666	3,136	376	3,043
		Agents involved in the sale of fuels, ores, metals and industrial chemicals	168	148	41	293
		Support activities for other mining and quarrying	Confidential	Confidential	Confidential	Confidential
Port activities	Ports and wharfage	Port activities	196	399	223	1,625
		Cargo handling	Not	Not available	Not available	Not

Established sector	Sub-sector	Industry	Companies	Turnover (€m)	GVA (€m)	Employed
Maritime transport, logistics and storage	Biosecurity	Supply of electricity to port	available			available
		Supply of water to port	208	5,726	3,128	6,627
		Cleaning and de-biofouling activities	Not available	Not available	Not available	Not available
		Laboratory examination and checks	981	302	155	2,209
		Quarantine provision and custom services	Not available	Not available	Not available	Not available
	Shipping and freight	Sea and coastal freight water transport (water transport)	Not available	Not available	Not available	Not available
		Inland freight water transport	Not available	Not available	Not available	Not available
	Passenger transport	Sea and coastal passenger water transport (water transport)	Not available	Not available	Not available	Not available
		Inland passenger water transport	Not available	Not available	Not available	Not available
	Support services	Renting and leasing of water transport equipment	81	58	47	65
		Service activities incidental to water transportation	196	399	223	1,625
		Warehousing	300	488	205	2,221
		Cold stores	See above	See above	See above	See above
		Sale of containers, (incl. dry, reefer, oil etc.)	Not available	Not available	Not available	Not available
	Warehouse and storage	Lease of containers, (incl. dry, reefer, oil etc.)	2,072	1,449	640	2,921
		Repair of fabricated metal products (incl. R&M of containers)	Not available	Not available	Not available	Not available
		Building of ships and floating structures	155	369	119	1,403
Shipbuilding and repairs	Shipbuilding and engineering	Building of pleasure and sporting boats	520	216	59	1,010
		Dismantling of wrecks	Not available	Not available	Not available	Not available
	Repairs and	Repair and maintenance of ships and	951	340	112	1,602

Established sector	Sub-sector	Industry	Companies	Turnover (€m)	GVA (€m)	Employed
Coastal tourism and recreation	maintenance	boats				
		Repair of machinery	3,991	1,582	586	8,366
		Repair of communication equipment	307	130	31	720
		Repair of electronic and optical equipment (incl. navigation, aeronautical and nautical equipment)	103	52	24	334
		Repair of electrical equipment (incl. electrical motors)	149	106	43	562
		Repair of other equipment (incl. fishing nets, shipping drums etc.)	133	56	23	384
	Accommodation	Hotels and similar accommodation	Not available	Not available	Not available	Not available
		Holidays and other short-stay accommodation	Not available	Not available	Not available	Not available
		Camping grounds, recreational vehicle parks and trailer parks	628	234	110	1,720
		Other accommodation	25	8	3	43
	Transport	Passenger air transport	Not available	Not available	Not available	Not available
		Sea and coastal passenger water transport	Not available	Not available	Not available	Not available
		Passenger rail transport, Interurban	26	1,113	498	4,866
		Boat chartering	Not available	Not available	Not available	Not available
		Urban and suburban passenger land transport	Not available	Not available	Not available	Not available
		Retail sale of automotive fuel in specialised stores	1,320	5,168	587	7,502
		Renting and leasing of cars and light motor vehicles	616	785	371	1,762
	Tour services	Taxi operation	8,388	1,802	995	18,035
		Travel agency activities	770	2,620	337	4,000
		Tour operator activities	1,356	4,213	354	4,018
		Other reservation service and related	1,529	201	30	1,063

Established sector	Sub-sector	Industry	Companies	Turnover (€m)	GVA (€m)	Employed
Maritime services	Recreational activities	activities				
		Activities of sport clubs (e.g. game fishing clubs, yacht and sailing clubs etc.)	211	205	108	1,337
		Other sports activities (incl. recreational fishing)	Not available	Not available	Not available	Not available
		Activities of other membership organisations N.E.C. (e.g. service activities to promote game fishing, surfing tournaments etc.)	715	106	24	821
		Other amusement and recreation activities (incl. activities of marinas)	4,251	406	127	2,489
	Other expenditures	Retail sale of cultural and recreation goods in specialised stores (e.g. souvenir shops)	Not available	Not available	Not available	Not available
		Retail sale of other goods in specialised stores (e.g. sports equipment; outdoor or special clothing/gear such as swimsuits, dive gear; fishing and bait shops)	Not available	Not available	Not available	Not available
		Food and beverage service activities (incl. restaurants and catering)	25,462	10,688	4,618	102,918
		Renting and leasing of recreational and sports goods	473	63	22	270
		Provision of wireless and satellite communication services	242	4,794	1,842	7,660
	Traffic control and safety	Manufacture of railway locomotives and rolling stock (incl. signalling and traffic control equipment for inland waterways)	158	414	143	1,910
		Electrical installation (incl. of illumination and signalling systems)	10,452	6,633	2,800	40,773
		Maritime traffic controllers (incl. lighthouses)	196	399	223	1,625
		Vessel tracking and e-monitoring	Not	Not available	Not available	Not

Established sector	Sub-sector	Industry	Companies	Turnover (€m)	GVA (€m)	Employed
Services	Transport, storage and communication	services	available			available
		Water police, coast guards and other rescue support services	Not available	Not available	Not available	Not available
		Lifeguards	Not available	Not available	Not available	Not available
	Business services	Property or other non-life insurance	Not available	Not available	Not available	Not available
		Finance & lending	Not available	Not available	Not available	Not available
		Accountancy, bookkeeping and consultancy	Not available	Not available	Not available	Not available
	Insurance and financial services	Employment agencies for recruitment services	2,262	1,554	912	14,754
		Real estate services (e.g. buying and leasing of buildings and plants)	Not available	Not available	Not available	Not available
		Maritime law services (e.g. to challenge fines or defend oil spill lawsuits)	Not available	Not available	Not available	Not available
		Public relations and marketing services	3,986	666	349	3,949
Manufacturing, construction, mining and quarrying	Manufacturing	Sale of machinery, industrial equipment, ships and aircraft	Not available	Not available	Not available	Not available
		Sale of food, beverages and tobacco (e.g. for victualling on fishing vessels and suppliers to cruise ships)	703	685	119	1,408
	Construction	Supply of marine diesel and fuel bunkering services	762	11,441	462	1,931
		Activities of business and employer's membership organisations (e.g. fishing and aquaculture industry associations)	Not available	Not available	Not available	Not available
		Cleaning services for yachts, cruises and ships (excl. de-fouling services)	981	302	155	2,209
Trade, restaurants and hotels	Trade, restaurants and hotels	Septic and waste disposal service for boat homes and ships	276	1,783	674	7,831
		Weather forecasting and ocean monitoring services	7,125	2,722	585	6,216

Established sector	Sub-sector	Industry	Companies	Turnover (€m)	GVA (€m)	Employed
Infrastructure and maritime works	Water projects	Construction of water projects (incl. harbours, marinas and dikes etc.)	139	85	25	346
		Construction of seawalls, offshore breakers and artificial headland etc.	Not available	Not available	Not available	Not available
	Underwater sea cables	Construction of utility projects for electricity and telecommunications (incl. submarine cables)	613	1,310	289	3,306
		Installation of tubes, pipes and hoses	661	436	181	2,168
		Repair and maintenance of tubes, pipes and hoses	133	56	23	384
	Oil and gas pipelines	Construction of oil and gas pipelines	376	285	61	746
	Other infrastructures	Construction of roads and motorways (incl. surface work on bridges and in tunnels)	653	4,040	1,036	11,190
		Construction of bridges and tunnels	65	384	76	983
		Construction of utility projects for fluids (incl. canals, pipelines, water well drilling)	573	482	162	1,733
		Other specialised construction activities N.E.C. (incl. subsurface work, waterproofing treatment, outdoor swimming pools etc.)	Not available	Not available	Not available	Not available
	Support services	Renting and leasing of construction and civil engineering machinery and equipment	1,597	1,880	869	5,960
		Renting and leasing of other machinery, equipment and tangible goods N.E.C.	Not available	Not available	Not available	Not available

Emerging sector	Sub-sector	Industry	Companies	Turnover(€ m)	GVA(€m)	Employed
Blue energy	Renewable energy	Wind farms	2,7 62	16	6	17, 047
		Ocean energy and hydro industries	Not available	Not available	Not available	Not available
		Solar farms at sea	Not available	Not available	Not available	Not available
		Other energy	Not available	Not available	Not available	Not available
Blue Bioeconomy	Pharmaceuticals	Manufacture of pharmaceutical products	155	6	3	11,549
		Wholesale and retail of pharmaceutical goods	1,797	17	3	22,017
		Manufacture of marine bio-based cosmetics	202	0	0	1,063
		Wholesale and retail of marine bio-based cosmetics	1,771	2	0	5,676
	Agriculture, livestock, veterinary products, and aquaculture	Manufacture of veterinary pharmaceuticals (incl. antibiotics)	Not available	Not available	Not available	Not available
		Manufacture of pesticides and other agrochemical products	16	0	0	34
	Bioplastics	Manufacture of plastic plates, sheets, tubes and profiles (i.e. bioplastics)	244	1	0	4,475
		Manufacture of plastic packaging goods	160	1	0	2,111
		Wholesale of bio-plastic goods	Not available	Not available	Not available	Not available
	Biofuel and other bio-refined chemicals	Manufacture of biofuel and other chemical products	Not available	Not available	Not available	Not available
		Wholesale of chemical products (incl. industrial salt)	666	3	0	3,043
Water treatment and supply	Water supply	Water collection, treatment and supply	Not available	Not available	Not available	Not available
		Remediation activities and other waste management services	129	0	0	536

Emerging sector	Sub-sector	Industry	Companies	Turnover(€ m)	GVA(€m)	Employed
Ecosystem services	Regulating	Test drilling and boring	53	0	0	243
		Desalination	Not available	Not available	Not available	Not available
		Climate regulation (incl. carbon sequestration)	Not available	Not available	Not available	Not available
		Nutrient cycling	Not available	Not available	Not available	Not available
		Water purification	Not available	Not available	Not available	Not available
		Waste treatment	Not available	Not available	Not available	Not available
		Coastal and flood protection	Not available	Not available	Not available	Not available
		Erosion control and sediment retention	Not available	Not available	Not available	Not available
		Climate regulation	Not available	Not available	Not available	Not available
		Biological control and habitat provisioning	Not available	Not available	Not available	Not available
Cultural (non-market)		Aesthetics value (e.g. higher house or apartment values)	Not available	Not available	Not available	Not available
		Non-market cultural values (incl. biodiversity, species preservation, cultural heritage etc.)	Not available	Not available	Not available	Not available
		Other non-use values: existence/bequest value	Not available	Not available	Not available	Not available

Below, the data are compared between selected established sub-sectors.

Spain

A sample of data collected for Spain is shown in Table 14. During the data collection, it was observed that different sectors possess unique characteristics. Some sub-sectors have readily sufficient data available and for some, there was a very limited amount of information online. The consortium has made a brief comparison between the Spain data obtained from National Statistical Offices (NSO), independent databases, and the Blue Economy report 2019 and 2020. It is important to note here that the baseline year for all data is 2017. As per the information received from the Commission, the baseline data for the Blue Economy 2020 report relies on the 2017 statistical data, this year was chosen to compare the collected data

In total 7 case examples are outlined in the table. It is noticeable that:

- for the sub-sectors which are more or less complete at the NACE level, the differences with the data reported in the Blue Economy report are smaller;
- whenever the methodology of estimating marine proportion according to the Blue Economy report is used, the data from NSO aligns with the data reported in the Blue Economy report. However, there are still an error margin observed of up to 15% for a few sectors.

This is especially salient in the sector "Wholesale of other food, incl. fish, crustaceans, and molluscs", due to the fact this sector normally also includes baby food, dried fruits, pet food, processed vegetables, etc., 50% of the total value is estimated to contribute to the Blue Economy. Following this methodology, the actual data published on National Statistics website (data from 2017) should be ~€10.6 billion turnover, which is close to the number reported in the Blue Economy 2019 report (data from 2017) ~€9.4 billion (difference of 13%). Additionally, the differences between independent secondary databases (D&B Hoovers, Factiva, etc.) are observed to be much more substantial. This may be caused by the nature of databases which has limited information on private companies.

France

Similar differences are accounted for France as for Spain. The brief comparison between the France data obtained from NSO, independent databases and the Blue Economy report 2019 can be found in Table 16.

For the sector "Wholesale of other food, incl. fish, crustaceans and molluscs", the National Statistics website have reported ~€3.7 billion turnover related to marine proportions under NACE code 46.38A. This 5-digit NACF (French equivalent of NACE) is a fraction of NACE code 46.38 which represents the entire sector at ~€10.6 billion. Therefore, the marine proportions of this wholesale of other food sector account for roughly 34.5% of the entire sector value. However, the Blue Economy attributes NACE 46.38 at 50% maritime proportions. This is an interesting case in point for the potential limitations of using macro-level coefficients.

Sweden

Similar analysis, as Spain and France, was conducted for Sweden after receiving the data from their National Statistics Office. As can be observed from Table 16, for the sector "Wholesale of other food, incl. fish, crustaceans and molluscs", the turnover reported by the BE report 2019 has a very close alignment with the data from the National statistics Office (macro) with a 0.2% difference. However, the bottom-up data collection has difference in turnover of 29%. During the interview with NSO Sweden, it was highlighted that most sectoral data for Sweden is modelled and not collected. This may be true for other countries concerning commerce (in PT, National Accounts determine it balancing data sources and the sum of trade margins). This could be a potential reason for the difference between macro and micro data collection.

Table 14 Comparison of data from different sources; sub-sector examples (Spain)

Sub-sector	NACE	Turnover in BE 2019 report -2017 data (M €)	Marine proportion according to BE report	Turnover in National statistics data in 2017 (M €)	National statistics data adapted (M €)	Absolute difference between NSO and BE (%)	Data from independent research organisations (D&B, Factiva, S&P) M €	Data from independent research organisations adapted (M €)	Absolute difference between independent database and BE
Processing and preserving of fish, crustaceans and molluscs	10.2	5,752	100%	6,050	Not available	5%	4,315	4,315	25%
Wholesale of other food, incl. fish, crustaceans and molluscs	46.38	9,381	50%	21,277	10,638	13%	47,817	23,908	155%
Retail sale of fish, crustaceans and molluscs in specialised stores	47.23	1,582	100%	1,701	1,701	8%	Not available	Not available	Not available
Cargo handling	52.24	486	50% (or country specific)	2,244	1,122	130%	51	51	90%
Building of ships and floating structures	30.11	1,596	100%	1,718	1,718	8%	Not available	Not available	Not available
Service activities incidental to water transportation	52.22	4,062	100%	4,626	4,626	14%	21	21	99%
Sea and coastal passenger water transport	50.1	621	100%	702	702	13%	Not available	Not available	Not available

Table 15 Comparison of data from different sources; sub-sector examples (France)

Sub-sector	NACE	Turnover in BE 2019 report - 2017 data (M €)	Marine proportion according to BE report	Turnover in National statistics data in 2017 (M €)	National statistics data adapted (M €)	Absolute difference between NSO and BE (%)	Data from independent research organisations (D&B, Factiva, S&P) M €	Data from independent research organisations adapted (M €)	Absolute difference between independent database and BE
Processing and preserving of fish, crustaceans and molluscs	10.2	4,173	100%	Not available	Not available	Not available	5,930	5,930	42%
Wholesale of other food, incl. fish, crustaceans and molluscs	46.38	7,096	50%	3,669	3669 (due to 5-digit NACF)	48%	48,957	24,479	245%
Retail sale of fish, crustaceans and molluscs in specialised stores	47.23	828	100%	751	751	9%	Not available	Not available	Not available
Cargo handling	52.24	2,288	50% (or country specific)	1,327	664	71%	Not available	Not available	Not available
Building of ships and floating structures	30.11	4,565	100%	6,057	6,057	33%	Not available	Not available	Not available
Service activities incidental to water transportation	52.22	1,747	100%	136	136	92%	Not available	Not available	Not available
Sea and coastal passenger water transport	50.1	1,606	100%	Not available	Not available	Not available	Not available	Not available	Not available

Table 16 Comparison of data from different sources; sub-sector examples (Sweden)

Sub-sector	NACE	Turnover in BE 2019 report - 2017 data (M €)	Marine proportion according to BE report	Turnover in National statistics data in 2017 (M €)	National statistics data adapted (M €)	Absolute difference between NSO and BE (%)	Data from independent research organisations (D&B, Factiva, S&P) M €	Data from independent research organisations adapted (M €)	Absolute difference between independent database and BE
Processing and preserving of fish, crustaceans and molluscs	10.2	565	100%	586	Not available	4%	46	46	-
Wholesale of other food, incl. fish, crustaceans and molluscs	46.38	1,260	50%	2,514	1,257	0.2%	3,253	1,626	29%
Retail sale of fish, crustaceans and molluscs in specialised stores	47.23	190	100%	189	Not available	0.5%	Not available	Not available	Not available
Cargo handling	52.24	116	50% (or country specific)	Not available	Not available	Not available	722	361	211%
Building of ships and floating structures	30.11	316	100%	369	Not available	17%	Not available	Not available	Not available
Service activities incidental to water transportation	52.22	404	100%	399	Not available	1%	Not available	Not available	Not available
Sea and coastal passenger water transport	50.1	1,789	100%	Not available	Not available	Not available	Not available	Not available	Not available

3.5 CHALLENGES AND RECOMMENDATIONS

In task 2, the consortium focussed on data collection for case study countries using an exhaustive combined approach of macro-level data and bottom-up data collection. Furthermore, the bottom-up data collected for the case study countries was compared to the Blue Economy report 2019, and the national statistics office datasets, both of which utilise a macro approach for data collection.

Based on a comparison between Spain's and France's data (see tables above), the industries which are complete at NACE level as marked in task 1 have relatively smaller differences across databases. However, for the sectors (such as Cargo handling) where the portion contribution from the Blue Economy is not calculated, (that comprise of Partial I in completeness of data), differences between the reported values were observed across Blue Economy report 2019, National statistics offices and independent data sources. The differences in values are observed due to factors, including but not limited to:

- Aggregation of maritime proportions directly from non-marine data;
- incomplete reporting of company data by private and public data sources;
- no data availability in case of a few sectors.

With regards to calculating the portion of the sector that contributes to the Blue Economy, there is a lack of information available to easily calculate the share of the Blue Economy in the overall data as this is a highly academic and technical exercise.; This lack of exact coefficients to provide the portion of industry attributed to the Blue Economy, results in inaccurate reporting of indicators such as, the number of companies, turnover, GVA, and the number of employees.

During the interviews conducted with the statistics offices and industry organisations, it was observed that most of the industry organisations relied on publicly available and published databases for sectoral information. Very few organisations publish the data on their sectors with most organisations opting for a need-based reporting system by hiring data research firms. Some organisations attributed the misreporting/underreporting of data at NACE level to the structural differences in the setup of the sectors compared to NACE classification.

An example, as highlighted on the website of European Sea Ports Organisation (ESPO) provides a summary of these differences:

- Eurostat relies on data from the port authorities, which is the source of ESPO data;
- Eurostat disseminates figures on the gross weight of goods handled in the ports (excluding the tare weight of containers and RO-RO units). However, ESPO ports use the gross-gross weight of goods (including the tare weight of containers and RO-RO units);
- Eurostat figures on the number of TEUs handled only cover Lo-Lo containers (Lifted-on Lifted-off). Ro-Ro containers (Rolled-on Rolled-off) are counted as Ro-Ro units. ESPO data reports several containers in TEU independently of the kind of vessel transporting them;
- Eurostat's maritime statistics are strictly limited to the handling of goods related to seaborne transport. Any handling of inland waterway goods in ports is excluded as river transportation is not included within Maritime;
- in addition, there might be differences in coverage of actual port facilities included in Eurostat's definition of a "statistical port" and the facilities included in the figures of a port.

Furthermore, it was observed that the quality of the collected data can depend very much on whether the data is collected bottom-up through surveys and data sources,

versus when it is estimated using marine share coefficients. A lack of a unified approach makes it difficult to obtain reliable data, even from trusted public data sources.

For instance, in case of macro data collection, although the approach simplifies the data collection and splitting process, the assumptions around the splitting coefficients can influence the overall accuracy of the data. In the interview conducted with Eurostat dated 14 April 2020, it was indicated that using splitting coefficients can be complicated as in a particular enterprise, the coefficient of turnover, associated costs and the number of employees attributed to Marine activities can have different values.

Collecting the macro-level data and calculating the Marine proportions using established coefficients

Benefits



- Macro data is available at Eurostat and National statistics offices if the classifications system is agreed and established
- Reduced data collection time if the right proportion coefficients are available

Limitations



- Marine proportions for costs, Revenue, employees can be different for each organization making it difficult to get right splits
- Discussions with experts and desk research highlighted no clear sources to make informed splits making general approximations difficult and not representative of the actual sector

Figure 5 Benefits and limitations of Macro-level data collection approach

In addition, if the sector is then aggregated over many organisations with each having a separate set of coefficients, it is extremely difficult to estimate the actual data. Desk research was conducted to find out how to split the data that does not only apply to the Blue Economy. Online search was used to identify information about the relevant industry in the respective case study country. There is a lot of qualitative information about these industries. However, an extensive search shows that the share of the Blue Economy is unknown for the industries since quantitative data is missing. As a result, estimating the share of the sector contributing to the Blue Economy is a challenging and technical exercise.

Collecting bottom-up data marine data through directed reach out to potential associations and online data sources

Benefits



- Limited post processing of the data as all data collected is ideally for Blue economy
- Multiple public and private databases available

Limitations



- Very few organizations associated with marine sectors collect and disseminate structural statistics as most rely on public bodies for data needs
- The reporting at enterprise level is not consistent making it very difficult to compare multiple sources for the same figures

Figure 6 Benefits and limitations of bottom-up approach

The bottom-up approach is not without its merits and challenges. Although the bottom-up approach leads to accurate data collection by searching for enterprise data on Maritime proportions, it has its limitations. Most organisations create geographical or product/service-based categorizations to report economic data. Therefore, creating a split in marine vs non-marine activities is considered a non-value-added activity unless it is part of the organisation's strategic agenda. For many industries, the data collected did not visibly separate the proportion for the Blue Economy.

Additionally, during the consultation interview with Eurostat, it was discussed that at the country level, reported data is consolidated by linking activities of an enterprise which is done only on the main activity, as declared by the enterprise. The structural business statistics data considers only the primary activity of enterprises, but one enterprise can have many activities, and even more products (PRODCOM). For example, if a company has many operation plants then the one located near the coast may disclose its main activity as attributable to the Blue Economy (e.g. farming fish) while another office of the same enterprise located elsewhere has its primary activity attributable to another sector (e.g. canning meat as the main activity even though they also can fish).

However, at the macro level, the primary activity reported to SBS/NACE may not be in the Blue Economy statistics. The data reported by the organisations is based on the primary activity reported.

In task 4, the consortium attempts to address some of these differences in more detail while proposing an accounting structure for Blue Economy sectors.

In sum, the following challenges were encountered during data collection from the resources:

- the **exact split** between the proportions of the Blue Economy is **not available** across the databases used including publicly available databases. Thus, it is hard to find reliable data or a unified methodology. One way to rectify this would be to improve the splitting coefficients in the Blue Economy Reports from 50% to more accurate values per region. This could potentially be conducted by the Blue Observatory's Sea Satellite Account, which will be discussed in subsequent chapters;
- renowned market research websites such as Factiva (Companies/Markets) used older NACE classifications which made it difficult to find the data; for example, the industry "cold stores" within "Warehouse and Storage" did not exist in the older classification. However, active referring of the paid datasets by including them in the desk research for Blue Economy data searches will result in more frequent updates within the dataset due to higher web engagement;
- based on the desk research, D&B Hoovers provided the most complete datasets across industries, partially due to its most up-to-date NACE classifications; however, whereas the total competitive landscape of the industry is available, **limited players reported their turnover and number of employees**. This is not only due to the nature of the entity (private vs. public company), but merely due to the lack of reported data.

