



# The progress on ocean accounting in Norway

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## Abstract

This paper is prepared for the 28<sup>th</sup> meeting of the London Group to be held 26-29 September 2022 in Siegburg, Germany. The paper discusses the current progress on ocean accounting in Norway.

Nationally, the [first satellite accounts for the ocean](#) were published in the spring of 2022, a national scoping assessment for holistic ocean accounts was completed in the fall of 2021, and the research project [MAREA](#) (MARine Ecosystem Accounting) is contributing to progress in ocean accounting by investigating how ocean accounts can be used in multilevel decision-making and in policymaking. The national work on ocean accounting has so far received ad hoc funding, but progress in establishing the accounts and developing statistical time series is dependent on long-term funding, which has not yet been secured.

Internationally, Statistics Norway is also involved in international work on ocean accounting, through its recent membership in Global Ocean Accounts Partnership [and International development programs cooperating](#) with Indonesia. This May, Indonesia and Norway signed a mutual contract for collaboration on ocean accounting with a focus on ocean satellite accounting and Ecosystem services accounts, a collaboration that is expected to be mutually beneficial because it will contribute to knowledge-exchange, and thus progress on ocean accounting in both countries.

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## 1. Introduction

The relationship between the environmental condition of the ocean, use of the ocean and human well-being is not well accounted for in the System of National Accounts (SNA). While the SNA measures the economic activity of a nation, it does not separate out the part of economic activity that is ocean related. Secondly, the SNA omits information on the ocean's contribution to society in terms of the value of many ecosystem services such as recreation and carbon sequestration and storage. The SNA does not capture how economic activity affects the environmental condition of the ocean, and vice versa, and the SNA does not keep account of changes in the asset value of the ocean capital. The GDP is used as a headline indicator in the SNA, and this contributes to less focus on the values that are not measured.

Holistic and sustainable management of marine ecosystems and natural resource would be facilitated by the development of complete national accounts that reflect the true value of the ocean. Such ocean accounts will yield several indicators that can help achieve more sustainable ocean management compared to just the GDP. An important indicator of sustainability is the stock of a nation's ocean wealth. This indicator can show how benefits today are balanced with the needs of future generations (Fenichel et al. 2020a; 2020b).

Developing a complete set of national ocean accounts which combines information on economic activities, the environment and society and thereby highlights the relationships between the environmental condition of the ocean, the use of the ocean and the contribution of the ocean to value creation, both economic and other can contribute to knowledge-based solutions when society must trade off economic interests against other social interests.

A set of ocean accounts could make an important contribution to the governance and management of ocean and coastal areas. As they provide spatially explicit information on the governance and administration of ocean and coastal areas in combination with information on the state of the environment and the condition of the ecosystems, this information could contribute to more knowledge-based management.<sup>13</sup> Socio-economic statistics for local communities and other relevant societal information may also be linked to these spatially explicit accounts.

Norway has a particular impetus to develop ocean accounts because of the High-Level Panel on a sustainable ocean economy (Ocean Panel), established in 2018 by then prime minister of Norway, Erna Solberg. The Ocean Panel member countries have committed to "sustainably manage 100% of the ocean area under national jurisdiction by 2025" (Stuchtey et al. 2020). One of the five main recommendations of the Ocean Panel is to change the way ocean accounts are kept so that it includes all the benefits provided by the ocean (Stuchtey et al. 2020). The Ocean Panel recommends that comprehensive ocean accounts be based on the internationally determined and accepted accounting frameworks. As Norway is a co-chair of the ocean panel this recommendation is being followed up at home.

This paper discusses Norway's current progress on ocean accounting, both nationally and internationally, and the way ahead. Chapter 2 gives an overview of the background for the work on ocean accounts in Norway, Chapter 3 describes the progress on ocean accounts in Norway, Chapter 4 describes Statistics Norway's pilot on ocean satellite account, Chapter 5 describes Statistics Norway's involvement in international work on ocean accounting, and Chapter 5 looks at the future plans for ocean accounts.

## 2. Background

### 2.1. International progress on ocean accounting

Over the recent years, ocean accounting has become prominent through various initiatives and organisations world-wide. Several countries have been piloting ocean accounts, several financed by UN ESCAP (Economic and Social Commission for Asia and the Pacific), and findings from this work led up to the Technical Guidance titled "Ocean Accounting for Sustainable Development" which was distributed for comments by the GOAP (Global Ocean Accounts Partnership) in October 2020.

The international work on ocean accounts also increased in relevance in March 2021 when the UN Statistical Commission decided that the biophysical part of the System of Environmental Economic Accounting, Ecosystem Accounting (SEEA EA), should be a statistical standard and that resources should be invested in developing a System of Environmental-