4. TASK3 OBSERVATORY OF THE BLUE ECONOMY – FEASIBILITY ANALYSIS

The purpose of task 3 was to conduct a feasibility analysis for the observatory. The key objectives of the observatory, as defined in the study are:

- gather, analyse and disseminate economic knowledge and data for better understanding the EU Blue Economy along its value chain;
- expand the data collection on the EU Blue Economy with a view to fill in the current data gaps, particularly for interrelated activities and emerging sectors of the EU Blue Economy;
- process, harmonise and analyse data;
- provide periodical surveys of latest trends of the emerging sectors of the EU Blue Economy;
- deliver ad-hoc market, financing and business studies on emerging sectors and high-tech established sectors of the EU Blue Economy.

The proposed observatory will benefit a wide variety of user groups, namely, **economic users, scientific users, societal users and policy makers**.

The identification of the main tasks and functions of the observatory served as the basis for the generation of setup, structure options for the observatory. Following the technical and operational feasibility, a cost feasibility was conducted to estimate the costs for various activities. Furthermore, a list of the economic and non-economic benefits was developed for each defined user groups to clearly showcase the potential added value of a Blue Observatory.

The following activities were carried out for this task:

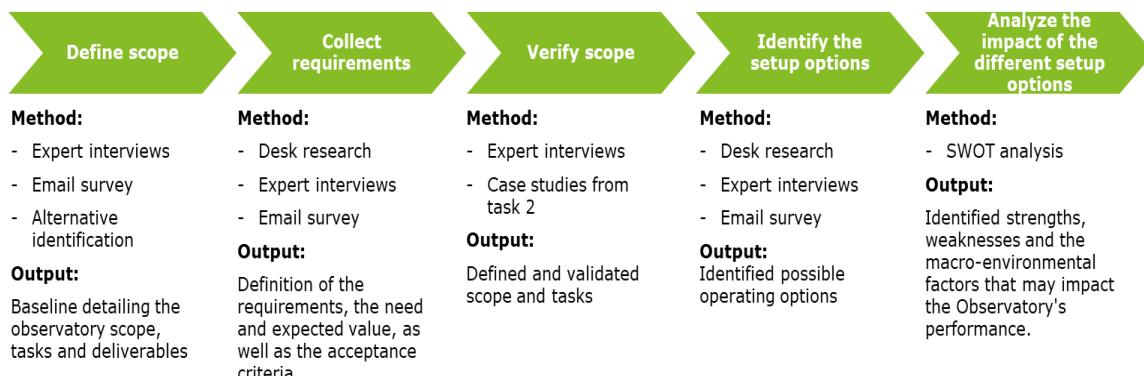


Figure 7 Approach for task 3

4.1. IDENTIFY THE MAIN FUNCTIONS OF OBSERVATORY

The first activity of identifying the main functions and tasks of the future observatory of the Blue Economy concerns the understanding of the scope of an observatory in general. As an observatory has a mandate and a fixed set of activities related to a sector, sub-sector or an industry, it is important to dive deeper into existing observatories to gain insights. As part of this activity, the contractor created an overview of relevant, similar observatories, institutions, and organisations, including their scope. This created a baseline that provided the best-practices and inspiration in setting up the Blue Economy observatory, as well as made sure that the Blue Economy observatory does not overlap and creates synergies with current initiatives.

As a first step, a framework for the identification of similar, relevant observatories, institutions, and organisations, a framework was created. This framework distinguishes between four categories of relevant organisations that together serve as a baseline for the future observatory of the Blue Economy. These four categories include:

- Blue Economy Observatories (outside the EU);
- Blue Observatories²² (within the EU);
- other Non-marine Observatories²³ (within the EU, non-maritime-related);
- maritime-related research institutions and data platforms (within the EU).

Within each category, several relevant organisations were identified. These identified organisations are an exemplary subset of all the organisations within a category, and together are not collectively exhaustive. Table 18 provides an overview of the exemplary organisations per category. The benchmark analysis was conducted on some of these exemplary organisations.

Table 17 Overview of exemplary, relevant organisations per category

Category	Exemplary, relevant organisations	Location
Blue Economy Observatories (outside the EU)	The Blue Economy Working Group	Norway
	Integrated Ocean Observing System	USA
Blue Observatories (within the EU)	European Market observatory for Fishery and Aquaculture Products (EUMOFA)	Online- EU wide
	Observatório da Economia Azul	Portugal
	The European Multidisciplinary Seafloor and water column observatory	Italy
Observatories (within the EU, non-maritime related)	Market Observatories, Directorate-General for Agriculture and Rural Development (DG AGRI)	EU-wide
	European Climate and Health observatory	Online- EU wide
	European 5G observatory	Online- EU wide
Maritime-related research institutions and data platforms (within the EU) ²⁴	EMODnet	Online- EU wide
	EMSA – maritime data hub?	Online- EU wide

4.2. BENCHMARK OF EXEMPLARY, RELEVANT ORGANISATIONS

In order to create a baseline for the future Blue Economy observatory, the contractor analysed the scope of some of the organisations identified in Table 19, namely:

- the Blue Economy Working Group;

²² Blue Observatories as mentioned here refers to Observatories which focus on sector/sub-sector level within the Blue Economy, as defined by the Blue Economy report

²³ Non-marine Observatories were included in the benchmark analysis to gain a better understanding of the general tasks of the observatory that may be independent of the application

²⁴ Other identified maritime-related research institutions and data platforms include: JERICO-RI, OSPAR and the European Maritime Spatial Planning Platform

- integrated Ocean Observing system;
- European Market observatory for Fishery and Aquaculture Products (EUMOFA);
- Observatório da Economia Azul;
- European Multidisciplinary Seafloor and water column observatory;
- European 5G observatory;
- EMODNET;
- EASME – maritime data hub;
- System of Environmental Economic Accounting (SEEA).

This analysis included (where possible);mission statement, covered geography, covered industries and sectors, targeted user groups, dedicated tasks, and framework structure of the observatory.Table19 below shows the results of the benchmark analysis.

In addition to the benchmark of observatories, a deep dive into the reporting framework of the European Market observatory for Fisheries and aquaculture products (EUMOFA) was conducted to identify key characteristics that could potentially inspire the EU Blue Observatory. EUMOFA was selected for deep dive as it is a fully functional observatory on Fisheries and aquaculture sectors of the Blue Economy. Both sectors have a 100% complete data availability in Eurostat, therefore indicating a good quality of data available for dissemination. As EUMOFA is a successful example of implementation of the Blue Economy sectors, it provides a good foundation to compare and scale up activities for the other Blue Economy sectors. The matrix in Figure 8 shows the reporting characteristics framework of EUMOFA mapped on a periodic basis (weekly, monthly annually).

Table 18 Benchmark of existing EU and non-EU observatories

	The Blue Economy Working Group	Integrated Ocean Observing system	European Market observatory for Fishery and Aquaculture Products (EUMOFA)
Category	Blue Economy Observatories (outside the EU)	Blue Economy Observatories (outside the EU)	Blue Observatories (within the EU)
Mission	Promote Blue Economy development in the region as a key source of inclusive economic growth, job creation, and education, based on the evidence-based sustainable management of marine resources.	To produce, integrate, and communicate high-quality ocean, coastal, and Great Lakes information that meets the safety, economic, and stewardship needs of the Nation	To monitor and analyse the EU fishery and aquaculture market from day to day. data collected are checked and interpreted through multiple contact points in the different EU countries in order to provide reliable and latest accurate data
Covered geography	South Africa, Tanzania, Mozambique, Kenya, Somalia, Yemen, United Arab Emirates, Oman, Iran, Comoros, Madagascar, Mauritius, Seychelles, Republic of the Maldives, India, Sri Lanka, Bangladesh, Thailand, Malaysia, Singapore, Indonesia, Australia	United States of America	European Union (EU27) and the rest of the world for certain datasets (trade flows)
Covered industries and sectors	Research and education, marine living resources, marine non-living resources, coastal tourism and recreation, port activities, maritime transport, logistics and storage, blue energy, blue Bioeconomy	Mostly marine living and non-living resources. also: maritime security and defence, research and education, shipbuilding and repairs, coastal tourism and recreation, port activities, maritime transport, logistics and storage, blue energy, blue Bioeconomy, infrastructure and maritime works, water treatment and supply, maritime services	Marine living resources (Fisheries and aquaculture products)
Targeted user groups	Not available	Not available	Fishery and aquaculture stakeholders, such as producer organisations, specialised medias, scientists, policymakers, professional organisations
Dedicated tasks	Work Plan, Terms of Reference, and schedule were drafted in September 2018 as based on reference to 1 st preparatory meeting ²⁵ . However, documentation in this cannot be found.	<ul style="list-style-type: none"> • Provide new tools and forecasts to improve safety, enhance the economy, and protect our environment • Provide integrated ocean information in near real-time, as well as retrospectively. • Create easier and better access to this information • Develop certification standards for non-federal assets • Identify gaps in observing coverage or needs for capital improvements • Create a merit-based competitive funding process • Develop a national data management and communications system, • Establish a System Advisory Committee • Draft a public-private use policy process, • Write a biennial congressional report 	<ul style="list-style-type: none"> • Create a consolidated database of aggregated and harmonised data and a large network of experts in Fisheries and aquaculture. Data are harmonised in 108 Main commercial species and 12 Commodity groups available from the first sale to consumption on a weekly, monthly, and yearly basis, in a single website and all 24 official languages of the EU. • Set up “price structure” methodology and case studies for analysing price transmission of specific products in specific markets. • Create a macroeconomic dashboard, reporting main indicators for contextualising analysis of the fishery sector (fuel prices, inflation, exchange rates, etc.) • Perform ad-hoc analyses and deepening on defined market issues, upon DG MARE request (e.g. studies on EU consumer habits, the EU organic aquaculture sector). • Create country profiles, offering a detailed snapshot of the Fisheries and aquaculture supply chain of each EU country.

²⁵ <https://www.iora.int/en/events-media-news/events/priorities-focus-areas/blue-economy/2018/1st-preparatory-meeting-for-the-establishment-of-iora-working-group-on-the-blue-economy>

	The Blue Economy Working Group	Integrated Ocean Observing system	European Market observatory for Fishery and Aquaculture Products (EUMOFA)
Framework structure	The Blue Economy Working group falls under the umbrella of the Indian Ocean Rim Association. The association is a regional forum bringing together representatives of government, business and academia, for promoting co-operation and closer interaction among the Member States. Due to lack of disclosure on the Work Plan, Terms of Reference, and schedule; the exact structure and functioning for the Blue Economy Working Group cannot be determined	<p>The U.S. IOOS Program Office is organised into two divisions that implement policies, protocols, and standards to implement IOOS and oversee the daily operations and coordination of the System: (1) Operations Division (OPS) and (2) Regions, Budget, and Policy (RB&P).</p> <p>The IOOS combines and reports on data collected from 11 IOOS Regional Associations, which offer data collected in their region through the website data portals. The data offered at each portal is different and focuses on the regional association's specific strengths and local partnerships. The Regional Associations include: Alaska (AOOS), Caribbean (CARICOOS) Central and Northern California (CeNCOOS), Gulf of Mexico (GCOOS), Great Lakes (GLOS), Mid-Atlantic (MARACOOS), Pacific Northwest (NANOOS), Northeast Atlantic (NERACOOS), Pacific Islands (PacIOOS), Southern California (SCCOOS), Southeast Atlantic (SECOORA)</p>	EUMOFA is managed by DG MARE with the support of a group of companies. The group of companies is coordinated by COGEA (Italy), in partnership with: AND (France), EUFISH (Denmark), KONTALI ANALYSE (Norway), and Business Integration Partners (Italy). The Editing Committee, comprised of European Commission policy officers and representatives of the EUMOFA team, defines the editorial line and supervises all publications. EUMOFA reports its data on a weekly, monthly, and yearly basis. Figure after this table provides a comprehensive overview of the reporting framework within EUMOFA
Contact details	Indian Ocean Rim Association; hq@iora.int ; +230 454 1717; website: https://www.iora.int/en	<p>U.S. Integrated Ocean Observing System (IOOS); noaa.ioos.webmaster@noaa.gov; (240) 533-9444</p>	European Commission DG Maritime affairs and Fisheries; website: https://www.eumofa.eu

	Observatório da Economia Azul	European Multidisciplinary Seafloor and water column observatory	European 5G observatory
Category	Blue Observatories (within the EU)	Blue Observatories (within the EU)	Observatories (within the EU, non-maritime related)
Mission	The Observatório da Economia Azul provides information for the main indicators of the Portuguese Sea Economy.	The European Multidisciplinary Seafloor and water-column observatory (EMSO) aims to explore the oceans, to gain a better understanding of phenomena happening within and below them, and to explain the critical role that these phenomena play in the broader Earth systems.	The European 5G observatory monitors market developments and preparatory actions were taken by industry stakeholders and the Member States in the context of 5G roll-out in Europe and beyond. The observatory enables the Commission to assess the progress of Europe's 5G Action Plan and act to fully implement it.
Covered geography	Portugal	France, Greece, Ireland, Italy, Portugal, Romania, Spain, UK,	European Union (EU27)
Covered industries and sectors	Fisheries, aquaculture, processing, wholesale and retail of its products, non-living marine resources ports, transports and logistics, recreation, sports, culture and tourism, shipbuilding, maintenance and repair, maritime equipment, infrastructures and maritime works, maritime services, and new uses and resources of the ocean.	Marine living resources, marine non-living resources	Marine living resources, marine non-living resources
Targeted user groups	Policy makers, Business Sector, R&D Institutions, General Public.	Scientists, industries, public, institutions, and policymakers	Not available
Dedicated tasks	<p>The main objectives of the Observatório da Economia Azul are:</p> <ul style="list-style-type: none"> • Provide up-to-date and reliable information on the Economy of the Sea; • Contribute to the knowledge of the socio-economic reality of the Sea Economy of Portugal; • Monitor the results of the implementation of the National Strategy for the Sea. <p>Provide information to support strategic decision-making and the adoption of concrete measures aimed</p>	<ul style="list-style-type: none"> • Provide deep sea high quality, long term time series data • Develop technology for sensors, communications, offshore operations • Attract scientist, technicians, managers, and industries • Collaborate with European and International Organisation and Institution (specifically in EOOS and Global Ocean Observing System (GOOS)) • Promote innovation and knowledge-sharing • Conduct outreach and communication • Provide services to a large group of users, including: <ul style="list-style-type: none"> - Access to the Infrastructure Services 	<p>The observatory will monitor the following developments (primarily in Europe, along with major international developments such as the USA, Japan, China, South Korea):</p> <ul style="list-style-type: none"> • Main 5G market developments including planning and commercial launch of 5G products and services with major impact; • New developments regarding key 5G products and components as well as technology choices made by key actors including regarding standards and use of spectrum bands; • 5G pre-commercial trials and partnerships between actors

	Observatório da Economia Azul	European Multidisciplinary Seafloor and water column observatory	European 5G observatory
	at the sustainable development of the sea economy.	<ul style="list-style-type: none"> - Climate Change Services - Marine Ecosystem services - Geo-hazards Services - Training & Best Practices Services - Technology & Engineering Services - Data Management Services - Communications & Branding Services - Lobby & Policy Services - International Relations & Partnering Services 	<ul style="list-style-type: none"> of the 5G value chain; • National strategies and plans by the EU Member States, available national data on 5G deployment including coverage and quality. • Preparation and execution of spectrum assignments by public authorities as well as 5G public funding for network deployment and R&I.
Framework structure	The Observatório da Economia Azul is an initiative developed under the responsibility of the Directorate General of Maritime Policy (DGPM), from the Portuguese Ministry of the Sea.	<p>EMSO is a consortium of partners sharing in a common strategic framework scientific facility (data, instruments, computing, and storage capacity). It consists of a system of regional facilities placed at key sites around Europe. Observatories are platforms equipped with multiple sensors, placed along the water column and on the seafloor. They constantly measure different biogeochemical and physical parameters that address natural hazards, climate change, and marine ecosystems²⁶.</p> <p>Physical and chemical oceanographic EMSO data from all regional nodes have been harmonised and integrated into the EMODNET data portal.</p>	<p>Plans to establish the European 5G observatory were announced in February 2018 by Commissioner Gabriel, to closely monitor the progress of the European 5G Connectivity objectives for a competitive Digital Single Market by 2025. In particular, IDATE DigiWorld has been selected to carry out the 5G European observatory for the European Commission.</p> <p>The European Commission started to expect the first comprehensive reports and a publicly accessible online platform to be available from mid-2018. However, based on the available online information, such online platform is yet to be established²⁷</p>
Contact details	https://www.dgpm.mm.gov.pt/observatorio	EMSO-ERIC; info@emso-eu.org; 06.45431040; website: http://emso.eu/	5G observatory; info@5Gobservatory.eu; website: https://ec.europa.eu/digital-single-market/en/european-5g-observatory

	EMODnet	EASME – maritime data hub	System of Environmental Economic Accounting (SEEA)
Category	Maritime-related research institutions and data platforms (within the EU)	Maritime-related research institutions and data platforms (within the EU) Website: https://ec.europa.eu/easme/en/news/maritime-datahub-launched	Statistical maritime-related accounts
Mission	Provide a gateway to marine data in Europe	To create insight and transparency into the projects and companies funded by EU and Member states programs, specifically in relation to projects that contribute to the implementation of the Atlantic Strategy	Bring together economic and environmental information to measure the contribution of the environment to the economy and the impact of the economy on the environment
Covered geography	European Union (EU27)	European Union (EU27)	All countries
Covered industries and sectors	Bathymetry, geology, seabed habitats, chemistry, biology, physics, human activities	Marine resources, marine non-living resources, Ecosystem services, coastal tourism and recreation, blue Bioeconomy, blue energy, research and education, port activities, maritime transport, logistics, and storage, maritime security and defence	Agriculture, Forestry, and Fishery, Energy, Water, Air Emissions, Environmental activity, Land, Material Flow
Targeted user groups	Public sector, private sector, scientific research community and society	Not available	Not available
Dedicated tasks	<ul style="list-style-type: none"> • Collect data once and use it many times; • Develop standards across disciplines as well as within them; • Process and validate data at different levels. 	Provide information on projects and companies funded by EU and Member states programs, specifically in relation to projects that contribute to the implementation of the Atlantic Strategy	The SEEA Central Framework brings together, in a single measurement system, information on water, minerals, energy, timber, fish, soil, land and ecosystems, pollution and waste, etc. The SEEA Central Framework is made up of several different

²⁶ <http://emso.eu/what-is-emso/>

²⁷ <https://5gobservatory.eu/about/what-is-the-european-5g-observatory/>

	EMODnet	EASME – maritime data hub	System of Environmental Economic Accounting (SEEA)
	<p>Structures are already developing at the national level but the infrastructure at sea-basin and European level is needed;</p> <ul style="list-style-type: none"> Provide sustainable financing at an EU level to extract maximum value from the efforts of individual Member States. Build on existing efforts where data communities have already organised themselves Develop a decision-making process for priorities that is user-driven Accompany data with statements on ownership, accuracy, and precision, and Recognise that marine data is a public good and discourage cost-recovery pricing from public bodies 		<p>accounts, all of which are integrated, and which draw information together into one coherent system. This is done by applying the same accounting concepts, structures, rules, and principles to different sets of environmental information. Because these concepts are aligned with those of the System of National Accounts, this environmental information can then be integrated with economic information.</p>
Framework structure	<p>The European Marine Observation and Data Network (EMODnet) is a network of more than 150 organisations supported by the EU's integrated maritime policy. For each of the sectors, EMODnet has created a gateway to a range of data archives managed by local, national, regional, and international organisations. These data products are free to access and use.</p> <p>EMODnet is operated by the Secretariat which provides high-level coordination and technical support to guide the development of the EMODnet Central Portal, monitor the various EMODnet projects, and disseminate their results. Since 2013, the EMODnet Secretariat is administered by Seascape and hosted at the InnovOcean site in Oostende with the support from the Flemish Government.²⁸</p>	<p>The maritime data hub consists of 3 modules: an interactive map, a list of beneficiaries and projects, and a statistic module. Users can search through filters such as budget allocated per country or per maritime sector, they can generate their statistics and export data in different formats such as pictures, PDF documents, or CSV files.</p> <p>The maritime datahub pieces out 9 other datahubs generating information on EU funding programs. For the moment, the application is available for Bio-Based Industries Joint Undertaking, Competitiveness of Enterprises and Small and Medium-sized Enterprises program (COSME), Horizon 2020 Energy Efficiency, Horizon 2020 Societal Challenge 'Climate action, environment, resource efficiency & raw materials', Horizon 2020 Fast Track to Innovation, Horizon 2020 Future and Emerging Technologies(FET) Open, Horizon 2020 Innosup, Horizon 2020 SME Instrument, LIFE.²⁹</p>	<p>The System of Environmental-Economic Accounting (SEEA) is a framework that integrates economic and environmental data to provide a more comprehensive and multipurpose view of the interrelationships between the economy and the environment and the stocks and changes in stocks of environmental assets, as they bring benefits to humanity. It contains the internationally agreed standard concepts, definitions, classifications, accounting rules, and tables for producing internationally comparable statistics and accounts. The SEEA framework follows a similar accounting structure as the System of National Accounts (SNA). The framework uses concepts, definitions, and classifications consistent with the SNA to facilitate the integration of environmental and economic statistics. The SEEA is a multi-purpose system that generates a wide range of statistics, accounts, and indicators with many different potential analytical applications. It is a flexible system that can be adapted to countries' priorities and policy needs while at the same time providing a common framework, concepts, terms, and definitions.</p>
Contact details	https://www.emodnet.eu/contact-us	Not available	system of environmental economic accounting; seea@un.org ; website: https://seea.un.org/content/seea-central-framework

²⁸<https://www.emodnet.eu/about-secretariat>

²⁹<https://ec.europa.eu/easme/en/news/maritime-datahub-launched>

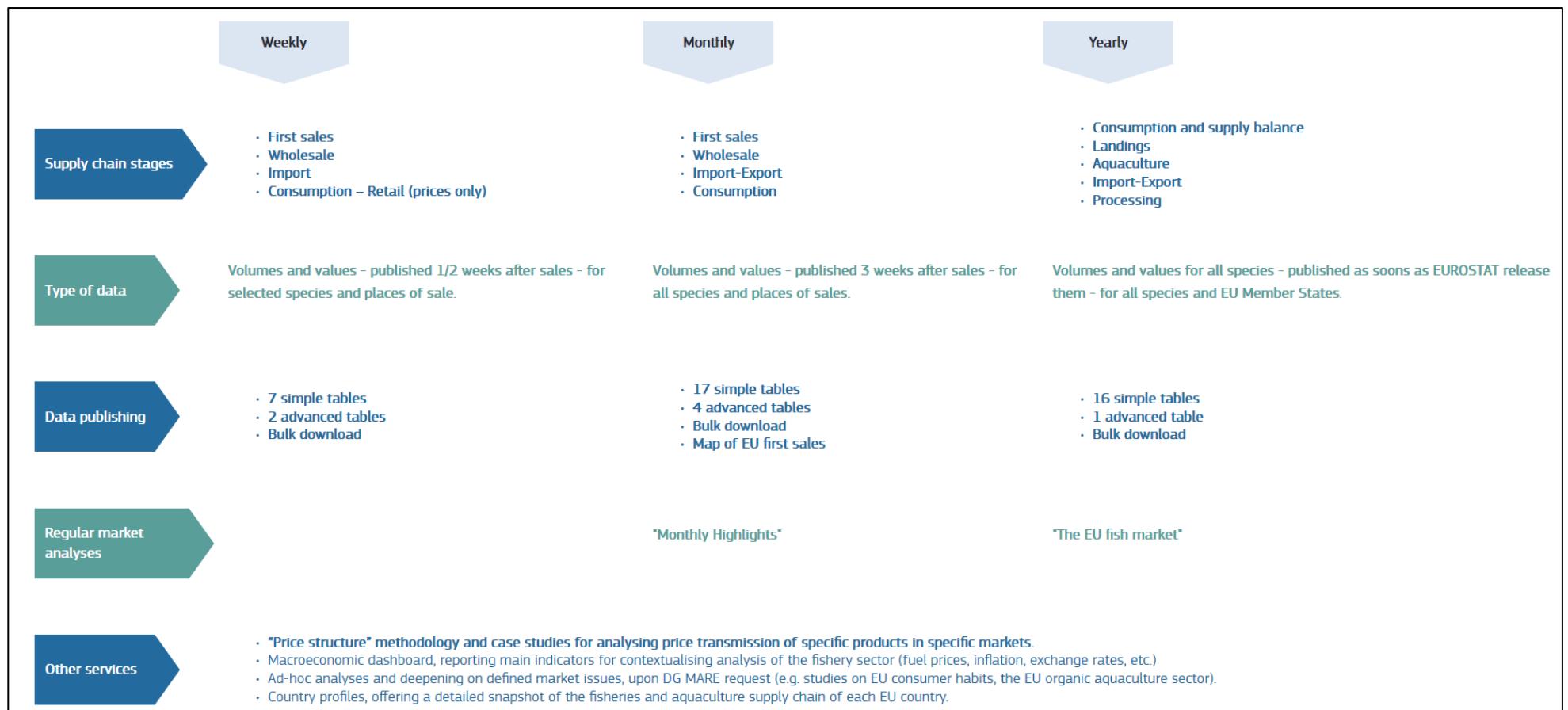


Figure 8 Overview of reporting framework of EU MOFA

4.2.1. MAIN ACTIVITIES OF EXEMPLARY ORGANISATIONS

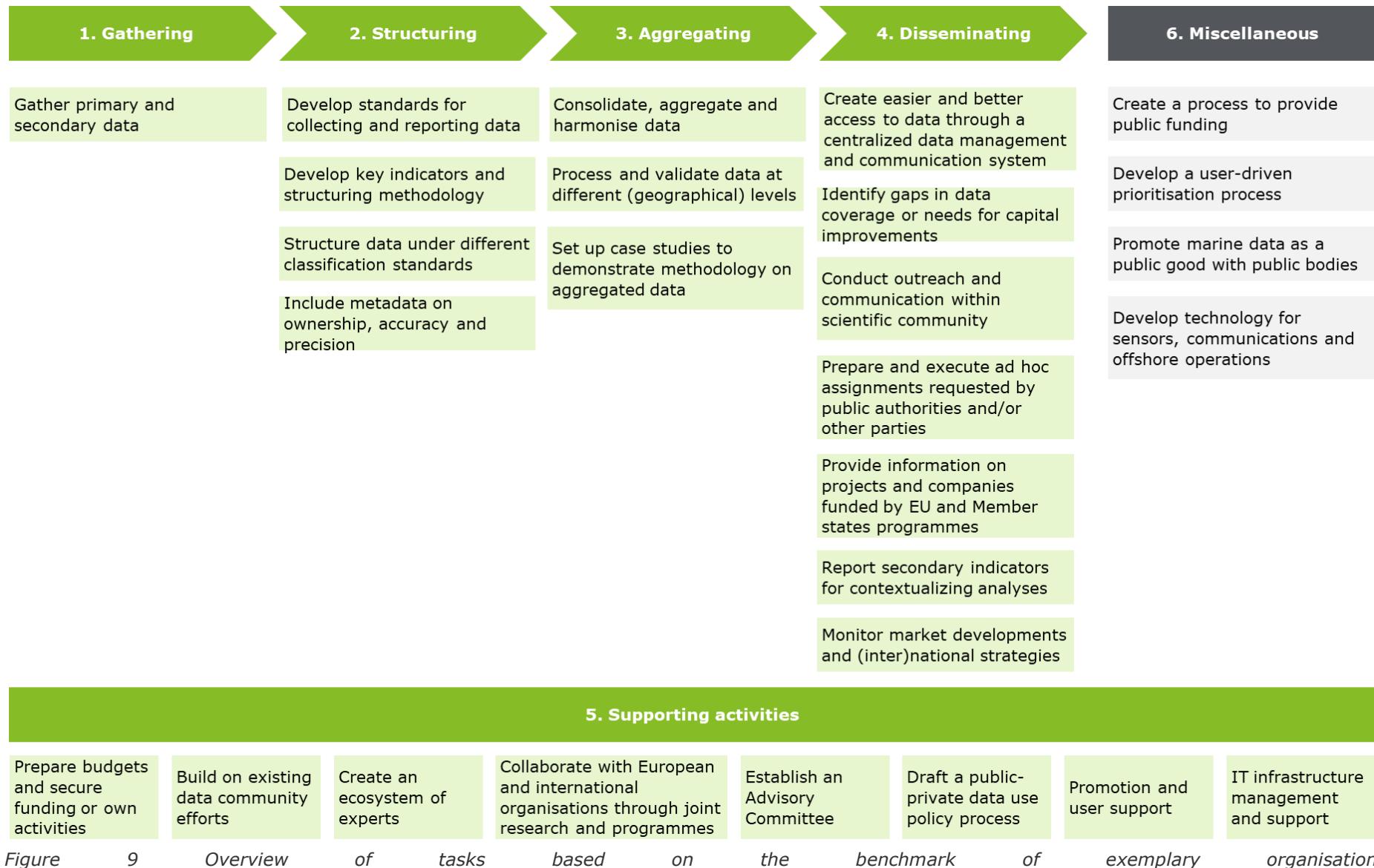
As the next step of identifying the main activities of the observatory, the consortium compiled an overview of all tasks of the exemplary organisations described in the previous section. Eight out of nine organisations provided information on their activities and tasks. The activities identified for each organisation were reported in an exhaustive list of tasks that were then aggregated and categorised into six categories: gathering, structuring, aggregating, disseminating, supporting activities, miscellaneous.

Figure 9 below provides an overview of the activities. The first four categories are focused on the primary, data-related activities of the observatories. Supporting activities describe tasks that are necessary to set up, run, and sustain the observatory. Miscellaneous tasks are secondary tasks that do not reflect data related activities or activities that support the functioning of the observatory as such.

A detailed list of activities and the cross-reference to different observatories can be found in Appendix 5 (see attached excel). An observatory can serve different stakeholders and goals. It is, therefore, necessary to determine the user groups of the observatory. User groups can be split into 4 key groups:

- **economic users:** industry, consumers, etc.;
- **science/academic:** Research organisations and academia;
- **societal:** NGOs, developmental institutions and the general public;
- **policymakers:** decision-makers and regulators.

It is important to note that the list of activities and benefits per user group (described in section 4.4) are both the outcomes of desk research. To complement the desk research, the consortium reached out to the organisation and conducted interviews and written surveys with the organisations to verify the list of activities, perceived benefits and gain insights on if at all there are activities to consolidate data on Blue Economy currently in place. These interviews and written surveys provided an opportunity to collect data on the cost and resources required to conduct these activities. The details of the reach-out and the questionnaire is described in the next section.



4.3. COST ANALYSIS AND FEASIBILITY

The second step consisted of the following activities:

- cost estimation;
- aggregate the budget for activities;
- comparing set up options.

Each step was conducted using different methods and with different outputs, described in the table below.

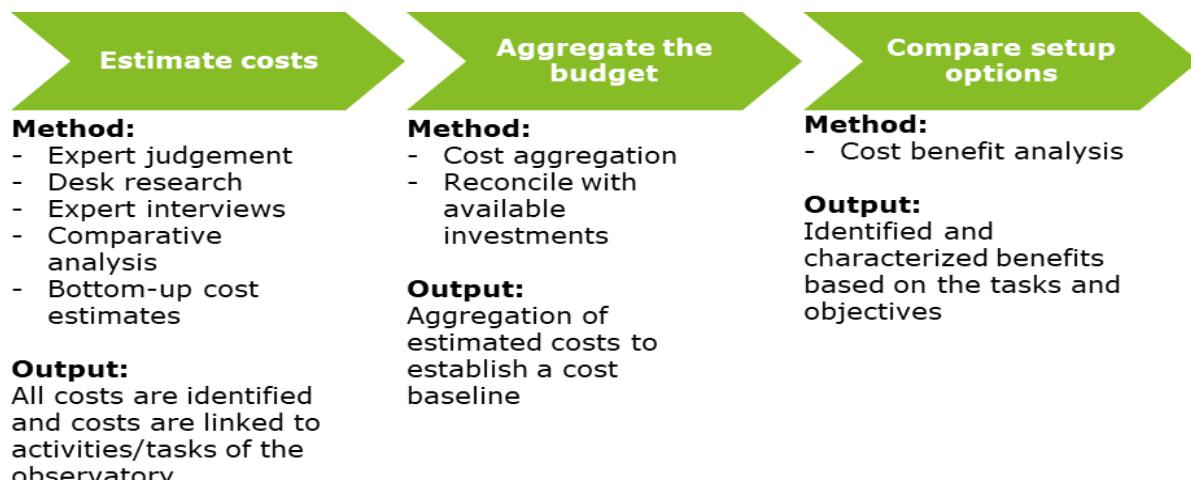


Figure 10 Approach for cost analysis

In estimating costs, the consortium interviewed organisations and different experts with different sets of questionnaires to be addressed by different entities. The questions were tailored based on relevance to the organisations being interviewed and surveyed for efficient information collection. For instance, when having a discussion with EUMOFA, focus was maintained on the questions relevant to an observatory, whereas, in case of Bureau of Economic Analysis, US, both observatory and Sea Satellite Account related questions were covered. The list of questions and the entities that were consulted through interviews and consultations for task 3 and task 4 can be accessed through Appendix 6 (see attached excel). The Table19 below shows the entities that were consulted along with the key topics to be covered.

Table 19 List of entities and key topics for stakeholder consultation

Entity	Organisation	Key topics covered
National Statistics Offices	INSEE France	• Experience in setting up national observatory
	INE SPAIN	• Method of data collection
	Statistics Sweden	• Cost estimates of activities
	Statistics Portugal	• Level of aggregation of data
	CBS, Netherlands	• Split of data (land vs marine) and the effort required
Statistics Offices within a ministry	Bureau of Economic Analysis US	• Experience in setting up a Sea Satellite Account
Sea Satellite Account task unit	Portuguese Sea Satellite Account	• Estimates on resource requirement for setting up a Sea Satellite Account
	National Oceanic and Atmospheric Administration (US)	
observatory	EUMOFA	
	IFREMER, France	
Consultant assisting	COGEA (supporting)	

Entity	Organisation	Key topics covered
statistical work	EUMOFA)	

The key two topics addressed during the interviews were: cost of different activities performed by the observatory and resource allocation of the observatory.

4.3.1. GUIDING PRINCIPLES

During the interviews and desk research, the consortium identified two key guiding principles that are relevant to the feasibility of the observatory:

- the **focus** of the observatory and;
- the **setup** of the observatory.

The **focus** of the observatory comprises the decision on which sectors are at the **core** of the observatory's activities and which sectors are **adjacent**. As noted in task 1, Blue Economy consists of multiple established and emerging sectors and each of the sectors can be further broken down into sub-sectors and industries respectively. Furthermore, the economic importance of each of the sectors may vary across the Member States posing a challenge in prioritising the sectors for the observatory to focus in the initial years of its setup. Assuming a steady ramp-up of the observatory operations over the years, gradually all the Blue Economy sectors across the Member States must be included in the data collection, structuring and dissemination of information. However, given the fixed periodic budgeting of the observatory, variation in the data availability across sectors and regions, and the differences in relative importance of sectors per Member State, it is important to consider a mechanism that can assist the observatory in selecting the sectors during its early phase of operation:

- in the context of prioritisation of sectors, **core sectors** are defined as the sectors that should receive a dedicated percentage of the budget and resources and for which the observatory will perform recurring data collection and analyses;
- the **adjacent sectors** are defined as the sectors for which the observatory dedicates a variable percentage of the budget and resources on periodical basis. These sectors should be prioritised based on the available capacity of the observatory after allocating budget to the core sectors.

The categorization of the Blue Economy sectors as core and adjacent sectors will impact the budget prioritization and resource allocation. Furthermore, the ease of data gathering, harmonisation and quality control of the collected data is an important contributor to the allocation of resources.

The **setup** of the observatory comprises the decision of whether the observatory should have a physical location or should it be a non-physical system with an exclusive online presence. This decision impacts the cost structure and budget allocation, for instance, by increasing the share of fixed relative to the variable cost, for a fixed budget. A non-physical observatory setup does not have a physical location or a designated building, and the activities will be completely online with the help of a third-party service through sub-contractors. A physical observatory setup does have a physical location, or designated building, and the activities will be performed by the permanent staff.

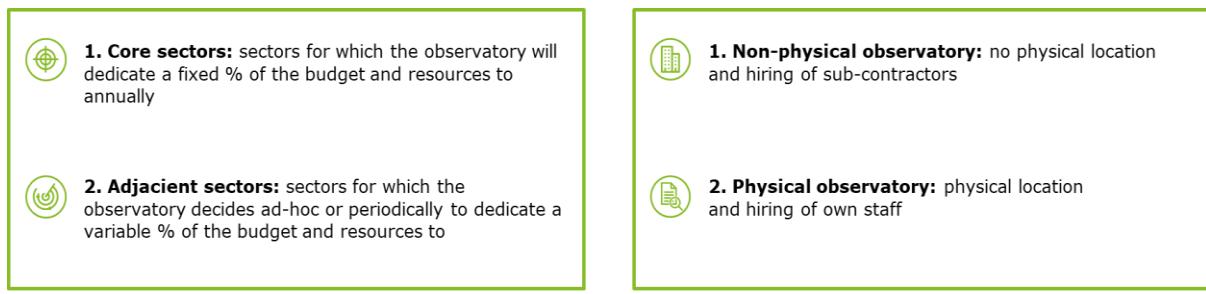


Figure 11 Overview of the guiding principles

As mentioned, the choice of the **focus** and the **setup** jointly will determine the implementation of the observatory and ultimately impact the cost structure, budget allocation and resource prioritization. In determining the feasibility of the observatory, a decision needs to be made on the guiding principles. The final decisions on the guiding principles are at the discretion of the European Commission.

4.3.2. FOCUS OF THE OBSERVATORY

The focus of the observatory in context of prioritising the sectors can be dependent on multiple factors. Based on the deep dive conducted on the Blue Economy sectors in task 1 and the data collection in task 2, the following four factors can potentially influence the attribution of a sector to core sector:

- the economic importance of the sector to the EU's and individual Member States' economy;
- the current and the future economic growth potential of the sector;
- the impact of the sector on the long-term plans of the EU;
- the level of data that currently exists on the key indicators for the sector.

To effectively prioritise the sectors into core and adjacent, the consortium proposes a framework with multiple indicators to assess the four factors listed above. It is important to note that the selection of indicators aims at demonstrating their potential role in prioritizing sectors. The indicators mentioned below are selected based on PESTEL with each of these indicators can have up to five levels of operationalisation metrics namely; **Economical, Environmental, Political, Social, Operational** (technical). The indicators that the consortium deemed relevant for demonstration are as follows:

- **size of the sub-sector** across all EU27 Member States, as measured by Gross Value Added (GVA), Turnover;
- **share of each Member State in the sub-sector**, as measured by % of Member State contribution to the overall GVA;
- **maturity of the sub-sector**, as measured by the period over which turnover is relatively stable;
- **size of the user group** of the dissemination of sub-sector data, as measured by number of institutions and companies that will use the data;
- **sentiment/interest** in the sector by investors, other governmental and non-governmental bodies and social interest. This can be measured through text mining and analysing anonymized social media data such as #hashtags and tweets on twitter;
- **sustainability footprint** of the sector with reference to set goals (e.g. SDG 14);
- **data availability** for the sector in existing datasets;
- **sector growth** trend as observed through the last 5-10 years.

Additionally, each the weightage of each indicator can influence the attribution of sectors as core or adjacent. The indicators can, therefore, have equal weightage for a balanced selection process.

It should be highlighted that ultimately the consortium merely provides a reference framework that can potentially be extended as required. The final selection of indicators and their respective weightages must be made by the European Commission after formal consultation with Member States on the relative importance of the sectors. The Figure 12 below depicts each indicator and how to measure these indicators.

Indicators	Metrics				
	Economical	Environmental	Political	Social	Operational
 Size of the sub-sector	• GVA • Turnover			• # of jobs	
 Share of member states	• GVA contribution • Turnover per state			• # of jobs per state	
 Sub-sector maturity	• # of years in stable turnover				
 Size of the user group	• # of institutions • # of companies				
 Sentiment/Interest	• Investments ³⁰	• Environmental policy • Pressure from NGOs	• Government policy • Political interest	• Social interest	
 Sustainability		• Sustainability footprint • Contribution to SDG14		• Social interest	
 Data availability					• # of identified data sources
 Sector Growth	• GVA growth • Turnover growth			• Job growth	

Figure 12 Reference overview of prioritisation indicators

As mentioned, the proposed focus framework can be operationalised in several ways;

- By assigning a different weightage to each indicator
- By choosing a sub-set of the indicators
- By adding additional indicators

Based on the data collection in task 1 and 2, initial recommendations on sector attribution are provided:

- priority should be given to sectors that have data availability in existing EU level data sources. Therefore, established sectors, namely, Marine living resources, Marine non-living resources, Port activities, Maritime transport, logistics, and storage, Shipbuilding and repairs, Coastal tourism and recreation, Maritime Services should be prioritised as core sectors. An exception is the Fisheries and aquaculture sub-sector where the data is already collected and disseminated by EUMOFA. Therefore, it is recommended to coordinate with EUMOFA and leverage this potential synergy;
- within the above-mentioned sectors, another key indicator is the economic size of the sector for the EU. Looking at the Blue Economy report 2020³⁰, Coastal tourism and recreation is the largest sector in EU with most Member States producing tourism statistics³¹. Therefore, having Coastal tourism as a core sector is recommended. Similar argument can also be presented for the Maritime transport and logistics sector;
- the Emerging Sectors should be initially included as adjacent sectors; however, the indicators must be applied to the sectors for a timely check on their development;

³⁰https://blueindicators.ec.europa.eu/sites/default/files/2020_06_BlueEconomy-2020-LD_FINAL-corrected-web-acrobat-pro.pdf

³¹ <https://ec.europa.eu/eurostat/documents/7870049/10293066/KS-FT-19-007-EN-N.pdf/f9cdc4cc-882b-5e29-03b1-f2cee82ec59d?t=1575909526000>

- the core and adjacent sector lists must be visited periodically (annually) to re-evaluate the position of a sector. In case there is a clear positive change in the indicators for an adjacent sector, it should be re-attributed as core sector and prioritised.

4.3.3. SETUP OF THE OBSERVATORY

During the interviews and desk research, the consortium identified two types of cost structure scenarios depending of the setup of the observatory: a **non-physical** observatory and a **physical** observatory. The key difference between a non-physical observatory and physical observatory is the additional fixed costs of the building (hardware, software, overheads etc.).

A non-physical observatory has relatively limited fixed cost, because the observatory operates without a physical location. Activities are performed remotely with possible assistance of third-party vendors and the allocated budget is used to contract the vendors. The Figure 13 below depicts the assumptions for a non-physical observatory along with the data sources that have been used to consolidate it. For the non-physical observatory, the consortium reached out to EUMOFA and their sub-contractor that is responsible for the day to day operations of the observatory: COGEA.

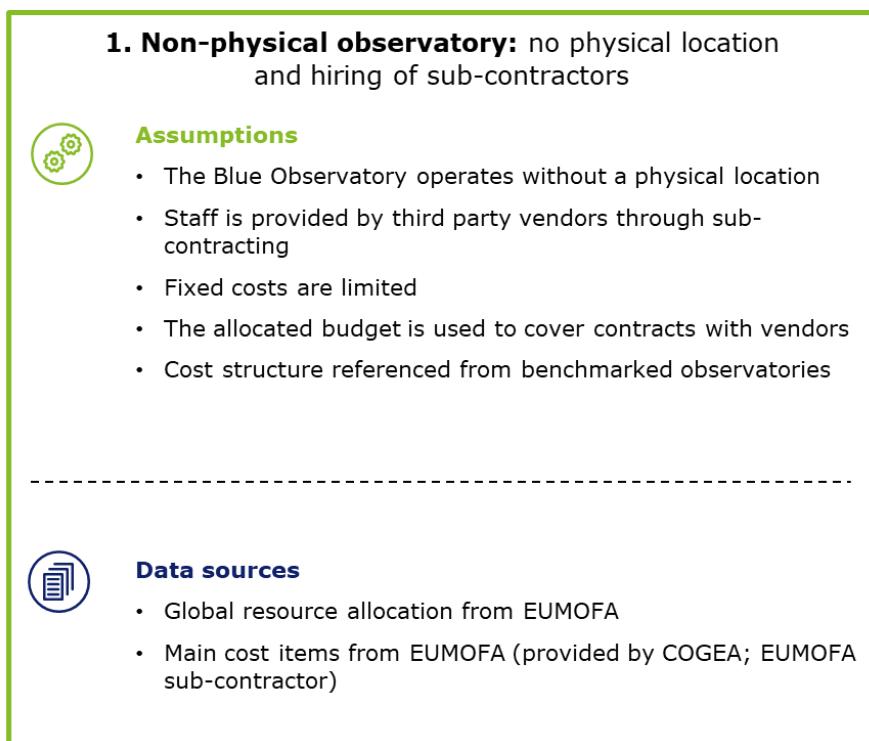


Figure 13 Cost structure scenarios – Non-Physical observatory

A physical observatory operates from its own physical location, and therefore has higher fixed cost due to increased overhead, such as, rent and office supplies. The activities of the observatory will also be performed by staff that is directly employed by the observatory. The Figure 14 below details out the set of assumptions that define a physical observatory along with the data sources used. To gain better understanding of a physical observatory and create a representative cost structure, the consortium reached out the French observatory of the sea, the national marine observatory of France. However, it was soon identified that the French observatory is scaling down the operations and is in process of integration and support to other internal ministries. Therefore, to have a complementary benchmark, the Central Bureau of Statistics (CBS) of the Netherlands was benchmarked, to understand how resources could be scaled in a physical environment.

2. Physical observatory: physical location and hiring of own staff



Assumptions

- The Blue observatory operates from its own physical location
- Higher fixed cost due to increased overhead e.g. rent, office supplies
- Staff is employed directly by the observatory
- Except for higher fixed cost, the allocation of variable cost remains similar to a non-physical observatory
- Cost structure referenced from a benchmarked organization with a physical location



Data sources

- Annual report 2018 from CBS (Statistics Netherlands)
- French marine observatory

Figure 14 Cost structure scenarios –Physical observatory

In both setup scenarios, the highest proportion of the budget must be allocated to the Human Resources as the allocation of HR on activities is similar in both structures. The key distinction between the scenarios being the additional allocation of budget for a physical location, that increase the fixed cost proportions for a physical observatory scenario.

4.3.4. GROUPING OF ACTIVITIES INTO COST ITEMS

To estimate the budget allocation for each activity(as mentioned in Figure9) for the two types of setup scenarios, the activities performed by the observatory were grouped based on the cost items used by the benchmark observatories (EUMOFA and French observatory of the sea). These cost items are as follows:

Data related activities:

- data collection, processing and analysis: including gathering, structuring and aggregating data;
- market analysis: including aggregating and disseminating data;
- dissemination and communication: disseminate data to various user groups;
- project flexibility: ad-hoc requests by public authorities and/or other parties to disseminate data.

Miscellaneous and supporting activities:

- IT services include supporting activities, such as, data-management, data analytics, data security and website management;
- management and administration: include supporting and other miscellaneous activities, such as, preparing budget, securing funding, and promoting marine data.

The Figures 15 and 16 below depicts the grouping of each task into cost items as identified during the interviews.

Item	Category	Task	
Data collection, processing and analysis	1. 	Gathering	
		Develop standards for collecting and reporting data	
		Develop key indicators and structuring methodology	
		Structure data under different classification standards	
	2. 	Include metadata on ownership, accuracy and precision	
		Consolidate, aggregate and harmonise data	
		Process and validate data at different (geographical) levels	
		Set up case studies to demonstrate methodology on aggregated data	
		Monitor market developments and (inter)national strategies	
		Report secondary indicators for contextualizing analyses	
Market analysis	3. 	Prepare and execute ad hoc assignments requested by public authorities and/or other parties	
		Create easier and better access to data through a centralized data management and communication system	
		Identify gaps in data coverage or needs for capital improvements	
Project flexibility	4. 	Conduct outreach and communication within scientific community	
		Provide information on projects and companies funded by EU and Member states programmes	
		Provide external translations	
Dissemination and communication			

Figure 15 Data related tasks grouped in cost items

Item	Category	Task
IT services	5. 	Running the website
		Prepare budgets and secure funding or own activities
		Build on existing data community efforts
		Create an ecosystem of experts
		Collaborate with European and international organisations through joint research and programmes
		Establish an Advisory Committee
	6. 	Draft a public-private data use policy process
		Create a process to provide public funding
		Develop a user-driven prioritisation process
		Promote marine data as a public good with public bodies
Management and administration		Develop technology for sensors, communications and offshore operations

Figure 16 Miscellaneous and supporting activities grouped in cost items

It is important to note that the activity groups created above correspond to the initial set of activities that are identified in section 4.2.

4.3.5. COST STRUCTURE FOR A NON-PHYSICAL OBSERVATORY

After having grouped each activity into respective cost items, the consortium was able to assess the budget allocation for each of the cost items. The share of proportional division between Human Resources, data and other activities have been benchmarked from EUMOFA estimates provided by COGEA. During the interview and data collection phase, EUMOFA and COGEA shared the proportion of budget that was allocated to the cost items during the four years of implementation. The current share allocation therefore assumes the same distribution as EUMOFA, as the Blue Observatory will be a scaled-up initiative which covers more sectors than EUMOFA. As both the physical setup and the non-physical setup will require staff, the Human Resource element remains common in either setup scenarios with no changes in the allocation percentages for HR.

The Figure 17 below show the cost allocation for a non-physical observatory. For a non-physical observatory, the share of Human Resources is proposed to be 78%, data purchase is 12% and other cost (fixed cost) is 10%. Within the Human Resources budget, 9% is attributed to one-off requests that may not be part of day-to-day activities. This category has been added to the cost structure to account for any deviations in dissemination from the original plan. A good example of this would be an additional report published on the impact of COVID-19 on the Blue Economy sectors in case the annual plan of the observatory initially did not have account for any COVID-19 report in 2020. The rather small share of the fixed cost in the overall allocation is derived from the lack of costs for a physical location.

Scenario 1: share of cost item and HR allocation

Cost item	Share	Activities	HR allocation
Human resources	78%	Data collection, processing and analysis	15%
Data purchase	12%	Market analysis	35%
Others (hardware, software, overheads etc.)	10%	Dissemination & communication	15%
		External translations	3%
		Ordinary management and administration	3%
		Project flexibility for unplanned requests	9%
		Planned activities e.g. running the website	20%
Total	100%	Total	100%

Figure 17 Cost allocation for a non-physical observatory

In addition to creating the split of budget among activities, it is important to understand the underlying elements for fixed and variable costs. This helps in gaining better understanding on the structural cost allocation and cost allocation at detailed level as shown in Figure 18.

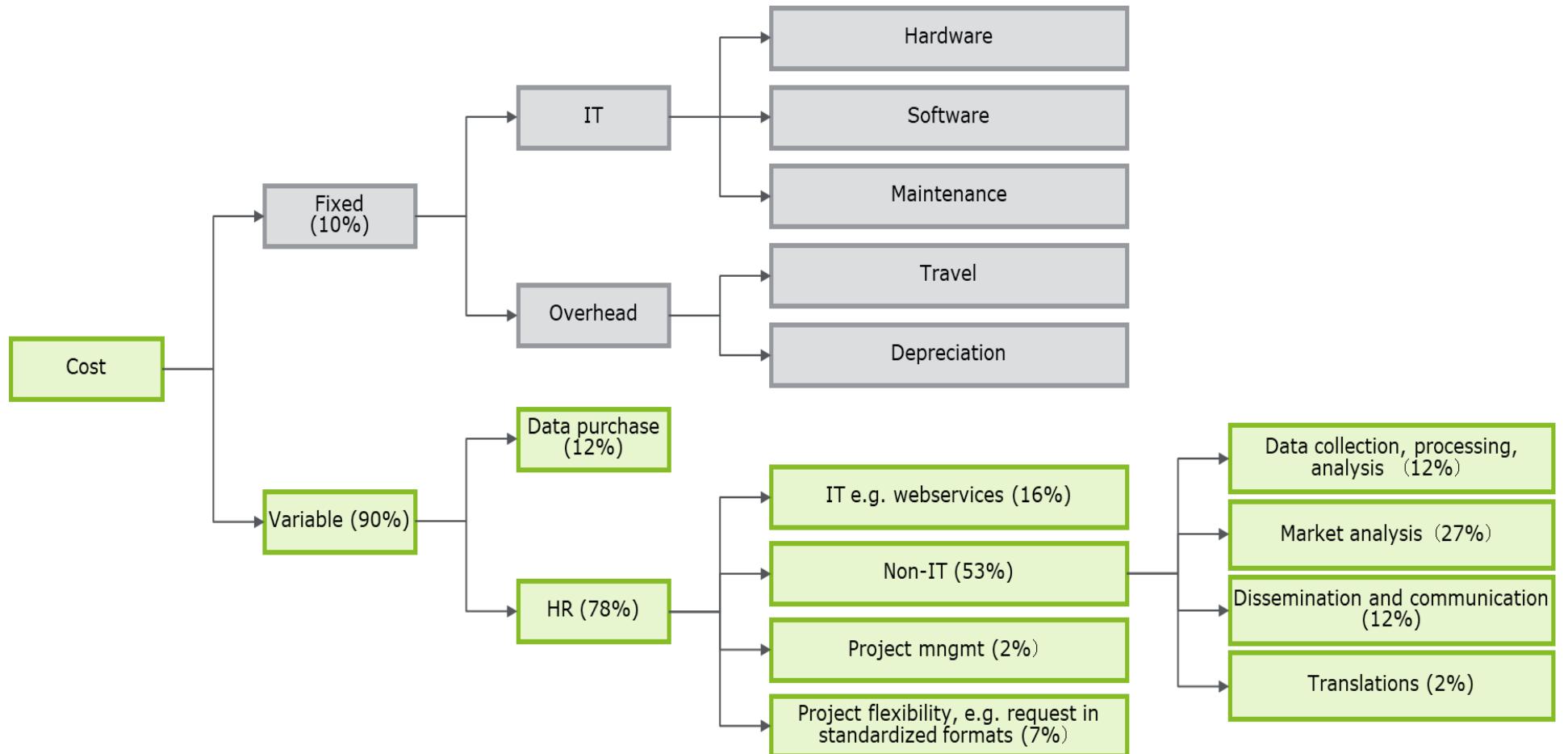


Figure 18 Cost driver tree for a non-physical observatory

4.3.6. COST STRUCTURE FOR A PHYSICAL OBSERVATORY

Like the non-physical observatory, a similar analysis was conducted to create an overview of cost allocations for the physical observatory. The key difference here is that the overall spent allocated a larger proportion of the total budget to "Others" section and reduces the allocation to Human Resources. The proportional allocation within the Human Resources group remains the same. Figure 19 below provides a high-level breakdown.

Scenario 2: share of cost item and HR allocation

Cost item	Share	Activities	HR allocation
Human resources	69%	Data collection, processing and analysis	15%
Data purchase	11%	Market analysis	35%
Others (hardware, software, overheads etc.)	20%	Dissemination & communication	15%
Total	100%	External translations	3%
		Ordinary management and administration	3%
		Project flexibility for unplanned requests	9%
		Planned activities e.g. running the website	20%
		Total	100%

Figure 19 Cost allocation for a physical observatory

In addition to the high-level breakdown, a driver tree is created to provide a detailed overview of the cost elements that constitute the fixed and the variable costs. The physical observatory has 20% of fixed cost, which is due to more overhead because of a physical location (e.g. cost such as, rent, utilities, inventory, office supplies, security and insurances. The figure below depicts the cost driver tree for the physical observatory.

Once key similarity between both the setups of the observatory; non-physical or physical is the distribution of budget for activities within Human resources. Although the overall distribution of budget in the cost items (left part of the figure above) changes due to additional fixed costs, the distribution of activities within of human resources (right side of the figure above)remains same. Hence, the budget allocated towards the observatory's activities, consisting of non-IT and IT activities for both the setup options has the same share. The rationale for keeping the same share of activities within HR is based on the assumption that the staff related (HR) activities will remain the same irrespective of the observatory's setup.

The allocation for non-IT activities is as follows: data collection, processing and analysis requires 15% of HR, market analysis 35%, dissemination and communication 15%, external translations 3%, ordinary management and administration 3%, project flexibility for unplanned requests 9%. 20% of HR is required for IT activities, such as, running the website. Market analysis are at the core of the observatory and hence, requires the largest share (35%) of HR.

For a physical observatory, the share of fixed cost increases, because of more overhead. The cost allocation for a physical observatory is 69% for human resources, 11% for data purchase and 20% for other cost (fixed cost). Hence, the consortium, created a cost driver tree, with percentage of cost for each cost item as shown in Figure 20. For the non-physical observatory, the share of fixed cost as mentioned above is 10% and overhead only includes travel and depreciation.

It is important to note that section 4.3.8 provides a cost estimate for both the scenarios of physical and non-physical observatory.

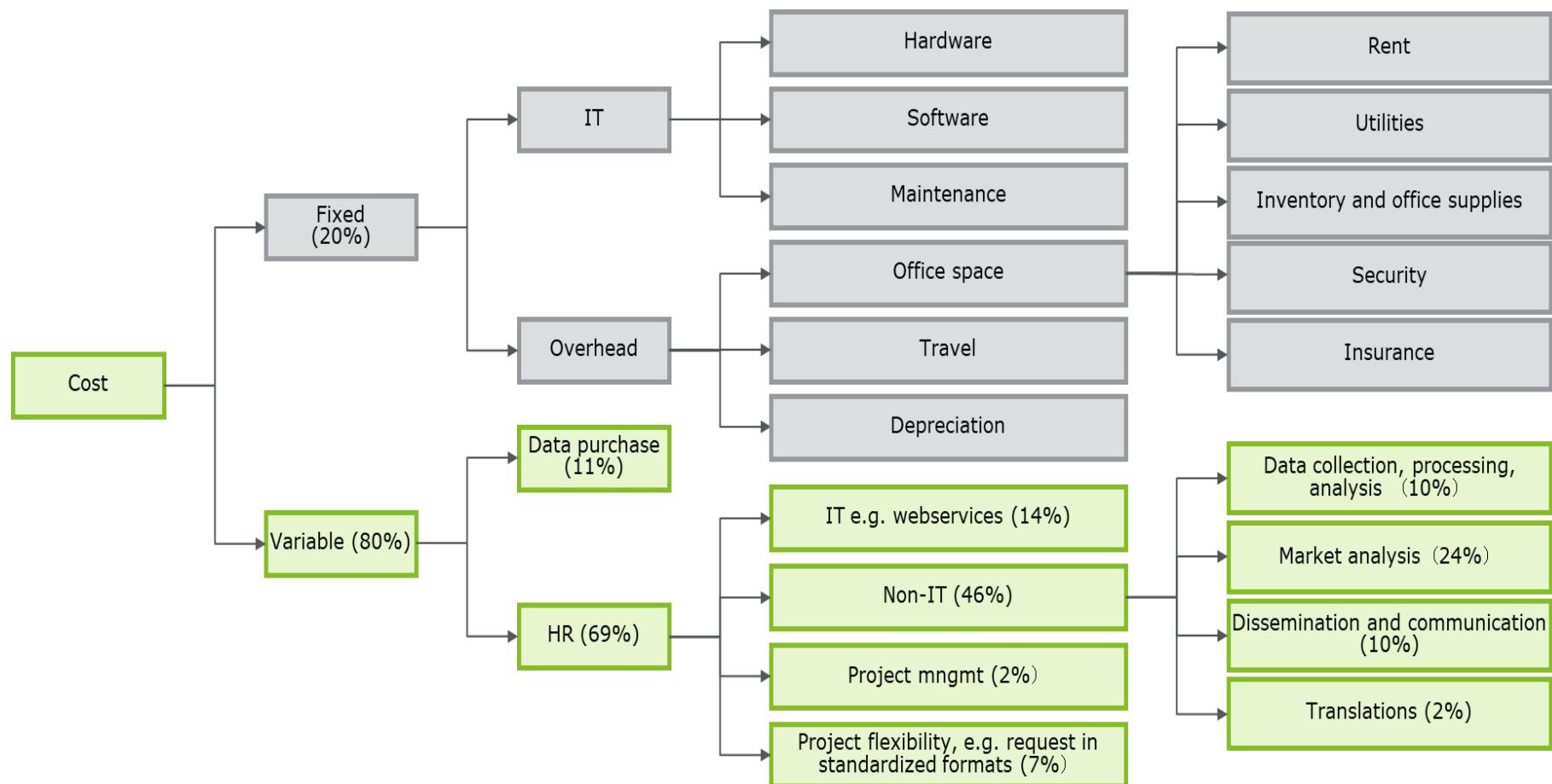


Figure 20 Cost driver tree for a physical observatory

4.3.7. ROLL-OUT PLAN FOR THE OBSERVATORY AND THE SEA SATELLITE ACCOUNT

Once the **focus** and the **setup** of the observatory is finalised, the next important step in the feasibility of the observatory is the orchestration of the roll-out for the observatory. By roll-out, the consortium intends to define a structured approach to operationalising the observatory in a phased manner. By establishing the observatory in phases, the workload can be easily prioritised to ensure smooth ramping up of the activities.

The rollout of the observatory is a complex exercise due to the sheer number of options and choices that are available with the decision makers. The consortium has classified these available options into 3 dimensions as shown in Figure 22:

- **activities** that constitute the operation of the observatory. These options available here have been created using section 4.3.4;
- **sectors** that will be covered by the observatory; namely established and emerging sectors as defined in task 1;
- **geography** that represents the different sea basins that constitute the EU region.

The large number of options mentioned above and depicted in Figure 21 cannot all be prioritised at once as it will be inefficient for the available time and resources. Therefore, these options must be configured into a set of choices that will help in a smooth ramp up of the observatory. The consortium proposed to configure the available options into four phases as shown in Figure 22. Each phase makes a clear set of choices among the options available in each dimension. Additionally, a clear rationale is provided for making the proposed set of choices per phase:

- **phase 0:** in the initial stages of the observatory launch, the objective must be on setting-up the observatory and onboarding the staff in a smooth and coherent manner. Therefore, only supporting and miscellaneous activities should be initiated to provide a solid foundation for the observatory. The supporting and miscellaneous category of activities includes the management, administration and IT related activities of the observatory, as indicated by Figure 21. Sector focus and geography are not relevant in this phase, as the core activities of the observatory are not performed yet.
- **phase 1:** after the foundation of the observatory is set, the next phase should focus on adding data gathering activities to the observatory as the first major step towards core activities. The focus in phase 1 should be on only core sectors and for a selected number of sea basin(s) that have been prioritised. As the established sectors are currently reported in the Blue Economy indicators dashboard, one way to approach the roll-out would be to include the eight sectors categorised as established sector in task 1 in the core sectors during this phase. The actual selection of the sectors will warrant an analysis of all Member States using the indicators defined in section 4.3.2.
- **phase 2:** in phase 2, the observatory should structure, aggregate and disseminate data to make this available to the users. The focus in this phase must still be on additional core sectors and prioritise any remaining established sectors. This will ensure that all the sectors with already existing information will now have dissemination of information and the observatory activities could be focused on more rigorous data collection for the emerging sectors. Therefore, by including the remaining 3 Established sectors, and the Blue Energy Emerging sector in the prioritised sea basin(s), it can be ensured that information is available for dissemination while the observatory plans the data collection activities for Emerging sectors. The selection of the sectors per Member State should be made using the indicators defined in section 4.3.2.
- **full function:** in this phase, the observatory is expected to be more mature and can extend its scope to adjacent sectors and other sea basins. This will be the first time the observatory will execute all the intended activities for all fifteen Blue Economy sectors and sea basins.

Dimension		Options							
Activity (Human Resources)		Data gathering	Data structuring	Data aggregating	Data disseminating	Supporting	Miscellaneous		
Sectors	Established	 Marine living resources	 Marine non-living resources	 Port activities	 Maritime transport, logistics and storage	 Shipbuilding and repairs	 Coastal tourism and recreation	 Maritime services	 Infrastructure and maritime works
	Emerging	 Blue energy	 Blue bio-economy	 Research and education	 Water treatment and supply	 Maritime security and defence	 Entertainment	 Ecosystem services	
Geography	 Baltic Sea	 North Sea	 Atlantic Ocean	 East Mediterranean	 West Mediterranean	 Black Sea			

Figure 21 Overview of options for each dimension

The consortium proposes a phased approach to roll out the observatory activities to ensure smooth ramp-up and management in the early stages.

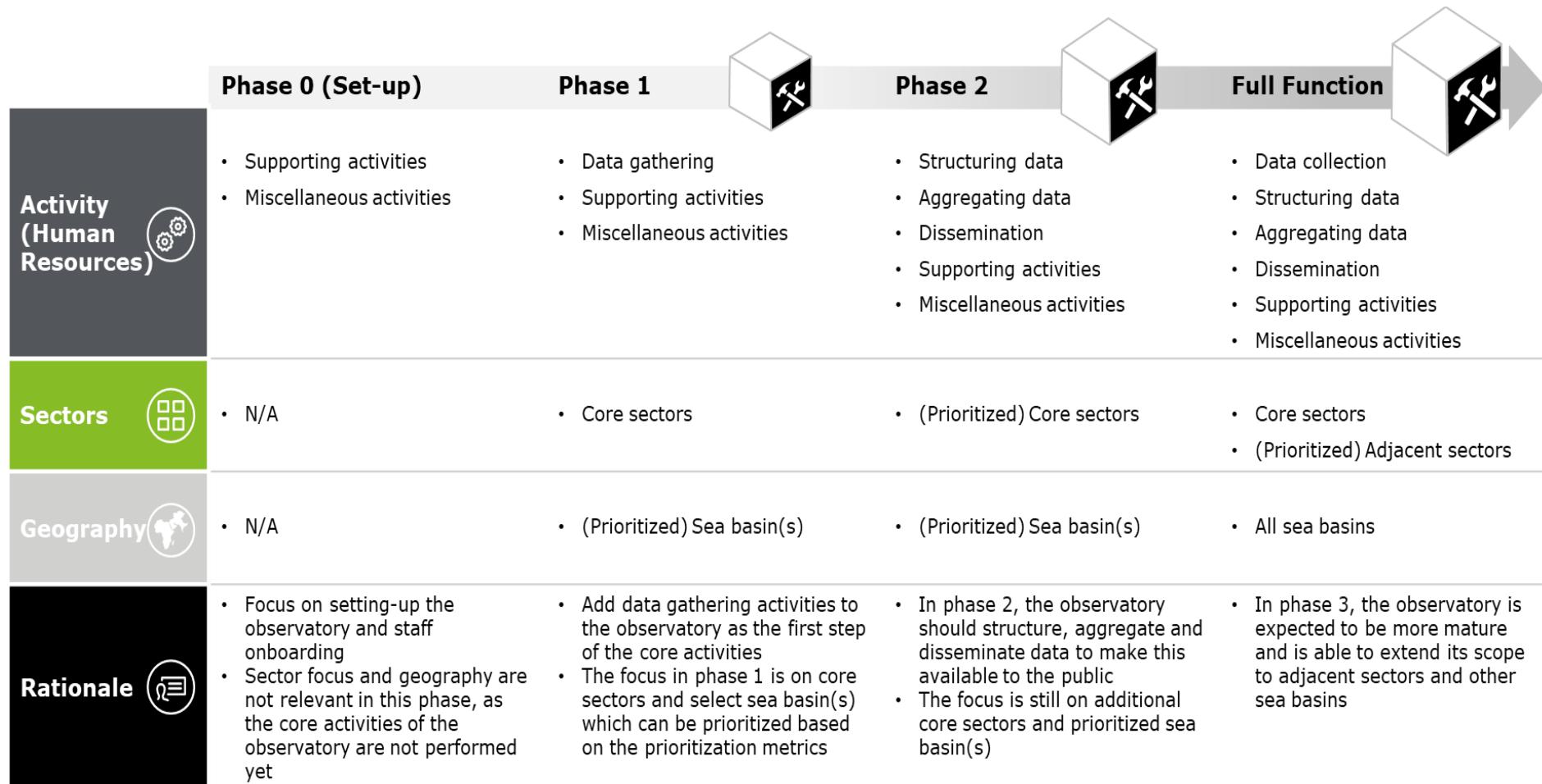


Figure 22 Phased roll-out of the observatory

It is important to note that each phase should last for at least one year, at the end of which the decision makers jointly review and decide to move to the next phase. This recommendation is based on the benchmark of other observatories conducted during the preparation phase for this task. However, chapter 5 will discuss the need for any additional time in case of calculating coefficients. If the operations are not at a sufficient level of expectations in a particular phase, it is advised to spend more time solidifying the foundation before moving ahead and increasing the scope of the activities.

4.3.8. COST ESTIMATIONS FOR OBSERVATORY SCENARIOS

Based on the core activities identified related to each task associated with setting up the Blue Economy observatory, the consortium has estimated the total cost structure. The estimated data is built upon the interviews conducted with stakeholders from EUMOFA, COGEA and CBS. However, only EUMOFA could provide reliable cost estimates. Thus, one needs to bear in mind that the numbers are very specific to the IT architecture of EUMOFA. Depending on a different IT architecture, the costs may be higher or lower. The same goes for the data purchase costs that may depend on the purchases.

As the number of variables for conducting a granular cost estimate for the observatory is high, a cost estimation tool has been developed. The cost estimation tool provides a dashboard where the following inputs can be provided:

- **average person days per year per sector** (Source; EUMOFA) – this has been fixed at **4000 person days** as input from the project documents of EUMOFA;
- total number of sectors in Blue Economy (Established + Emerging) as identified during the project – During the analysis in task 1 and task 2, the total sectors identified **was 15**, including both Established and Emerging sectors;
- average hourly wage for Commission employees³² (Euro/hr) (Average wage from AD5 to AD10 wage groups)– **€ 42.8 per hour** (pre-tax and benefits);
- average hourly wage for contractors³³ (Euro/hr) (Average FGIII Grade 10 and FGIV Grade 14)**€ 25.3 per hour** (pre-tax and benefits);
- average hourly wage for 3rd party consultants (Euro/hr) (Average FWC hourly costs)**€ 55 per hour** (pre-tax);
- number of sectors prioritised in Phase 1 (Emerging + Established) – Initially **set to 8**;
- number of sectors prioritised in Phase 2 (Emerging + Established) – Initially **set to 12**;
- number of sectors prioritised in Phase 3 (Emerging + Established) – Covers all **15**;
- number of workdays per month – **20 workdays**;
- factor for economies of scale – **0.6³⁴**.

The steps involved in estimating the costs are simplified in the diagram as below:



Before deep diving into the cost estimates, it is important to lay down the assumptions used to model the cost elements:

- the setting up of EUMOFA required 4000 person days per year with focus on Fisheries and aquaculture. As the Blue Observatory will require scale up of 15

³²Wage data taken from 2020 Annual update of the remuneration and pensions of the officials and other servants of the European Union and the correction coefficient - [https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020XC1211\(01\)&from=EN](https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020XC1211(01)&from=EN)

³³Wage data taken from 2020 Annual update of the remuneration and pensions of the officials and other servants of the European Union and the correction coefficient - [https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020XC1211\(01\)&from=EN](https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020XC1211(01)&from=EN)

³⁴Scale economies and the "0.6 rule"

sectors equivalent, the cost model must consider all 15 sectors that have been identified in task 1 and task 2. Therefore, the FTE calculations must be based on all 15 sectors distributed over the different phases of roll-out. The actual number of worth of man hours at **full function**. The prioritisation of the actual sectors for each phase must be done jointly with the Member States. Alternatively, the sectors may also be prioritised based on their relevance to all EU27 Member States;

- however, since the observatory is proposed to be operationalised in phases, the actual increase in person days hours will also be phased as new sectors are added in each phase, for example, 4000×8 person days in phase 1, 4000×12 person days in phase 2 and 4000×15 person days in full function;
- the scaling of costs in each phase due to addition of new sector only influences the data related activities; Data gathering, structuring and aggregating, dissemination and communication, and market analysis. Administration and IT related activities are not influenced by increase in number of sectors in the cost estimate model;
- the current calculation does not include economies of scale factor due to addition of sectors. The overall scaling factor for the Blue Observatory can be between 0.6 to 1.0, which entails that actual cost can be up-to 40% less than the current estimates³⁵;
- the labour cost per hour is considered as shown in the assumptions above. Three categories of costs are considered; **Commission employees, EU Contractors and 3rd party service providers**. The cost estimation tool provides an option to individually allocate the activities to any of the three categories. A pre-set allocation is already been created within the model, but it is advised to re-visit this allocation based on the final setup of the observatory.

Based on the assumptions above, the detailed steps involved in estimating the costs are as follows and the cost estimate tool can be reviewed in **Appendix 7**. Firstly, the consortium detailed out the tasks involved per activity and allocated the percentages accordingly. Note that these percentages represent merely a share of the total 100%:

- for the non-physical setup, the human resources allocation of 78% was applied on the total person days 4,000; for the data purchase, 12% and for others, 10%; based on the person days, number of FTE required for each activity was calculated by dividing the person days with 365 (days in a year). Assuming one FTE day = 8 hours, this gives us the total number of FTE days needed per task;
- next, the labour costs are applied using the 3 categories that have been allocated, hour costs (including costs and taxes) were used to estimate the yearly cost for all activities. The labour allocation for non-physical observatory considers all the tasks being handled by 3rd party consultants except for general management and administration of the observatory. This task is assigned to commission employees to maintain oversight on the implementation;
- all the costs calculated so far are only for one sector, therefore, once the FTE and cost per activity was calculated, the costs were multiplied by the number of sectors added in each phase to provide the overall cost estimates throughout the different phases;
- in case of the cost estimate for physical observatory, the Human Resources estimates were calculated with 69% of the overall budget and the average wage allocation is modified. This considers that the entirety of implementation is done by the Commission staff. Although, this results in additional costs of a physical premise, the overall costs of the physical observatory are lower. The key reason is the higher hourly wage of the 3rd party consultants. However, the cost and time to search for a location, hire the staff, relocation costs are not considered.

³⁵Scale economies and the "0.6 rule"

Figures 23 and 24 below provide the phase by phase estimate of for physical and non-physical observatory. In case of non-physical observatory, during phase 0 only the supporting and miscellaneous activities are conducted (setting up the administrative and IT systems). As the actual data collection and analysis has not yet started it only consists of a small percentage of the overall costs. In phase 1, data structuring activities for eight core sectors are added. This results in a significant increase in the costs for this phase. Similarly, as the activities as well as sectors are added in the subsequent phases, the overall costs of operation keep increasing. However, as mentioned earlier, the impact on costs due to addition of sectors is assumed only for data gathering and analysis related activities. This provides an **overall estimate of ~€8.6million** for the non-physical observatories. At first glance, this seems like a significant figure compared to the EUMOFA costs. However, there are 15 sectors across all Member States that need to be included within the scope of the Blue Observatory. Additionally, it is important to mention that this cost includes the setup cost for the Sea Satellite Account as the activities and the costs are fully integrated into the Observatory calculation. For a detailed breakdown of the SSA costs, in case the account is set up outside the Observatory, please refer to chapter 5.

For the physical setup of the observatory, due to the presence of a physical location as well as a higher Commission staff cost results in an estimate of **~€6.6 million**. The overall costs of the physical observatory are lower. The key reason is the higher hourly wage of the 3rd party consultants. However, the cost and time to search for a location, hire the staff, relocation costs are not considered.

Activity (Human Resources)	Phase 0 (Set-up)		Phase 1		Phase 2	Full Function		
	Supporting activities	€ 83,045	Data gathering	€ 1,083,196	Structuring & aggregating	€ 1,624,793	Data gathering	€ 2,030,992
	Miscellaneous activities	€ 21,073	Supporting activities	€ 83,045	Dissemination	€ 1,624,793	Structuring & aggregating	Included in above
			Miscellaneous activities	€ 21,073	Supporting activities	€ 83,045	Dissemination	€ 2,030,992
					Miscellaneous activities + external translations	€ 33,530	Supporting activities	€ 83,045
							Market analysis	€ 4,738,981
							Miscellaneous activities + external translations	€ 33,530
							Ad-hoc requests	€ 63,219
	Total cost for Human Resources activities	€ 104,118		€ 1,187,314		€ 3,366,132		€ 8,980,758
Data Purchase allocation	-			€ 117,927		€ 117,927		€ 117,927
Others (hard/software, overheads, etc.)	€ 98,272			€ 98,272		€ 98,272		€ 98,272
Total costs per phase	€ 202,391			€ 1,403,513		€ 3,582,361		€ 9,196,958
						Total costs for 3 phases		€ 14,385,222
							Economies of scale adjusted	€ 8,631,133

Figure 23 Cost estimate for non-physical observatory

Activity (Human Resources)	Phase 0 (Set-up)		Phase 1		Phase 2		Full Function			
	Supporting activities	€ 159,702	Data gathering	€ 745,663	Structuring & aggregating	€ 1,118,494	Data gathering	€ 1,398,118		
	Miscellaneous activities	€ 18,642	Supporting activities	€ 159,702	Dissemination	€ 1,118,494	Structuring & aggregating	Included in above		
			Miscellaneous activities	€ 18,642	Supporting activities	€ 159,702	Dissemination	€ 1,398,118		
					Miscellaneous activities + external translations	€ 42,597	Supporting activities	€ 159,702		
							Market analysis	€ 3,262,275		
							Miscellaneous activities + external translations	€ 42,597		
							Ad-hoc requests	€ 71,866		
	Total cost for Human Resources activities	€ 187,343		€ 924,006		€ 2,439,287		€ 6,332,657		
	Data Purchase allocation	-		€ 108,097		€ 108,097		€ 108,097		
	Others (hard/software, overheads, etc.)	€ 196,541		€ 196,541		€ 196,541		€ 196,541		
	Total costs per phase	€ 374,884		€ 1,228,644		€ 2,743,925		€ 6,637,313		
		Total costs for 3 phases				€ 10,984,766				
		Economies of scale adjusted				€ 6,590,860				

Figure 24 Cost estimate for a physical observatory

4.4. BENEFITS TO THE USER GROUPS

In addition to the functioning of the observatory, it is important to understand the underlying benefits of the observatory. Therefore, through benchmarking, the consortium created a list of potential benefits of an observatory, in general and as per different user groups; namely Economic users, Scientific users, Societal users and policy makers. The entire list has been reviewed by the observatory organisations that were contacted for data collection.

 General benefits	 Economic users	 Science	 Societal users	 Policy makers
<ul style="list-style-type: none"> Centralized access to data from multiple sources Informs users on data limitations and context Increased manageability and interpretability of the data through well-defined indicators and data structure Comparable, reliable and complete data Public and free access to (marine) data that is difficult to obtain directly Free access to all available data in Blue Economy sectors User friendly interface enables ease of access 	<ul style="list-style-type: none"> Data reporting can inform CSR or sustainability policy Data can inform investment and business decisions Transparency in fund allocation can steer business efforts towards areas of interest for public bodies Transparency in fund allocation can help in identifying partners and promote collaboration Equal access to data can help fueling innovation and R&D 	<ul style="list-style-type: none"> Observatory can provide guidance on data reporting practices, increase comparability and ease of data sharing Ease of access to information enhances efficiency of the research process Promote collaboration and knowledge-sharing for faster advancements in science Informed decision making on interesting research and funding opportunities Availability of funding grants to support research activities 	<ul style="list-style-type: none"> Inform societal decision making (investment decisions, political decisions, etc.) Help focus NGO / developmental institution efforts on key issues Transparency in allocation of public money Third-party analyses can bring more solidity / trustworthiness to NGO or developmental institute missions Creates more funding opportunities for (marine-related) activities 	<ul style="list-style-type: none"> Inform for better policy making on marine topics Reporting on EU Blue Economy indicators and producing socio-economic reports Provide guidance on data reporting practices, increasing comparability and ease of data sharing Third-party analyses requests by policymakers can help gain specific insights on complex policy issues Data on different geographical levels allows for cross-border comparison, informing policy on national and international level

Figure 25 Benefits of the observatory to the user groups

4.5. CHALLENGES AND RECOMMENDATIONS

Conducting the feasibility analysis for the Blue Observatory posed several challenges from conceptual phase to the cost estimates. These challenges have been discussed in this section along with reflections and recommendations going to the next phase of the Blue Observatory. Most of the challenges have been highlighted throughout the text, but a summarised view can be found here:

- **role of the observatory:** during the data collection phase from the existing observatories and national statistics offices, one key question raised by more than one stakeholder was regarding mandate of the Blue Observatory with regards to data management. The question whether the observatory should assume a coordinating role in the Blue Economy space or whether it should actively engage in collection of data on behalf of Member States. As a coordinating organisation, the observatory can actively create standards and guidelines to organise the Blue Economy sectoral data. This ensures that the data collection is still conducted with the Member States. The benefit of assuming this role for the observatory is that the operations can be scaled down leading to lower costs. However, without a mandate or a budget allocated for the Member States, it would be extremely difficult to orchestrate the data collection. On the other hand, the observatory can assume ownership of data collection and engage in primary and secondary data collection for all sectors across Member States. In addition to being an expensive process, there is a possibility that local context and knowledge of national accounting systems within the Member States may limit the accuracy of the data collected. Both the options have their benefits and limitations. However, the recommendation from the interviewees leaned towards a coordinating role with budget for Member States. Having an incentive for the Member States to support in data collection will make it easier to access regional level data;
- **prioritisation of sectors:** as mentioned in section 4.3.2, prioritisation of sectors to be included initially as the observatory enters in operational state will influence the ease of data collection in the pilot phase. The categorization of the Blue Economy sectors as core and adjacent sectors will impact the budget prioritization and resource allocation. A successful start of the observatory will ensure that the future efforts are coordinated as the observatory grows. Although the chapter provides initial insights on prioritisation of the sectors by introducing P(political), E(economical), S(social), T(technical) and E(environmental) indicators, the actual selection of the sectors must be done in close coordination with the Member States. Therefore, as part of the pilot phase of the observatory, a recommendation would be to setup a cross Member State group of experts from the Blue Economy and marine accounting domains, who can closely guide the initial sector selection process;

- **cost estimates for functioning of the observatory:** reaching clear estimates for the activities of the Blue Observatory proved challenging in more than one way. Unavailability of quantitative data on cost structures of similar observatories meant reliance on the consortium's expertise in helping large business transformation and scale-up initiatives. However, the uncertainty around the estimates is still high due to the possible combination of options available to implement the Blue Observatory, as covered in the entirety of section 4.3. As a result, the cost estimation model for the observatory has been customised and modified into a cost estimation tool. As the assumptions around the observatory change in the next phase and the uncertainty reduces, there may be a need to re-visit the cost estimates. Having a cost and resource allocation tool will help the Commission to update the estimates and explore setup possibilities with ease. Changes in the development of sectors may result in more data being available on many emerging sectors and sub-sectors. The numbers provide a good baseline to proceed to the next phase, if the Commission decides to pursue the initiative. Once some key design principles are finalised, creating a viability (business) case will become manageable.
- **Synergies with other Observatories and the EU Sea Satellite Account:** being an observatory of the Blue Economy covering a large number of sectors and sub-sectors, it is possible to leverage any existing initiatives that exist in the Blue Economy space and ensure that redundancies are avoided by investing resources in areas where information already exists. Throughout task 1, the existing relevant data sources and organisations have been highlighted. For Example, data on Marine Living Resources can be directly accessed from EUMOFA. Similarly, Portugal has a fully operational Sea Satellite Accounting system that can provide reliable Blue Economy data on most of the sectors. Searching for similar initiatives both at private and public arenas can ensure synergies;
- **double counting of data gathering and analysis activities:** throughout task 3, the possible activities of the Blue Observatory are highlighted, and the feasibility analysis is conducted. However, most of the activities related to data, namely; data gathering, structuring, analysing and disseminating; are shared with the activities necessary to setup the Sea Satellite Accounts. Being aware of the potential overlap, there is a likelihood of double counting the estimates produced in task 3 and task 4. Therefore, it is important to clarify that all the activities covered in task 4 for setting up the Sea Satellite Account are part of observatory activities related to data. The categorisation of those activities may vary based on the reports and studies, but the core tenets are still shared between the Blue Observatory and the Sea Satellite Account. Therefore, a section is added at the end of the cost analysis section (5.5) in chapter 5 that clarifies the relationship between the two tasks while creating an overarching estimate for setting up the observatory and the Sea Satellite Account for the EU. However, individual estimates for both the observatory and the Sea Satellite Accounts are included in the respective chapters to ensure that they can be treated as stand-alone analyses and referred independent of each other.

5. TASK 4 SEA SATELLITE ACCOUNTS – FEASIBILITY STUDY

Task 4 outlines the financial feasibility of a national or European Satellite Account comparing both options. It will be based on the required database structure and content. The approach to task 4 is structured as follows:

- define structure and data needs for the SSA (part of task 1);
- evaluate sources that may contribute to the SSA (part of task 1 and task 2);
- methodology to structure an SSA;
- verify the options for setup of the SSA;
- cost analysis for the SSA.

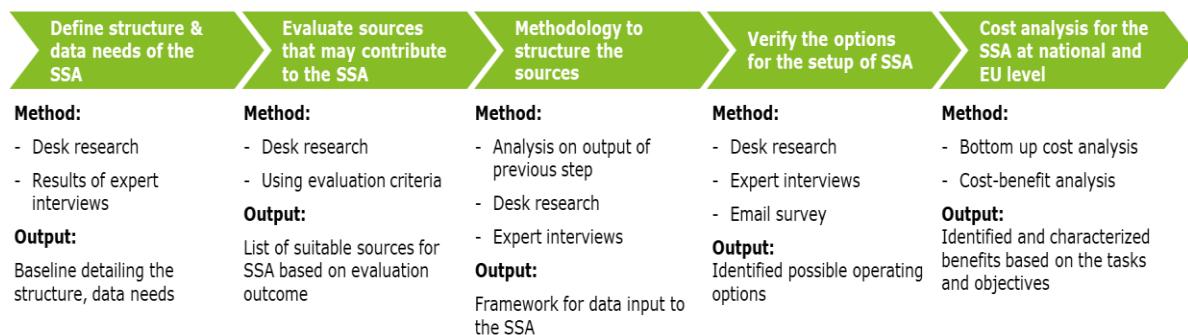


Figure 26 Approach for task 4

5.1. DEFINING STRUCTURE AND DATA NEEDS OF THE SSA

As part of the defining structure for the Sea Satellite Account, the consortium had the opportunity to look at some of the existing Satellite accounts in addition to the Portuguese SSA as well as suggested guidelines. All accounts and guides are listed in the Table 20 below.

Table 20 International satellite accounts and guides

Satellite account	Source	Country
Portuguese Satellite Account for the Sea	Statistics Portugal (Instituto Nacional de Estatística) and Directorate-General for Maritime Policy	Portugal
Ocean Economy Satellite Account	National Oceanic and Atmospheric Administration	The United States of America
The Economic Contribution of Australia's Marine Industries	The Allen Consulting Group, Report to The National Oceans Office (Australian Government Department of Environment)	Australia
Measuring the Blue Economy: The System of National Accounts & Use of Blue Economy Satellite Accounts	Caribbean Development Bank	Jamaica

Satellite account	Source	Country
Rethinking Innovation for a Sustainable Ocean Economy	OECD	OECD countries
Tourism Satellite Accounts in Europe	Eurostat	The European Union
Economic description of the Dutch North Sea	Statistics Netherlands	The Netherlands
Marine Economic Statistics 2017	Marine Scotland	Scotland
Economic Impact of Marine Related Activities in Canada	Fisheries and Oceans Canada	Canada

As discussed under task 1, the structure and data needs of a Sea Satellite Account for the European Union is defined based on sectors and subsectors identified in the BE 2019 report and the Portuguese Sea Satellite Account methodological report. The additional sources were consulted to fill in any missing sectors and ensure consistency with Sea Satellite Accounting internationally.

The inclusion of sectors in the Sea Satellite Account covers not only those industries that operate directly within the Blue Economy but also those that rely on the Blue Economy to be financially viable. The extensive list of sectors, sub-sectors, and industries, in which data is reported for France, Sweden and Spain (see task 2 and Appendix 4) are also partly influenced by the division of economic activities as classified in NACE and ISIC. That rationale for using NACE classifications as the base structure of the Sea Satellite Account is described in section 2.1.

5.2. METHODOLOGY TO STRUCTURE THE SEA SATELLITE ACCOUNT

Based on observations made from existing satellite accounts and guidelines listed in Table 20, the general methodology outlining the process of constructing a Sea Satellite Account can be divided into the following steps:

- conceptual phase: the purpose of this step is to determine the scope of the activities to be included in the satellite accounting of the Blue Economy;
- compilation, calculation and analysis phase:
 - a. measuring the value of economic activities: data collection and analysis, and in particular, coefficient calculations for existing data within the national accounting framework and supplementary databases;
 - b. measuring the value of marine ecosystems: non-market values that may not be readily available or collected in a systematic framework like national accounts;
 - c. measuring the value of indirect and induced sectors and industries usually done through the employment of supply and use tables (SUTs) and Input Output tables (IOT);

- revision and re-production phase: once the pilot Sea Satellite Account has been completed, updates of the account will need to take place at regular intervals. Updates should include revisions of coefficients as more information or sources of information become available.

5.2.1. CONCEPTUAL PHASE

The first step in constructing a SSA is to clearly define the scope of the economic activities that fall under the Blue Economy (BE). This step usually involves consultations with various government and industry bodies as well as experts (pers. communication NOAA and Statistics Portugal). The aim is to map out the sectors and industries that fall under the definition of the Blue Economy, for direct, indirect and induced. The geographic boundaries that determine the scope are normally also defined during the conceptual phase. For example, the hospitality and retail industries (e.g. hotels, restaurants, bars and retail shops) that fall within the maritime tourism sector.

While the definition of the Blue Economy varies across countries, the key categories considered are comparable to those identified in Table 21 for the established sectors (see Table 21). For instance, the US attributes an economic activity to the ocean economy if the activity to Ocean Economy i) production taking place in or on the waters that are geographically in-scope, ii) production that by necessity is located near the ocean, and iii) production of commodities that supplies ocean related industries (Nicolls et al. 2020)³⁶. Similarly for the Portuguese Satellite Account for the Sea, the sectors of the economy are aggregated by 3 'observation levels' – 1) characteristic: activities in which an important part of the operations takes place at sea or whose products come from or are intended for use at sea or on the shore limit, 2) crosscutting activities: supporting activities such as maritime equipment and services, and 3) activities favoured by the sea: include the accommodation activities, restaurants and imputed rents of second homes located in villages in coastal areas (Statistics Portugal and DGMP 2016). These definitions mirror countries elsewhere in the world, including Australia, the UK, Canada, South Korea and so forth (OECD 2019).

Table 21 Definitions of the Blue Economy from selected countries, OECD 2019

Country	Main substance
USA	The economic activity, which is (a) an industry whose definition explicitly ties the activity to the ocean, or (b) which is partially related to the ocean and is in a shore-adjacent zip code.
UK	Those activities which involve working on or in the sea. Also, those activities that are involved in the production of goods or the provision of services that will directly contribute to activities on or in the sea.
Australia	Ocean-based activity ("Is the ocean resource the main input? Is access to the ocean a significant factor in the activity?").
Ireland	Economic activity which directly or indirectly uses the sea as an input.
China	The sum of all kinds of activities associated with the development, utilization and protection of the ocean.

³⁶ Nicolls et al. (2020), Defining and Measuring the US Ocean Economy, BEA methodological report, available at <https://www.bea.gov/system/files/2020-06/defining-and-measuring-the-united-states-ocean-economy.pdf>

Country	Main substance
Canada	Those industries that are based in Canada's maritime zones and coastal communities adjoining these zones or are dependent on activities in these areas for their income.
New Zealand	The economic activity that takes place in, or uses the marine environment, or produces goods and services necessary for those activities, or makes a direct contribution to the national economy.
Japan	Industry exclusively responsible for the development, use and conservation of the ocean.
South Korea	The economic activity that takes place in the ocean, which also includes the economic activity, which puts the goods and services into ocean activity and uses the ocean resources as an input.
Portugal	Economic activities that take place at sea and others that are not taking place at sea but depend on it, including marine natural capital and non-tradable services off marine ecosystems

The exact structure of sectors, sub-sectors and industries that fall under the key categories mentioned tend to differ relatively more across countries, according to significance or dependency on the Blue Economy as well as the recognition given to particular sectors by policy makers and stakeholder. Traditional sectors like Fisheries and aquaculture, shipping, port industries, shipbuilding, oil and gas, and marine tourism are common across existing Sea Satellite Accounts (Allen Consulting Group 2004, DFO 2009, Statistics Portugal and DGMP 2016, Statistics Netherlands 2016, Chang 2017, Stats NZ 2018, Marine Scotland 2020, Nicolls et al. 2020)³⁷. However, emerging sectors of the Blue Economy vary more depending on natural resources available, blue technology advancements of the countries and/or the methods that can account for them. For instance, emerging sectors such as renewable energy, marine bioeconomy and blue biotechnology are accounted for in both the Blue Economy Report (European Commission 2020) and the Portuguese SAS methodological report. Meanwhile, South Korea now include environmental and emerging high valued sectors like water purification and coastal restoration in the concept of the ocean economy (Chang 2017). The US NOAA and BEA have also begun developing measures for blue technology and related services to be included in the next edition of the Ocean Economy Satellite Account (Nicolls et al. 2020).

Marine natural capital and Ecosystem services were highlighted as new areas of interest for marine satellite accounting in the latest Blue Economy Report (European Commission 2020) and establishing an internationally consistent system of environmental accounting of such services has been actively promoted by the United Nations (United Nations 2021)³⁸. To date, there are no SSAs that incorporate a comprehensive account of the value of marine ecosystems. The Australian Bureau of Statistics carried out an experimental ecosystem account for the Great Barrier Reef to measure the

³⁷Chang, J. (2017), "Measuring Ocean Economy in Korea", presentation at OECD Workshop: New Approaches to Evaluating the Ocean Economy, 22 & 23 November 2017, OECD, Paris

³⁸United Nations 2021, System of Environmental-Economic Accounting—Ecosystem Accounting Final Draft, prepared by the Committee of Experts on Environmental-Economic Accounting, submitted to the UN Statistical Commission, 52nd session, 1-3 and 5 March 2021, available at:
https://unstats.un.org/unsd/statcom/52nd-session/documents/BG-3f-SEEA-EA_Final_draft-E.pdf
https://seea.un.org/sites/seea.un.org/files/seea_eea_final_en_1.pdf

environmental asset, its net wealth, income and production, resource depletion and intensity of use, employment, and expenditure related to environmental activities (ABS 2015, 2017)³⁹. Of course, the Great Barrier Reef makes up only one fraction of the natural capital in Australia and there are many other marine ecosystems along the extensive coastline that remain unaccounted for. Similarly, Statistics New Zealand released a series of environmental economic accounts in 2018 that includes, in part, the marine economy (Stats NZ 2018)⁴⁰. While the fish accounting uses the System of Environmental-Economic Accounts (SEEA) Central Framework as its guiding reference, it is far from complete in the account marine natural capital. Monetary estimations are made for commercial fish species using data recorded from the fishing quota system, but the accounting of the marine economy is limited to 9 sectors with commercial use values.

In terms of the actual structure of sectors and subsectors of the European Sea Satellite Account, the following is proposed as seen in the figure below. A detailed list of sectors, sub-sectors and industries to the covered in the Sea Satellite Account are produced in the subsequent tables.

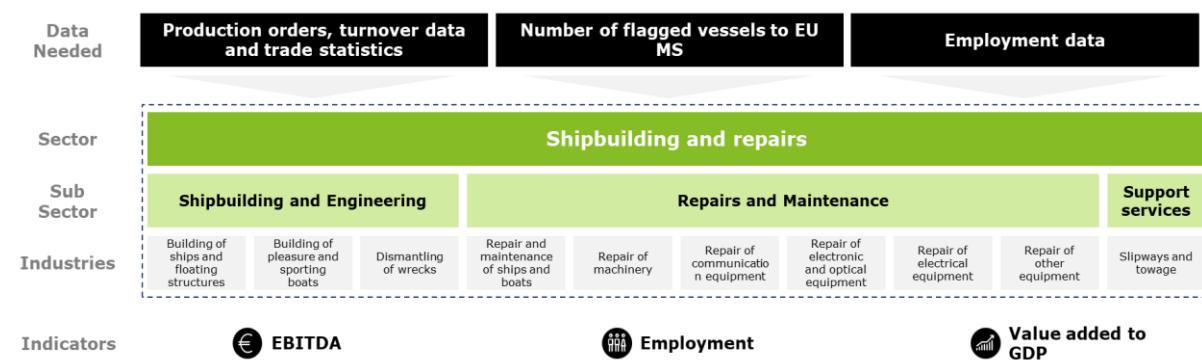


Figure 27 Example of one sector - Proposed structure for the Sea Satellite Account

Established sector	Sub-sector	Industry
Marine living resources	Primary production	Commercial marine fishing sector (inc. ornamental fish)
		Marine aquaculture sector
	Processing and distribution	Processing and preserving of fish, crustaceans and molluscs
		Manufacture of oils and fats
		Prepared food products (incl. meals and dishes)
		Processing and preserving of fisheries products not fit for human consumption (incl. bait, feed, pet food etc.)

³⁹ABS (2017), 4680.0 - Experimental Environmental-Economic Accounts for the Great Barrier Reef, Australian Bureau of Statistics, Canberra, Australia

ABS (2015), 4680.0.55.001 - Information Paper: An Experimental Ecosystem Account for the Great Barrier Reef Region, Australian Bureau of Statistics, Canberra, Australia

⁴⁰Stats NZ (2018), Environmental-economic accounts: 2018 (corrected), Retrieved from www.stats.govt.nz, Stats NZ Tatauranga Aotearoa, Wellington, New Zealand

Stats NZ (2018), Environmental-economic accounts: Sources and methods, Retrieved from www.stats.govt.nz, Stats NZ Tatauranga Aotearoa, Wellington, New Zealand

Established sector	Sub-sector	Industry
Marine non-living resources	Offshore drilling, oil and gas	Processing of other fisheries products (incl. pearls and jewellery)
		Wholesale of fisheries products
		Retail sale of fisheries products
		Extraction of crude petroleum
		Extraction of natural gas
		Support activities for petroleum and natural gas extraction
		Harvesting of gravel, sand, clay and kaolin
		Extraction of salt
		Extraction of peat
		Mining of chemical and fertiliser minerals (e.g. phosphate)
Manufacturing	Other minerals (incl. seabed mining)	Quarrying of ornamental stones (e.g. limestone) and gravel and sand
		Mining of other non-ferrous metal ores
		Manufacture of refined petroleum products
	Processing and distribution	Manufacture of industrial gases
		Manufacture of dyes and pigments
		Manufacture of fertilisers and nitrogen compounds
Trade, restaurants and hotels	Trade, restaurants and hotels	Manufacture of perfumes and toilet preparations (e.g. ambergris)
		Manufacture of other chemical products N.E.C.

Established sector	Sub-sector	Industry
Port activities	Ports and wharfage	Manufacture of ceramic products
		Manufacture of lime and plaster
		Cutting, shaping and finishing of stone
		Precious metals production
		Lead, zinc and tin production
		Copper production
		Other non-ferrous metal production
		Distribution of gaseous fuels through mains
		Wholesale of solid, liquid and gaseous fuels and related products
		Wholesale of metals and metal ores
Maritime transport, logistics and storage	Shipping and freight	Wholesale of chemical products (incl. industrial salt)
		Agents involved in the sale of fuels, ores, metals and industrial chemicals
		Support activities for other mining and quarrying
		Port activities
		Cargo handling
		Supply of electricity to port
		Supply of water to port
		Cleaning and de-biofouling activities
		Biosecurity
		Laboratory examination and checks
	Warehouse and storage	Quarantine provision and custom services
		Warehousing
		Cold stores
		Sale of containers, (incl. dry, reefer, oil etc.)
		Lease of containers, (incl. dry, reefer, oil etc.)
		Repair of fabricated metal products (incl. R&M of containers)
		Sea and coastal freight water transport (water transport)
		Inland freight water transport
		Sea and coastal passenger water transport (water transport)
		Inland passenger water transport
	Passenger transport	Renting and leasing of water
	Support services	

Established sector	Sub-sector	Industry
Shipbuilding and repairs	Shipbuilding and engineering	transport equipment Service activities incidental to water transportation Building of ships and floating structures Building of pleasure and sporting boats Dismantling of wrecks
		Repair and maintenance of ships and boats
		Repair of machinery
		Repair of communication equipment
		Repair of electronic and optical equipment (incl. navigation, aeronautical and nautical equipment)
	Repairs and maintenance	Repair of electrical equipment (incl. electrical motors)
		Repair of other equipment (incl. fishing nets, shipping drums etc.)
		Hotels and similar accommodation Holidays and other short-stay accommodation
		Camping grounds, recreational vehicle parks and trailer parks
		Other accommodation
Coastal tourism and recreation	Accommodation	Passenger air transport Sea and coastal passenger water transport Passenger rail transport, Interurban Boat chartering
		Urban and suburban passenger land transport
		Retail sale of automotive fuel in specialised stores
		Renting and leasing of cars and light motor vehicles
		Taxi operation
	Transport	Travel agency activities
		Tour operator activities
		Other reservation service and related activities
		Recreational activities
		Activities of sport clubs (e.g. game fishing clubs, yacht and sailing)

Established sector	Sub-sector	Industry
Maritime services	Other expenditures	clubs etc.)
		Other sports activities (incl. recreational fishing)
		Activities of other membership organisations N.E.C. (e.g. service activities to promote game fishing, surfing tournaments etc.)
		Other amusement and recreation activities (incl. activities of marinas)
		Retail sale of cultural and recreation goods in specialised stores (e.g. souvenir shops)
	Traffic control and safety	Retail sale of other goods in specialised stores (e.g. sports equipment; outdoor or special clothing/gear such as swimsuits, dive gear; fishing and bait shops)
		Food and beverage service activities (incl. restaurants and catering)
		Renting and leasing of recreational and sports goods
		Provision of wireless and satellite communication services
		Manufacture of railway locomotives and rolling stock (incl. signalling and traffic control equipment for inland waterways)
Transport, storage and communications	Manufacturing	Electrical installation (incl. of illumination and signalling systems)
		Maritime traffic controllers (incl. lighthouses)
		Vessel tracking and e-monitoring services
		Water police, coast guards and other rescue support services
		Lifeguards
	Trade,修整, maintenance and repair of transport equipment	Property or other non-life insurance
		Finance & lending
		Accountancy, bookkeeping and consultancy
		Employment agencies for recruitment services
		Real estate services (e.g. buying and leasing of buildings and plants)
Trade,修整, maintenance and repair of transport equipment	Transport, storage and communications	Maritime law services (e.g. to challenge fines or defend oil spill lawsuits)
		Public relations and marketing
		Warehousing
		Transport by road
		Transport by rail

Established sector	Sub-sector	Industry
Infrastructure and maritime works	Provisioning services	services
		Sale of machinery, industrial equipment, ships and aircraft
		Sale of food, beverages and tobacco (e.g. for victualling on fishing vessels and suppliers to cruise ships)
	Associations and organisations	Supply of marine diesel and fuel bunkering services
		Activities of business and employer's membership organisations (e.g. fishing and aquaculture industry associations)
	Other services	Cleaning services for yachts, cruises and ships (excl. de-fouling services)
		Septic and waste disposal service for boat homes and ships
		Weather forecasting and ocean monitoring services
	Water projects	Construction of water projects (incl. harbours, marinas and dikes etc.)
		Construction of seawalls, offshore breakers and artificial headland etc.
	Underwater sea cables	Construction of utility projects for electricity and telecommunications (incl. submarine cables)
		Installation of tubes, pipes and hoses
		Repair and maintenance of tubes, pipes and hoses
	Oil and gas pipelines	Construction of oil and gas pipelines
	Other infrastructures (incl. Maritime equipment)	Construction of roads and motorways (incl. surface work on bridges and in tunnels)
		Construction of bridges and tunnels
		Construction of utility projects for fluids (incl. canals, pipelines, water well drilling)
		Other specialised construction

Established sector	Sub-sector	Industry
Entertainment		activities N.E.C. (incl. subsurface work, waterproofing treatment, outdoor swimming pools etc.)
	Support services	Renting and leasing of construction and civil engineering machinery and equipment
		Renting and leasing of other machinery, equipment and tangible goods N.E.C.
	Film entertainment	Motion picture, video and television programme production activities
	Photography	Photographic activities
	Events	Organisation of festivals, conventions and trade shows
	Amusement parks and aquariums	Botanical and zoological gardens and nature reserves activities
		Activities of amusement parks and theme parks (e.g. water parks, esp. aqua parks on lakes and sea)
	Professional sport competitions and related sectors	Operation of sports facilities (incl. organisation of sport events for professionals e.g. marine Olympic sports and other racing events) Gambling and betting activities
	Cultural tourism and other cultural (market) values	Artistic creation Physical well-being activities (e.g. wellness retreats) Museums activities
Maritime security and defence	Naval and related defence activities	Defence activities
	Shipbuilding and weaponry	Manufacture of military vehicles (incl. ship building of submarines, aircraft carriers etc.)
		Manufacture of maritime weapons and ammunition Manufacture of specialised maritime military equipment (incl. communications, navigation, sonar and radar etc.)
Research and education	Repair and maintenance	Repair of specialised maritime military equipment Repair of fabricated metal products (incl. R&M of weapons and weapon systems)
	Research and development	Research and experimental development on biotechnology
		Research and experimental development on social sciences and humanities
		Other research and experimental development on natural sciences and engineering Engineering activities and related

Established sector	Sub-sector	Industry
		technical consultancy Seabed exploration survey and mapping Technical testing and analysis Repair of electronic and optical equipment (incl. lab equipment) Activities of professional membership organisations (e.g. IIFET, EAFE etc.)
	Governance and data	Business and other management consultancy activities (incl. fish stocks management) Data and information services Digitalisation services
	Education	Technical and vocational secondary education (incl. tuition for ship licences, lifeguard and survival training) Post-secondary non-tertiary education Tertiary education (e.g. marine biology, naval engineering etc.) Sports and recreation education (incl. instructor training for sports and recreation activities, e.g. surf, diving, and professional athletes)

Emerging sector	Sub-sector	Industry
Blue energy	Renewable energy	Wind farms
		Ocean energy and hydro industries
		Solar farms at sea Other energy
Blue Bioeconomy	Pharmaceuticals	Manufacture of pharmaceutical products
		Wholesale and retail of pharmaceutical goods
		Manufacture of marine bio-based cosmetics

		Wholesale and retail of marine bio-based cosmetics
	Agriculture, livestock, veterinary products, and aquaculture	Manufacture of veterinary pharmaceuticals (incl. antibiotics)
		Manufacture of pesticides and other agrochemical products
		Manufacture of plastic plates, sheets, tubes and profiles (i.e. bioplastics)
	Bioplastics	Manufacture of plastic packaging goods
		Wholesale of bio-plastic goods
	Biofuel and other bio-refined chemicals	Manufacture of biofuel and other chemical products
		Wholesale of chemical products (incl. industrial salt)
Water treatment and supply	Water supply	Water collection, treatment and supply Remediation activities and other waste management services Test drilling and boring
	Desalinisation	Desalinisation
Ecosystem services	Regulating	Climate regulation (incl. carbon sequestration)
		Nutrient cycling
		Water purification
		Waste treatment

	Coastal and flood protection
	Erosion control and sediment retention
	Climate regulation
	Biological control and habitat provisioning
Cultural (non-market)	Aesthetics value (e.g. higher house or apartment values)
	Non-market cultural values (incl. biodiversity, species preservation, cultural heritage etc.)
	Other non-use values: existence/bequest value

The proposed structure has obvious links to data classifications under CPA, PRODCOM, and NACE. The rationale is given in section 2.1 and predominantly relates to the consistency that would be achieved at the international level. To date, there is no standardised or agreed framework to satellite accounting for the Blue Economy, as is exists for the tourism sector set out by the United Nations World Tourism Organisation (OECD 2019⁴¹). Therefore, the development of a Sea Satellite Account for the European Union should not only present a concrete example for the construction of such accounts for EU Member States but also employ data collected in accordance with international classifications, such as the SNA, UN ISIC and SEEA-EEA which are discussed further in the following sections. The latter paves way for integration and standardisation of Sea Satellite Accounting at the international level.

⁴¹<https://www.oecd.org/cfe/tourism/tourismsatelliteaccountrecommendedmethodologicalframework.htm>

5.2.2. MEASURING THE VALUE OF ECONOMIC ACTIVITIES

Once the conceptual phase is complete – i.e. all sectors, subsectors, industries and related products have been decided on – the next step is the compilation, calculation and analysis of data belonging to the said sectors. All the existing methodologies for measuring the economic value of the ocean economy begin with examining data collected via the national statistical systems (OECD 2019). As with national accounting, key variables of interest for a Sea Satellite Account are centred around the economic contribution and benefits arising from activities within the Blue Economy. These include but are not limited to output and turnover, gross value added, employment and wages, value added per employee, taxes and subsidies, and value of investment and capital stocks. The indicators can also provide references for monitoring the performance of the Blue Economy over time.

Perhaps the most prominent and difficult part of the process in calculating the value of economic activities attributable to the Blue Economy, as reported by interviewed organisations with existing SSAs, is the extraction of data from national accounts. This involves the calculation of coefficients to split maritime related activities from land-based ones and is usually the most time-consuming step of constructing a SSA (pers. communication US NOAA, US BEA, Statistics Portugal, Statistics Netherlands 2020)⁴². The variables available in the internationally agreed System of National Accounts (SNA)⁴³ provide coverage for indicators of interest in a Sea Satellite Account (see Table 22, SNA 2008).

Table 22 Shortlist of main variables and aggregates under the SNA framework

SNA codes	Description	SNA codes	Description
P1	Output	P6	Export of goods and services
P11	Market output	P7	Import of goods and services
P12	Output for own final use	B1g	Gross value added
P13	Non-market output	B2g	Gross operating surplus
P2	Intermediate consumption	B3g	Gross mixed income
P3	Final consumption expenditure	B11	External balance of goods and services
P31	Individual consumption expenditure	D1	Compensation of employees
P32	Collective consumption expenditure	D11	Wages and salaries
P4	Actual final consumption	D12	Employers' social contributions
P5	Gross capital formation	D2	Taxes on production and imports
P51g	Gross fixed capital formation	D3	Subsidies
P52	Changes in inventories		
P53	Acquisitions less disposals of valuables		

However, as illustrated in the Appendix 1, Eurostat data reported under NACE v2 classification is far from complete or uniquely identifiable for all maritime sectors and industries. This is also the case with the United Nations ISIC classification as well as most subsidiary classification codes at the national level, be it Member States of the EU or elsewhere in the world (e.g. NAICS, ANZSIC). Therefore, a key challenge in the construction of a Sea Satellite Account is the separating of the main variables for economic activities directly and indirectly attributed to the Blue Economy. This was not only identified by national statistical offices interviewed but also the OECD as well as

⁴²Personal communication undertaken as part of the interviews conducted for this study. Refer to the appendix 2 for more details

⁴³<https://unstats.un.org/unsd/nationalaccount/docs/SNA2008.pdf>

industry associations (OECD report, pers. communication European Boating Industry, US NOAA, US BEA, Statistics Portugal, Statistics Netherlands2020)⁴².

The lack of detailed breakdown of economic activities and production from maritime industries in international classifications (i.e. the UN ISIC and Central Product Classification (CPC)) has contributed to the unprecedented challenges faced by governments during the COVID-19 Pandemic. Particularly in identifying the extent of losses from industries and sectors in order to design well-formulated recovery plans and support packages in a timely fashion. The OECD Rethinking Innovation for a Sustainable Ocean Economy report⁴⁴ recommends the collection of data via official databases (e.g. extension of SBS under NACE or CPA classification) and/or industry surveys (OECD 2019). However, as discovered during the desk study for this report, and as pointed out in the OECD guide, the sectoral scope of the Blue Economy varies considerably from country to country.

As such, the process of developing splitting-coefficients for the maritime economy is heavily dependent on not only the maturity of the national accounting framework, but often engagement with other government offices, industry associations, and independent institutes that collect various forms of data in the Blue Economy (e.g. via household surveys, business-level registries etc.). In this study, maturity of the national accounting framework refers to the level of detail at which the commodity and activity codes are indexed. In practice, maturity of a national accounting framework depends on various quantifiable and unquantifiable elements including the accuracy, rigor and robustness of the data collection process; the organisation and centralisation of statistics across government departments and databases; and the experience and expertise of statistical personnel – all of which can be difficult to measure. As the OECD (2019) explains, while it's impossible to create a code for every possible activity taking place within an economy, the structure used by national statistical offices to classify industries splits the economy into increasingly detailed groupings. The greater the number of classification codes or the finer the sub-classification of activities and commodities, the more likely maritime industries and activities are uniquely identifiable (see Table 23). In general, a detailed or mature national accounting framework also provides more information to a country in establishing splitting coefficients for the maritime sector.

Table 23 Maturity of national accounts for interviewed statistical offices

Maturity of national accounts	CBS Netherlands	Statistics Portugal	Bureau of Economic Activities (US)
Unique commodity codes	220	433	~5,000
- Those related to the Blue Economy	Not available	221	~1,200
Local Kind of Activity Units (LKAUs)	2.2 million	1.4 million	34.4 million
- Those related to the Blue Economy	Not available	56,613	Not available
Supply Use Table (SUT)			

⁴⁴ <https://www.oecd.org/publications/rethinking-innovation-for-a-sustainable-ocean-economy-9789264311053-en.htm>

Maturity of national accounts	CBS Netherlands	Statistics Portugal	Bureau of Economic Activities (US)
- Industries	130	127	400
- Products	220	433	400

For economic activities not uniquely distinguishable to maritime sectors, there are several common strategies employed by countries at the present time. Based on the data gaps observed in the conceptual phase, relevant statistical and governmental offices as well as industry experts and bodies associated with the sectors and/or economic activities of interest are identified. Through close collaboration with such agencies, and utilising additional private and public databases and information available, splitting coefficients can be estimated to proportionate key economic indicators (e.g. turnover, employment) to maritime sectors. Alternatively, data can be compiled for a representative sample and scaled up to produce proxy values for the population. Combinations of the two strategies are also observed. For example, in the Portuguese SSA the coefficients proportioning contributions from the sea to the education and R&D sector were estimated based on a selection of accredited tertiary education courses related to the sea (i.e. offered by Higher Educational Institutes in the field of science such as PhD, Master and Bachelor degrees) registered with the Agency for Assessment and Accreditation of Higher Education and the Directorate-General for Education and Science Statistics, and the institutions that offered those courses as well as students enrolled (Statistics Portugal and DGMP 2016)⁴⁵. For R&D, coefficients were calculated by distinguishing projects that were undoubtedly related to the sea reported in the databases of the Portuguese science and technology authority (FCT), the main public organisation responsible for R&D financing and EU R&D funds management (Statistics Portugal and DGMP 2016)⁴⁵. In both instances, projects and accredited courses that contained cross-cutting disciplines or could not be determined to be related to the sea with certainty were excluded leading to a potential underestimation of contributions from the sea to the sector.

For the estimation of splitting coefficients to proportion economic activities attributable to the sea, geographic approaches are also used. This can be seen in the Economic description of the Dutch North Sea and coast report, where postcodes are used to select the businesses within seaports or the coastal regions whose business classification fits within a selected list of activities (Walker et al. 2020). Similarly, the Portuguese Satellite Account of the Sea also uses geographical distribution of businesses related to marine tourism (e.g. hotels and restaurants) (Statistics Portugal and DGMP 2016). The coefficient estimates for several maritime industries in the US also initially began with geographic distribution before moving to activity based split when more data became available (Pers. communication NOAA and BEA 2020).

Where there is insufficient information available to ascertain the level of contribution from the sea to specific sectors or economic activity units, additional surveys and samplings have also been carried out to collect the necessary primary data (Marine Scotland 2020). For the Economic Impact of Marine Related Activities in Canada report, data from the national accounting framework were supplemented not only by data reported by other governmental agencies and industry-led surveys, but also by Statistics

⁴⁵ Statistics Portugal (Instituto Nacional de Estatística) and Directorate-General for Maritime Policy (DGMP) 2016. Portuguese Satellite Account for the Sea: Methodological Report, available at: https://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_destaque&DESTAQUESdest_boui=261968449&DESTAQUESmodo=2&xlang=en

Canada's own direct surveys (DFO 2009)⁴⁶. The additional collection of ocean economy data, directly or via industry-led surveys is also one of the four key recommendations made by the OECD to its members (OECD 2019). Given that out of the 19 ocean-based industries identified by the OECD, only four have fully concordant four-digit codes, establishing splitting coefficients is absolutely critical in separating ocean-related activities from land-based ones (OECD 2019). While the general strategies have been explained here, the methodology for the actual construction of splitting coefficients is beyond the scope of this study. The Blue Economy observatory can play an important coordinating role in formalising the exact methodological guidelines for the construction of splitting coefficients that can be applied consistently across EU Member States, drawing on the practical examples mentioned in this section. However, as discussed, the appropriated strategy selected is heavily dependent on the specific agencies, industry organisations and the alternative databases available within a country, and therefore any guidelines will need to be flexible enough to allow varying degrees of adaptation across countries. For an example of such separation techniques used for the construction of a SSA, one can refer to the Ocean Economy Satellite Account report published by NOAA (Nicolls et al. 2020)³⁶. A sample selection of Blue Economy sectors for which splitting coefficients are calculated by NOAA is provided in Table 24.

Table 24 Sample of splitting coefficient calculations for sectors within the Blue Economy, taken from Nicolls et al. (2020)¹⁷

Activity with ocean dependence	Item Description	Ocean Portion	Method Used to Estimate the Ocean Portion
Federal Government Construction	New conservation and development structures - federal	43% purchases by government	The ocean portion of these items is estimated by dividing the sum of the ocean and coastal related activities, such as beach nourishment, harbour dredging, and federal beach reclamation, by the U.S. total for these activities (Data Source: U.S. Army Corps of Engineers Analysis of Dredging Costs, Study of Developed Shorelines Master Database)
	Conservation & development facilities repair & maintenance construction - federal	<1% purchases by government	
State and Local Government Construction	New conservation and development structures - state & local	34% purchases by government	The ocean portion of these items is estimated by dividing the sum of the ocean and coastal related activities, such as habitat restoration and beach reclamation, by the U.S. total for these activities (Data Source: NOAA Habitat Restoration Expenditures, Chesapeake Bay Program Expenditures, Everglades Restoration USACE Budget, CWPPRA Expenditures, Study of Developed Shorelines Master)
	State and Local Government Construction	<1% purchases by government	

⁴⁶DFO (2009), "Economic Impact of Marine Related Activities in Canada", *Statistical and Economic Analysis Series, Fisheries and Oceans Canada, Government of Canada*, Vol. 1/1

Activity with ocean dependence	Item Description	Ocean Portion	Method Used to Estimate the Ocean Portion
			Database)
Electric Power Generation	Electric power generation	5% of non-final demand sales to other businesses	The ocean portion of this item is estimated by dividing the total megawatt hour (Mwh) generation in plants in shore-adjacent Zip Codes areas by the
Federal Government - Defence	Federal defence government services	1% of purchases by government	The ocean portion of this item is estimated by dividing the sum of ship depot maintenance and defence activities by the U.S. total for this item (Data Source: BEA Input-Output Accounts)
Federal Government - Nondefense	Federal nondefense government services	3% of purchases by government	The ocean portion of this item is estimated by dividing the sum of federal non-defence activities (not accounted for elsewhere) by the U.S. total for this item (Data Source: FOCAR Report 2015, BEA Input- Output Accounts)
Seafood Processing	Prepared fresh fish and other fresh seafood	95% of sales to consumers; 99% of exports; 90% of imports; 54% of non-final demand sales to other businesses	The ocean portion of seafood imports is estimated by dividing the sum of marine fish imports from commercial harvests and aquaculture by the total seafood imports (Data Source: Fisheries of the U.S. 2015 report and USDA Aquaculture Census); Almost all commercial fish exports in the U.S. are ocean related, since most of the commercial fishing in the U.S. are ocean related (Data Source: NOAA Fisheries Commercial Fisheries Landing Statistics, Fisheries of the U.S. 2015 report); The ocean portion of the seafood domestic production is estimated by dividing the sum of marine species production values by the total production values (Data Source: NOAA Fisheries Commercial Fisheries Landing Statistics, Fisheries of the U.S. 2015 report);
	Fresh and frozen seafood processing		
	Prepared frozen fish, shellfish, and other prepared frozen seafood - not elsewhere classified		
	Canned and cured fish and other seafood, including soup (except frozen seafoods)	94% of sales to consumers; 99% of exports; 90% of imports	

Activity with ocean dependence	Item Description	Ocean Portion	Method Used to Estimate the Ocean Portion
	Seafood product preparation and packaging	95% of sales to consumers; 99% of exports; 90% of imports; 55% of non-final demand sales to other businesses	The ocean portion of the seafood domestic consumption is estimated by the sum of ocean-related domestic production and imports, deducted by ocean-related exports (Data Source: Fisheries of the U.S. 2015 report)
Oil & Gas Extraction and Production	Drilling, spudding, or tailing oil, gas, dry, or service wells - construction	7% of private investment	The ocean portion of these items is estimated by dividing the costs of the rotary wells drilled offshore by the U.S. total for all the wells, which includes the onshore wells (Data Source: Baker Hughes North America Rig Count, Average Day Rates for Offshore vs Onshore Drilling)
	Crude petroleum and natural gas - not specified by kind	5% of non-final demand sales to other businesses	The ocean portion of these items is estimated by dividing the offshore production by the U.S. total production for all these activities (National Ocean Economics Program, Energy Information Administration); These partials are also scaled back to avoid double counting the values of these activities that consumed by the other marine activities (Data Source: BEA Input- Output Accounts)
	Crude petroleum, including lease condensate (vols. corrected to 60 deg. F) shipped	21% of non-final demand sales to other businesses	
Sand & Gravel	Construction sand and gravel	20% of non-final demand sales to other businesses	The ocean portion of these items is estimated by dividing these activities taken place in the shore-adjacent counties by the U.S. total for these activities (Data Source: BLS Quarterly Census of Employment and Wages); These partials are also scaled back to avoid double counting the values of these activities that consumed by the other marine activities (Data Source: BEA Input- Output Accounts)
	Industrial sand		

Activity with ocean dependence	Item Description	Ocean Portion	Method Used to Estimate the Ocean Portion
Eating and Drinking Places	Meal and alcoholic/non-alcoholic beverage charges of full-service restaurants	4% of sales to consumers	The ocean portion of these items is estimated by dividing the leisure travel portion of these activities that take place in the shore-adjacent counties by the U.S. total for these activities (Data Source: Data Source: BEA Input-Output Accounts, DK Shifflet's Demand for Travel Commodities by Type of Visitors data, CIC Research's Survey of International Air Travelers, BLS Quarterly Census of Employment and Wages)
	Meals and alcoholic/non-alcoholic beverages of limited service eating places	3% of sales to consumers	
	Caterers and food contractors-meals and alcoholic/non-alcoholic beverages	4% of sales to consumers	
	Mobile food services - food	3% of sales to consumers	
	Meals, alcoholic/non-alcoholic beverages and tips at drinking places	4% of sales to consumers	
	Meals, alcoholic/non-alcoholic beverages, and tips at hotels/motels	3% of sales to consumers	
	Food, alcoholic/non-alcoholic beverages sales by performing arts companies	4% of sales to consumers	
	Food, alcoholic/non-alcoholic beverages sales by sports teams and clubs	12% of sales to consumers	

5.2.3. MEASURING THE VALUE OF MARINE ECOSYSTEMS

Although there are currently no comprehensive account of marine ecosystems within SSAs to date, it is important to consider the values of such ecosystems to the Blue Economy in order to inform decision makers based on fairer comparisons with economic information on industry (OECD 2019). Especially since many Ecosystem services from the marine environment directly impact the performance of commercial sectors (e.g. fisheries, tourism, oil and gas, blue biotechnology etc.). The consideration of marine ecosystems and potential accounting approaches, as well as information gaps, should be deliberated during the conceptual phase.

There are several classification systems for identification, differentiation and categorisation of ecosystem system services generated by ecosystem assets, including the Millennium Ecosystem Assessment (MA 2005), the Economics of Ecosystem and Biodiversity (TEEB 2010), and the Common International Classification for Ecosystem services (CICES v5.1, European Environmental Agency)⁴⁷. All three classification systems can be helpful in conceptualising ecosystem goods and services that need to be valued in a comprehensive satellite account of the maritime economy. For example, the Millennium Ecosystem Assessment (MA 2005) provides the basic framework for assessing the avenues through which ecosystems contribute to human wellbeing, through goods and services provided⁴⁸. It also ties in the concept of total economic value (TEV) to the broad set of economic values associated with Ecosystem services, matching services with the typology of values provided by Ecosystem services (i.e. direct use values, indirect use value, option value and non-use value).

The Economics of Ecosystem and Biodiversity (TEEB 2010), on the other hand, is a series of reports that builds on the extensive pre-existing literature in the field of ecosystem valuation. These reports provide not only an overview of approaches used in ecosystem accounting, a detailed review of existing methods for valuing Ecosystem services—including the advantages and disadvantages associated – but also a synthesised approach to help decision makers recognise, demonstrate and, where appropriate, capture the values of ecosystems and biodiversity. There are also an extensive collection of 1310 values estimated for various Ecosystem services from studies around the world up to 2010 reported in the TEEB database. However, the values related to marine and coastal ecosystems are rather limited in comparison to terrestrial ecosystems. Finally, the Common International Classification for Ecosystem services (CICES v5.1) is the ecosystem classification system was developed by the European Environment Agency especially to provide a framework for the SEEA Experimental Ecosystem Accounting guidelines, which is currently led by the United Nations Statistical Division (UNSD). The revision for CICES v5.1 is based on a review of relevant existing scientific literature and consultations with a diverse range of stakeholders and experts through surveys and workshops. The output is a large database of Ecosystem services divided by biotic and abiotic functions, and clustered by division, group, class and sub-class. The specific design of the classification framework in line with the SEEA Experimental Ecosystem Accounting guidelines makes it the most appropriate classification system for the purpose of accounting for Ecosystem services (OECD 2019).

While the SEEA Experimental Ecosystem Accounting framework has not been accepted as an international standard due to its experimental status⁴⁹, it should not stop countries

⁴⁷<https://cices.eu/cices-structure/>

⁴⁸MA (2005), *Ecosystems and human well-being: biodiversity synthesis*, Millennium Ecosystem Assessment Series, World Resources Institute, Island Press, Washington, D.C., USA

⁴⁹The new manual for the SEEA Experimental Ecosystem Accounting framework is intended to be approved in the first quarter of 2021 - <https://seea.un.org/content/seea-experimental-ecosystem-accounting-revision>

from exploring approaches to adopt valuing marine ecosystems. As discussed previously, Australia has used the SEEA to produce experimental ecosystem accounts for the Great Barrier Reef in the past, to measure the environmental asset, its net wealth, income and production, resource depletion and intensity of use, employment, and expenditure related to environmental activities (ABS 2015, 2017)⁵⁰. Similarly, Statistics New Zealand released a series of environmental economic accounts in line with the SEEA Central Framework that includes, in part, the marine economy (Stats NZ 2018)⁵¹.

One limitation of the SEEA Experimental Ecosystem Accounting framework is that it is apt in many terrestrial ecosystems and freshwater bodies, but it faces challenges when it comes to marine ecosystems. This is because marine ecosystems do not have the same rigid spatial boundaries as terrestrial ecosystems, and therefore, the treatment of spatial dimensions for Ecosystem services flowing from ecosystem assets is more difficult to correctly attribute (OECD 2019). The current revision for the SEEA-EEA is in part focused on delivering guidance for the classification of marine ecosystems (UN SEEA 2018).

5.2.4. REVISING AND UPDATING SEA SATELLITE ACCOUNTS

Based on interview responses from National Statistical Offices (NSO) that have undertaken exercises in Sea Satellite Accounting, the revision and reproduction phase involve five key activities:

- monitor new sectors emerging under the scope of the Blue Economy;
- revise splitting coefficients as new or better data becomes available;
- refine the scale of satellite accounting (e.g. from country to state or territory level)
- update economic information for the additional years, including moving to deflated values against a base year, and;
- where possible, develop plans for data collection or sampling based on information gaps identified.

As Sea Satellite Accounts mature, and better data becomes available, the methodology of accounting can improve too. For example, the Ocean Economy Satellite Account of the US initially relied on geographic distributions of companies responsible for storage and handling associated with sea freighted goods. However, as data networks became more developed, new sources of external information for warehousing were uncovered so that the separation of ocean related storage could be done on an activity basis, reducing the reliance on geographic definitions (Pers. communication NOAA and BEA 2020)⁴². Similarly, for the Portuguese Satellite Account of the Sea, the second revision allowed for the detail of ocean-related activities on the islands and mainland. The methodology of accounting also had to be refined due to the physical size of islands because the existing geographic definition would engulf the entirety of the islands and attribute all touristic activities to the sea (Pers. communication Statistics Portugal 2020)⁴². In the second revision it was possible to use Input Output Tables and have more consistent results. In addition to improved methodology, human resources are usually reduced in the revision and reproduction phase. This is both the result of reduced workload in coefficient development and increased human capital (i.e. knowledge and experience of analysts and dedicated staff).

⁵⁰ABS (2017), 4680.0 - *Experimental Environmental-Economic Accounts for the Great Barrier Reef*, Australian Bureau of Statistics, Canberra, Australia

ABS (2015), 4680.0.55.001 - *Information Paper: An Experimental Ecosystem Account for the Great Barrier Reef Region*, Australian Bureau of Statistics, Canberra, Australia

⁵¹Stats NZ (2018), *Environmental-economic accounts: 2018 (corrected)*, Retrieved from www.stats.govt.nz, Stats NZ Tatauranga Aotearoa, Wellington, New Zealand

Stats NZ (2018), *Environmental-economic accounts: Sources and methods*, Retrieved from www.stats.govt.nz, Stats NZ Tatauranga Aotearoa, Wellington, New Zealand

5.3. OPTIONS FOR SETTING UP SSAS ACROSS THE EUROPEAN UNION

In terms of options to carry out SSAs across the European Union, two approaches were identified. Initially it was the vision of the Commission for the Blue Observatory to take an active role in data collection for the economic activities related to the Blue Economy in order to have a better overview of activities taking place in maritime related sectors across Europe. A centralised approach in information gathering and analysis will allow for greater control over the consistency of methodology applied, as well as the timeliness of data reporting. However, during consultations with statistical offices in Member States, it soon became apparent that an alternative approach was more suitable given limitations to the centralised approach (refer to

Table 25). The alternative that was deemed more practical is for Member States to carry out their own SSA, with the observatory taking a coordination role in providing guidelines and support to Member States. This conclusion was reached due to primarily two key factors:

- the first is that information sources are specific to each country, and local knowledge of external databases to the national accounting framework and key stakeholder bodies, which were identified to be exceptionally crucial in splitting coefficient estimation, would be more prevalent to national statistical offices than a centralised European body;
- the second determining factor is that the logistics of sending extensively large datasets necessary for the construction of SSA is not practical. As illustrated in the table below, the basic economic units at which information is recorded within the national accounting framework is well into the millions for any given Member State, and this information is used not only in construction of splitting coefficients but also the general data aggregation at industry and sector level. Moreover, much of the detailed level data containing business information is highly confidential, and it is more than likely that there would be resistance from Member States in sharing this data. For the full summary of pros and cons for the two approaches identified, refer to

- Table 25.

Table 25Pros and cons for options in setting up SSAs across the European Union

<p>1. The observatory takes a central role: in data collection and compilation</p> <p> Pros</p> <ul style="list-style-type: none"> The Blue Observatory has control over the methodology used in the construction of SSAs for all EU Member States, ensuring consistency in calculations of contributions from the Blue Economy The Blue Observatory can benefit from economies of scale in producing SSAs for all EU Member States 	<p>2. The observatory takes a coordination role: in providing guidelines and assisting Member States</p> <p> Pros</p> <ul style="list-style-type: none"> The construction of Satellite Accounts utilises local knowledge by national statistical offices or government agencies, that the Blue Observatory may lack The cost is considerably less for the Blue Observatory The Blue Observatory can focus resources in the dissemination of information and monitoring of trends Member States can still receive detailed guidance from the Blue Observatory if the observatory issues a best practice methodology, like that being done by Eurostat for many statistical datasets
<p> Cons</p> <ul style="list-style-type: none"> The Blue Observatory may lack local knowledge of national agencies, industry associations or market experts who may possess data that can supplement in that reported in the SNA framework necessary for splitting coefficient calculations There may be reluctance or data sensitivities in data available at the national level to be shared with the European Commission Logistically very difficult to coordinate large datasets to be sent to the Blue Observatory by Member States Hugely expensive in manpower to work on large datasets of varying detail level, format and specifications 	<p> Cons</p> <ul style="list-style-type: none"> There is less control over methodologies applied by Member States in constructing their SSAs and provides more room for inconsistencies Increases the burden and costs to Member States in constructing their own SSAs Requires significant coordination across Member States, especially to ensure different national views and priorities are taken into consideration

5.4. COST ANALYSIS FOR THE SEA SATELLITE ACCOUNT

For the cost analysis of setting up an SSA, a weighted average was applied to the resource breakdown reported by interviewed respondents based on the level of detail in the final economic account of activities related to the sea produced. The cost analysis

below details the elements that will be needed to set up a Sea Satellite Account for one-Member State physically. An aggregated view on the overall costs required for an EU-wide SSA is provided in section 5.5. Then the labour cost per hour (compensation for employees, plus taxes and minus subsidies) for professional, scientific and technical activities was taken from Eurostat for the latest year and applied to the estimated resource needs (Eurostat 2020). The average resource demand and cost (in 2019 Euros) associated with constructing a pilot SSA are reported by key activities in Table 27 and Table 28, respectively. An illustration of the cost breakdown is also presented in Figure 28.

Table 26Breakdown of resources required for the construction of a pilot SSA

Hours required for pilot project	Share
Conception (incl. Scoping and mapping)	9%
Data collection (incl. Reference population and coefficients)	39%
Data analysis (incl. Reference population and coefficients)	34%
Meetings and project management	6%
Report writing and publishing	10%
General hours	1%
Total hours used	100%

Table 27Breakdown of cost required for the construction of a pilot SSA

Cost of pilot exercise	Euros (2019)	Share
Cost of conception exercise	€27,838	7%
Cost of coefficient and data analysis	€226,317	59%
Cost of data purchase	€1,216	0.3%
Cost of other activities in the project	€54,027	14%
Cost of overheads	€76,454	20%
Total cost	€385,853	100%

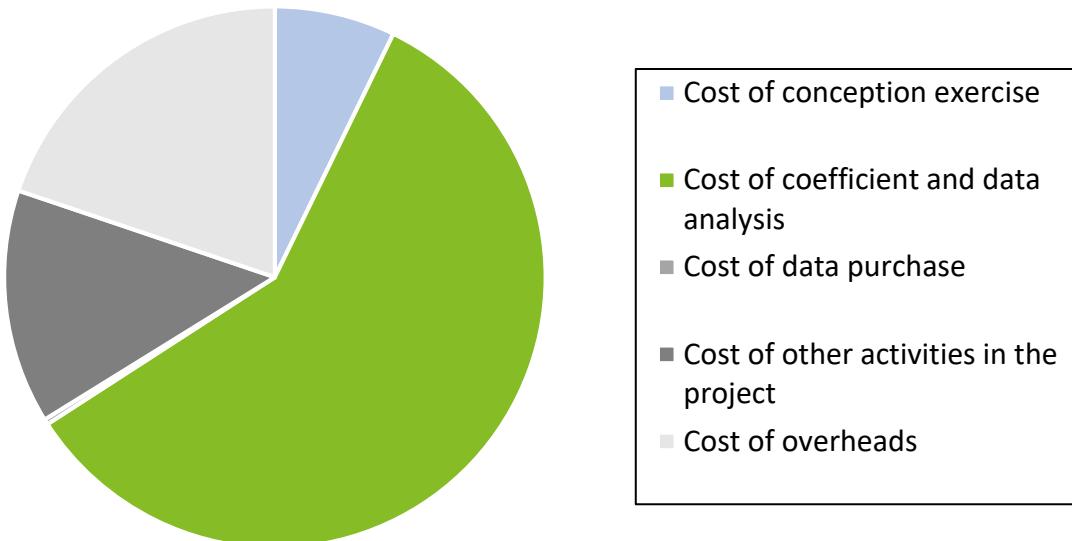


Figure 28 Cost breakdown of constructing a pilot Sea Satellite Account

Depending on how respondents classified data collection and analysis (i.e. where coefficient construction is attributed to), the resource demand in *Table 26* is divided. This is because defining a reference population and coefficient analysis is closely tied with the data collection needs. In general, the bulk of resource demand and cost of producing a pilot SSA is associated with data analysis, including the construction of splitting coefficients. Overall, it is estimated that for the construction of the first SSA for the average Member State it will amount to €385,853 over the time span of approximately 3-3.5 years. This is expected to vary according to maturity of national accounts as well as the number of sectors within the Blue Economy that is significant for the Member State. It's important to note that this amount does not include calculation of values for marine ecosystems as this was not estimated in the Satellite Accounts of the interviewed agencies.

The total number of full-time equivalent personnel (FTEs) required on the pilot study is approximately 4 for a country of sufficient maturity. The actual number of persons working on the project could be anywhere between 10-20, on a part time basis, including contracted external experts but not including personnel from agencies contacted for data, feedback and review. In general, the team is usually consisted of at least one personnel from the national statistical office specialised in national accounting, one personnel from the government agency for marine resources, senior industry experts, enterprise statistics analysts, and IT and communication support staff for the dissemination of information.

As mentioned previously, the revision and reproduction phase of carrying out SSAs tend to demand considerably less resources compared to the pilot exercise. According to estimates and feedback from the interview respondents, the resource demand for repeating the exercise is around on average just below 50% of that for the pilot study, equating to roughly € 187,946. This is the ongoing estimated cost per production of an SSA, with the interval between productions commonly set around 2-3 years. The turnaround time for reproduction is expected to be roughly 1-1.5 years and requiring around 2 FTEs.

5.5. EXISTING ACCOUNTS OF THE SEA

During the scoping analysis for the structure and data needs of SSAs in task 1, several EU Member States with existing data or research on the maritime economy were identified. These are listed below:

- Denmark: ECLM (2017), Employment and production in Blue Denmark 2017, Prepared for the Danish Maritime Authority, Economic Council of Labour Movement, available at https://www.dma.dk/Documents/Publikationer/ECLM_Employment-and-production-in-Blue-Denmark.pdf
- Italy: Borra, M. (2017), Measuring the Ocean Economy: An Italian Perspective, presentation at OECD Workshop: New Approaches to Evaluating the Ocean Economy, 22 & 23 November 2017, OECD, Paris
- Sweden: Statistics Sweden (2018), Statistics are now available on maritime industries, Statistical news, available at <https://www.scb.se/en/finding-statistics/statistics-by-subject-area/business-activities/structure-of-the-business-sector/maritime-industries/pong/statistical-news/maritime-industries/>
- Portugal: Statistics Portugal (2016), Satellite Account for the Sea 2010-2013, available at https://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_destaque&DESTAQUESdest_boui=261968449&DESTAQUESmodo=2&xlang=en
- The Netherlands: Walker et al. (2020), Economic description of the Dutch North Sea and coast: 2010, 2015 and 2017, Statistics Netherlands (CBS), The Hague, available at <https://www.cbs.nl/en-gb/custom/2020/19/economic-description-of-the-dutch-north-sea-and-coast>
- France: Girard and Kalaydjian (2014), French Marine Economic Data 2013, Ifremer, Marine Economics Unit, available at http://www.ifremer.fr/demf/archives/2013/FMED_2013.pdf
- Ireland: Hynes, S. (2017), Progress in Measuring the Ocean Economy: An Irish Perspective, presentation at OECD Workshop: New Approaches to Evaluating the Ocean Economy, 22 & 23 November 2017, OECD, Paris.
- Norton et al. (2018), Valuing Ireland's Coastal, Marine and Estuarine Ecosystem services, prepared for Environmental Protection Agency, National University of Ireland, available at http://www.epa.ie/pubs/reports/research/water/Research_Report_239.pdf
- Poland: Statistics Polandand Statistical Office in Szczecin (2019), The maritime economy in Poland in years 2017 and 2018, Warsaw Szczecin, ISSN 2450-0178, available at <https://stat.gov.pl/en/topics/transport-and-communications/transport/the-maritime-economy-in-poland-in-years-2017-and-2018,8,3.html>
- Italy: Studi e Ricerche per il Mezzogiorno (SRM) 2020, Italian Maritime Economy – Annual Report 2020, Naples Italy, available at <https://www.srm-maritimeconomy.com/cp/annual-report/>
- Germany: Federal Ministry for Economic Affairs and Energy (2017), Maritime Agenda 2025, Berlin, available at <https://www.bmwi.de/Redaktion/EN/Dossier/maritime-industry.html>
- Finland: Heikkinen, E. (2019), The Finnish Blue Economy: Definition and Economic Significance, University of Helsinki, Faculty of Agriculture and Forestry, available at https://helda.helsinki.fi/bitstream/handle/10138/301683/essi_heikkinen_masters_thesis.pdf?sequence=2&isAllowed=y

Table 28 presents a sample of countries within the EU-27 with existing studies on contributions from the maritime economy, detailed by the sector classifications suggested in task 1.

Table 28 Example of countries within the EU-27 with existing studies on contributions from the maritime economy, per sectors identified in task 1

	Portugal (2013)		The Netherlands (2017)		France (2011)		Ireland (2016)	
Established sectors	€ 000' GVA	Employment	€ 000' GVA	Employment	€ 000' GVA	Employment	€ 000' GVA	Employment
Marine living resources	1,223,400	62,395	136,000	1,000	2,306,000	40,205	398,990	6,595
Marine non-living resources	24,700	1,729	2,150,000	3,000	4,322,000	24,655	71,670	265
Port activities	743,600	15,096	16,023,000	104,000				
Maritime transport, logistics and storage			1,687,000	9,000	2,332,000	53,180	533,150	4,666
Shipbuilding and repairs	115,100	4,129			2,747,000	40,379		
Coastal tourism and recreation	1,704,400	45,401	1,303,000	26,000	14,600,000	235,500	515,590	14,891
Maritime services	839,700	26,214	749,000	16,000			105,650	1,132
Infrastructure and maritime works	49,500	2,267	1,112,000	15,000	1,001,000	6,086	70,990	1,023
Research and education					452,000	6,583		
Maritime security and defence					2,492,000	43,790		
Entertainment								

	Portugal (2013)		The Netherlands (2017)		France (2011)		Ireland (2016)	
Emerging sectors								
Blue energy	14,400	56	149,000	Not available	Not available	9,718	38,100	454
Blue Bioeconomy							77,620	1,148
Water treatment and supply								
Ecosystem services					Not available	300	1,214,967 (a)	
Total	4,714,800	157,287	23,309,000	174,000	30,252,000	460,396	1,811,760	30,174

(a) based on a separate study carried out in 2018, excludes values estimated for provisioning services as these are indirectly included in the GVA figures

The breakdown of data reported Table 30 illustrates that a number Member States have considered or undertaken studies on key sectors contributing to the maritime economy, which can already include initial scoping analyses and expert consultations. This suggests that the estimated cost of a pilot study in Table 27, of €385,853, represents mostly an upper bound value. Extending the cost calculation to the whole EU based on some rough assumptions⁵², it is estimated that the overall cost for constructing a SSA for each Member State will be in the region of €6,459,891 to €9,250,511 for the initial round (refer to Table 30 for breakdown). The cost for subsequent rounds of production is then calculated as the cost of reproduction multiplied by the total number of EU Member States (i.e. €187,946 x 27), equating to €5,074,542 across the EU per production cycle.

It is important to note that the rough estimates for the initial production cycle of SSAs across the EU (€6,459,891 to €9,250,511) as well as subsequent cycles (€5,074,542) do not take into account any savings arising from economies of scale due to inadequate information available on coordinating SSAs on a large scale. Therefore, streamlining the reporting standard and process for economic accounting of the sea for EU Member States is expected to provide additional cost reducing benefits, and improve consistency measures across the EU.

Table 29Overall estimated cost for constructing SSAs for all Member States within the EU-27⁵²

Countries with existing SSA (€187,946)	Countries with existing maritime economic reports (€187,946 – €289,390)	Countries not known to be with existing maritime economic reports Countries with extensive coastlines or maritime activities (€385,853)	Countries with little or no coastal borders (€187,946 – €385,853)
Portugal	The Netherlands	Spain	Austria
Ireland*	France	Croatia	Czech Republic
	Denmark	Cyprus	Slovakia
	Italy	Estonia	Hungary
	Sweden	Greece	Slovenia
	Germany	Latvia	Luxembourg
	Finland	Malta	Belgium
	Poland		Bulgaria
			Lithuania
			Romania
€375,892	€1,503,568 €2,315,118	– €2,700,971	€1,879,460 – €3,858,530

* Given the extensive accounting of contributions from the maritime economy in Ireland, for both market and non-market (i.e. Ecosystem services) goods and services, the cost of reproduction is used to calculate Ireland's participation in the first round of coordinated Sea Satellite Accounting at the EU level.

⁵²In calculating the overall cost for conducting a coordinated round of Sea Satellite Accounting at the EU level, it is assumed that the cost varies across Member States based on the extent of existing studies and accounts of maritime activities. For countries with an extensive or detailed account of maritime activities, the cost of reproducing an existing SSA is used. For countries with some form of account of maritime activities – that may vary in degrees of complexity and detail, a range from the cost of reproduction to 75% of the full cost of a pilot study is used. This is because it is assumed that some preliminary scoping analyses and data collection, including defining the reference population and coefficients, are expected to have been undertaken which demands a consideration portion of resources as per that reported in Table 26. With regards to countries without any existing reports on the maritime economy, the full cost of a pilot study is assumed for those countries with extensive coastlines or maritime activities. Meanwhile those with little to no coastal borders are assumed to use anywhere between the reproduction cost of a SSA to the full cost of a pilot study. This is because the splitting coefficient formulation process can be just as complex for countries with little maritime activity as it is for those with extensive maritime activities. In some circumstances, it may be more resource intensive ascertain the said coefficients due to limited data available

It can be observed from the above estimates to setup the Sea satellite that the aggregate figures in the €6,459,891 to €9,250,511 are similar to the estimates of Human resources share of observatory activities as produced in task 3 which were closed to ~€5.2 million. It is important to highlight that when considering the overall cost estimate for the observatory and the Sea Satellite Account, this overlap of activities should not be discounted. Setting an individual Sea Satellite Account based on the maturity of a country's accounting system can be a stand-alone activity. However, creating Sea Satellite Accounts for the entire EU is one of the activities of the observatory. This distinction is important while creating an overall cost estimate for the observatory and the Sea Satellite Account.

Challenges and recommendations

During the interviews with the participating statistical offices, several challenges in setting up a SSA were identified in addition to the discussions on methodology and cost structure of establishing a SSA(refer to section 5.2). As already mentioned, the most time-consuming, and perhaps challenging, process in the construction of a SSA is the calculation of splitting coefficients needed to proportionate not uniquely distinguishable activities related to the maritime space from its on-land counterparts. Out of the 19 ocean-based industries identified by the OECD, only four have fully concordant four-digit codes within ISIC Rev4 (OECD 2019). This means that not only is there significant reliance on supplementary data sources but also industry knowledge on specific sectors, especially those cross-cutting.

The other key challenge area highlighted is consistency over time. This issue can be divided into three sub-issues:

- accounting frameworks change over time at the national level, including the level of detail for sector and industry breakdowns. While this is usually tied in with changes in international or regional reporting classifications and standards, it can be the case that countries individually choose to extend data collection methods and classifications to finer levels. Changes in the national accounting framework open up issues for consistency related to aggregation and splitting of data related to the maritime sector;
- related to the first issue is changes in businesses registrations reported within national accounting framework. For example, the main registered activity of a business determines the classification of economic activity accounted, and changes in the registered primary activity, especially for larger corporations, can impact the economic value of an industry or even sector. Further, the registered geographic locations for businesses can also change from year to year. Businesses often can declare activities to central offices where actual production or services do not take place. For those industries or sectors where splitting coefficients for maritime related activities are done based on geographic location, this issue can undermine data consistency over the time series;
- deflation is another time series difficulty faced by several the respondents. This is owing to the fact that deflators vary for each sector (e.g. seafood and other fisheries products will have a different deflator than the oil and gas industry) and updating the data with one additional year or when the base year is changed, then this can require significant amount of adjustments.

Lastly, there are substantial data gaps for marine Ecosystem services that does not have a market value. The lack of scientific consensus on the estimation techniques do not aid to this situation. Given the location and ecosystem specific services provided, in order to accurately reflect the values of such services demand significant amount of research and resources for the individual country. Especially as the interconnectedness of the ocean allows for Ecosystem services to move over considerable distances, such that accounting for services to the origin marks a limitation of even the SEEA-EEA (OECD 2019). This

could be an area that can benefit from a centralised coordinated approach and clearer definitions for marine Ecosystem services.

In summary, based on the literature and satellite accounts reviewed, as well as feedback from the consultations and interviews conducted, the key conclusions and recommendations are provided as follows:

- while key categories of the Blue Economy considered across countries are comparable to those identified in Table 1 for the established sectors, there remain differences in the definition of activities pertaining to the Blue Economy. Given that Sea Satellite Accounting is still very much in its infant phase globally, the development of a standard for Sea Satellite Accounting for the European Union should not only present a concrete example for the construction of such accounts for EU Member States but also employ data collected in accordance with international classifications, such as the SNA, UN ISIC and SEEA-EEA. The latter will pave way for integration and standardisation of Sea Satellite Accounting at the international level;
- a key limitation for several ecosystem accounting frameworks (e.g. the TEEB database and the SEEA Experimental Ecosystem Accounting framework) is that they tend to be more complete for terrestrial ecosystems and freshwater bodies than marine ecosystems. Therefore, more effort should be expended in identifying and understanding the value of marine ecosystems;
- much of the difficulty for establishing a SSA in conceptualising which sectors and activities need to be accounted within the Blue Economy and separating the main variables for economic activities directly and indirectly attributed to the Blue Economy, which includes agreeing on methods to calculate the splitting coefficients. At this conceptual phase, extensive expert consultations with various government and industry organisations are required. As such, a well-established communication chain and strong cooperation is crucial key in ensuring accurate reflection of activities in a Sea Satellite Account from all sectors;
- given limitations to the centralised approach identified during the expert consultations(refer to

- Table 25), it is deemed more practical for Member States to carry out their own SSA, with the observatory taking a coordination role in providing guidelines and support to Member States. The establishment of flexible but consistent guidelines, and an explicit methodology framework, is important in ensuring the feasibility of carrying out a SSA for all EU Member States and can help alleviate some of the challenges presented in the conceptual phase;
- overall, it is estimated that for the construction of the first SSA for the average EU Member State it will amount to €385,853 over the time span of approximately 3-3.5 years. However, this value represents mostly an upper bound value given that several Member States have already conducted some form of accounting exercise for activities pertaining to the Blue Economy. It is estimated that the overall cost for an initial round of SSAs for all Member States will be in the region of €6,459,891 to €9,250,511 (see Table 29), with the cost for subsequent rounds of production at around €5,074,542 per production cycle. It is also expected that streamlining the reporting standard will not only improve consistency across the EU, but also provide further cost reducing benefits to the values estimated.

6. SUMARISED CHALLENGES AND RECOMMENDATIONS

The study was conducted to review the current level of information available at European and Member state level and understand the current level of feasibility for setting up a Blue Observatory for Europe and Sea Satellite Account. Throughout the study, numerous challenges were encountered on topics such as collecting and accessing data, finding the right authorities responsible, understanding the nuances of national statistics offices and their respective data collection guidelines, to name a few. In this chapter, a summary of the challenges has been provided for the key topics, followed by recommendations/solutions employed towards the topic respectively.

- 1. Establishing a taxonomy of established and emerging sectors:** one of the key challenges encountered was to reach an agreement on the definition of established and emerging sectors for the Blue Economy and the basis of qualification for a sector>sub-sector>industry. The Blue Economy reports published by the European Commission provided a good starting point on the definitions of established and emerging sectors, however, closer inspection of the individual sectors highlighted inconsistencies within the taxonomy. An example is the presence of sectors like "Maritime security and Defence" in the emerging sectors which does not clearly fit as per definition of emerging sector as it has been an active sector with long term contribution to the economy. An additional source of reference available was the Portuguese Sea Satellite Account report, which provided an alternative view on the taxonomy of Blue Economy sectors. However, as the report discussed the Portuguese context, certain sector>sub-sector>industry was specific to the Member State. Similarly, there were other international sources that provided solutions applicable to the respective local contexts, however having their merits in unique approach towards defining Blue Economy sectors.

Having multiple possibilities to approach the taxonomy resulted in a proposed taxonomy that was inspired by multiple sources of information. The taxonomy proposed within this study builds upon the definitions of the Blue Economy report while daring to expand the scope of the sector and reallocate sectors as seen necessary. This resulted in an elaborate taxonomy of sector>sub-sector>industries that creates a link between the initiatives at the EU level, within Member States as well as outside of the EU.

- 2. Identifying availability of data for Blue Economy sectors in central EU-level databases:** once the taxonomy was agreed, the next challenge encountered was to identify the underlying data for sector>sub-sector>industries first at an EU level and then for the three case studies namely; Spain, France and Sweden. However, before delving into the case studies, it was important to identify EU-level data sources. At the EU-level, there is a plethora of classifications available under the data collection framework that could potentially be used to map the identified taxonomy to the collected data. The Blue Economy report used NACE rev 2.0 classification for the sectors. Under the NACE rev 2.0, data is collected at a sector level, sub-sector level and the industry level which is sufficient to create aggregate industry statistics at the EU-level. However, as the industries can cover both marine and non-marine activities (Marine Logistics covers water transport and in-land storage), it is extremely difficult to ascertain the exact portion of the industry contribution from marine sectors.

On the other hand, PRODCOM is another method of classification available at the EU-level which goes more into detail and breaks down each industry into its respective products. This provides a detailed insight into the potential marine and non-marine products of an industry. However, there is no mandate for Member States to submit this data towards Eurostat, unless explicitly requested for certain studies or initiatives. Therefore, for this study, a detailed mapping was created between the identified taxonomy of the established and emerging sectors and the NACE and PRODCOM classifications. This is an anticipatory step to ensure that as soon as detailed data is available at PRODCOM level, it will be easier to identify the marine proportions of industries through the products. This does not solve the issue completely as products can use disproportionate resources in the form of time, cost and employment. However, it is a positive step towards a more comprehensive data collection system for the Blue Economy.

The existence of detailed classifications at the EU-level is a good starting point towards building a database for Blue Economy sectors. Although Eurostat collects Member State data as per NACE rev 2.0, this is not sufficient to understand the proportion of economic activity generated from marine sectors. During the interviews conducted for this study, a few ways were identified to bridge this gap:

- Eurostat or the European Commission can commission a study to engage economists into looking at the individual industries and calculating coefficients of marine proportion for each industry individually. This is an academic project and will require significant time and resources;
- Eurostat, in agreement with the European Commission, can create a mandate towards the Member States to provide the data at PRODCOM level in addition to NACE rev 2.0. This will increase the details in the collected data but will require the Member States to significantly adapt their respective national frameworks. Moving in this direction will require significant time and resources from each Member State and can potentially be met with some pushback;
- during the interviews with the national statistics office of the Member States, another potential approach was discussed. If the member states, in their regional and local data surveys, request the responding industries to indicate the portion of economic activities generated from the sea, it will be possible to aggregate this data with relative ease at the Member State and the EU level. This will, however, require a mandate from the EU towards the Member States, as well as an incentive for the respondent organisations for the additional work required to provide the information.

The last two of the above recommendations should be considered by the commission as it will be easier to collect the data bottom-up by engaging the Member States and will provide a more accurate picture.

3. **Collection of data for established and emerging sectors:** apart from the challenges faced towards availability of data, the actual collection of data as part of the study posed its own set of challenges. As part of task 1 for the study, a mapping was created between the taxonomy of sectors>sub-sectors>industries and the NACE rev 2.0 and PRODCOM classifications. The next step towards this map was to check the underlying data for each industry available with Eurostat and identifying whether the data split between marine and non-marine portions is available. A detailed map of this can be accessed in chapter 2 as well as in Appendix 1 (external attachment). For the sectors such as Fisheries and aquaculture, where the marine proportions are clear, the individual industries are indicated as "complete", whereas for sectors where the proportions are unclear, a "partial" tag is used.

This exercise was conducted for both established and emerging sectors. For established sectors, there is a significant amount of available data due to the maturity of the sectors, therefore it was observed to be easier to ascertain the marine portions. For emerging sectors, as most of the industries are relatively nascent, identifying the marine proportions was not a simple task. Therefore, extensive desk research and reach out to relevant industries and industry associations was conducted. During the interviews conducted with the industry organisations, it was observed that most of the industry organisations relied on publicly available and published databases for sectoral information. Few organisations publish the data on their sectors with most organisations opting for a need-based reporting system by hiring data research firms. Some organisations attributed the misreporting/underreporting of data at NACE level to the structural differences in the setup of the sectors compared to NACE classification. Therefore, the classification of data provided in this study report as well as the sector mapping is as detailed as possible given the scope of the study. The detailed challenges encountered during the data collection can also be accessed in the challenges and recommendations section of chapter 3.

As mentioned in the previous point on data availability, there are a few potential ways in which these gaps can be filled, however, these will require additional steps which lie outside the expertise and the mandate of the current study. However, for emerging sectors, it is anticipated that more data will be available as the industries mature. With the role of data as a central tenet in many industries, the outlook towards data collection is changing and many industries are conducting individual initiatives to create a compendium of sources. Some of these sources identified during the initial stages of the study have been highlighted in Appendix 1.

4. **Understanding the differences within data collection frameworks of Member States:** as part of the study, data was collected for three Member States namely; Spain, France and Sweden, as case studies. During the data collection, one challenge encountered was the differences in the data collection and management systems for the Member States. In case of the case study countries, each of the Member State had a different maturity level of the accounting system with respect to data collection on Blue Economy sectors. Where Spain and France preferred a data collection approach through surveys to close the gaps, Sweden engaged academics and experts to use modelling techniques. Additionally, all three case study countries had limited experience with Blue Economy data collection limited mostly to stand-alone studies. France had an observatory of the Sea, which was responsible to collect Blue Economy data, however, the observatory has been phased out over the past years and integrated into other organisations as a data support system.

To establish a system for collection of Blue Economy data from the Member States, it is therefore important to account for these differences in the national frameworks. Additionally, the level of data maturity in each Member State is observed to vary significantly, which will result in different pace of implementation and compliance towards any mandate for Blue Economy data collection. It is therefore important to work closely with the Member States and for the Commission to act as a coordinator of initiatives. One recommendation that emerged during the interviews was to setup a committee with key member state experts that can potentially assist in clarifying the local context and coordinate efforts at the member state level for data collection and aggregation. However, discussions are needed with the Member States at this stage to reach an agreement for a unified approach.

5. Understanding the difference between role of observatory and the Sea Satellite Account:

Sea Satellite Account: one of the key assumptions throughout this study is that the role of the observatory includes gathering and dissemination of information and knowledge on Blue Economy. The dissemination of information and knowledge also includes the key-economic data on the Blue Economy sectors, therefore, by extension the activities of the Sea Satellite Account. With this assumption, if an observatory of the Blue Economy exists, a key portion of its activities will go towards building the Sea Satellite Account. This is reflected in contents of chapter 4, where the setup, role and activities of the observatory are discussed in detail.

The resources and costs for setting up an observatory will, therefore, also include the costs of Sea Satellite Account. This is important to keep in mind as a central organisation will aggregate the data received from the Member States and create EU level insights. However, setting up a Sea Satellite Account itself is an important task and has an important place as a standalone initiative. This can be seen through the existence of Sea Satellite Accounts in Portugal, Ireland, USA etc. although none of these locations have an observatory. Therefore, in chapter 5, the focus is to set up a Sea Satellite Account independent of a framework for an observatory. This section is more valuable to readers interested in Sea Satellite Accounting at a Member State level as the section highlights the current initiatives within the Member States and their respective readiness to build and support a national account.

6. Identifying synergies for the observatory and Sea Satellite Account:

as the scope of the observatory is expected to include large number of sectors>sub-sectors>industries and their role in the Blue Economy, it is important to consider the possibilities to leverage any and all existing initiatives in this space. This unlocks opportunities for potential synergies and ensures that redundancies are avoided by investing resources in areas where information already exists. There are a few areas where opportunities for synergies exist and therefore are discussed:

- **cross organisation** synergies can be captured by looking at the initiatives that are currently in place with across other organisations. For instance, in the domain of Blue Bioeconomy, an initiative is currently being conducted towards sustainable growth of the EU Algae sector⁵³. As part of the initiative, economic data will be collected and collated on the EU Algae sector. Therefore, it is important to keep a close alignment with the initiative to gain data insights and leverage the output of the study. Similarly, the European Commission Joint Research Centre is in process of creating a consolidated view of the EU Algae sector⁵⁴. Such initiatives will help in reducing the data collection effort and complexity for the observatory and the account. A detailed list of the initiatives can be accessed in Appendix 1;

⁵³https://ec.europa.eu/oceans-and-fisheries/news/towards-strong-and-sustainable-eu-algae-sector-conclusions-public-consultation-2021-02-11_en

⁵⁴<https://ec.europa.eu/jrc/en/science-update/algae-biomass-production-bioeconomy>

- **cross stakeholders'** potential synergies that can be captured across stakeholder groups. Building on the abovementioned Blue Bio-Economy sector, apart from the initiatives in the EU domain, another key stakeholder, The European Algae and Biomass Association (EABA) is extremely active in this space and provides a good example of cross stakeholder synergies. As an industry association, EABA acts as a coordinator between the public, private and financial stakeholders to create an ecosystem where knowledge is shared to create synergies. While setting up the observatory, it is therefore important to understand the ongoing sector>sub-sector>industry initiatives that are ongoing within the Blue Economy domain and can be leveraged.
- **cross Member States:** as discussed in the previous sections, there are existing initiatives for Sea Satellite Accounting across Members States at different levels of maturity. In chapter 5, these initiatives within EU as well as outside are discussed namely; Portugal, Netherlands, France, Ireland and USA. Leveraging the learnings and the expertise gathered through these initiatives across Member States, will help in the formative phases of the observatory. One of the recommendations that emerged during the expert validation session was to bring the key stakeholders from the initiatives together to convene once every 6-months. The opportunity could then be used to discuss the individual projects and influence the data collection initiatives so that it may eventually support the functioning of the observatory.

7. REPORT OF THE EXPERT VALIDATION WORKING SESSION CLOSING WORKSHOP

As part of the final review with Blue Observatory experts, an alternative method of working sessions was proposed. Due to the COVID-19 restrictions to gather physically, whereas the presence of experts within the session from outside the EU, an online working session was conducted to collect expert feedback and gain insights on the study activities. This ensured efficient use of the limited time available while providing the right forum for the experts to share their observations.

7.1. OBJECTIVE

The objective of this expert validation working session workshop was to gather feedback from expert reviews to the draft final deliverables of the project mentioned. These deliverables included the draft output of each tasks along with the key analyses in the form of Appendices. The review collected during the workshop contributed to the further improvement of the deliverables.

7.2. STRUCTURE

The Figure 29 below show the proposed structure of working sessions conducted over the course of October-November 2020.

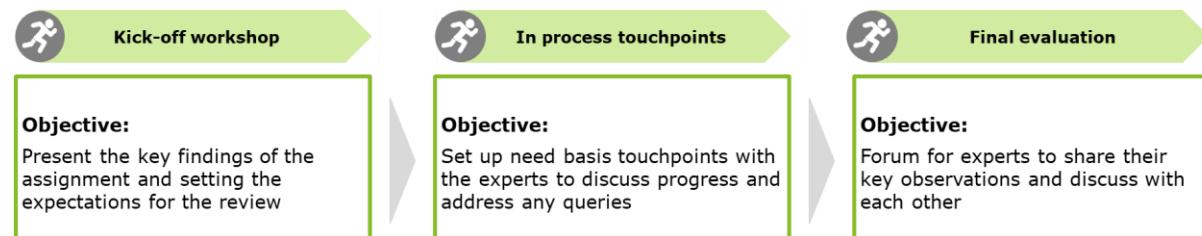


Figure 29 Working sessions setup

The engagement of the expert was split into three phases namely; the Kick-off workshop, possible in-process touchpoints, and a final evaluation. Members of the expert panel had not received the document in advance to have a fresh perspective on the overall study. During the kick-off session, the study and key findings were presented and discussed among the experts. Subsequently, the experts were provided with 4-week time to review the study document and the deliverables I detail and reach out in case of clarifications. Lastly, a final evaluation session was organised where the experts presented in detail their comments, feedback, questions and suggestions. The table below summarises the workshop structure.

8. LIST OF APPENDICES

The appendices to the report have been submitted as separate document attachments.

- 1. Database for sectors>sub-sectors>Industries with identified sources and data quality indicators;** Consolidated view on identified data sources **List of organisations reach out and interview summary**
- 2. List of questions used for interviews used for data collection with National Statistics offices**
- 3. Results of the data collection for case study countries** (Eurostat/NSO, Independent databases and BE report 2020)
- 4. Detailed list of activities and benefits of observatories**
- 5. Questionnaires used for the interviews for the feasibility of Observatories and Sea-satellite accounts**
- 6. Final Cost Structure of the observatory scenarios**
- 7. Feasibility and cost calculations for the Sea Satellite Account**



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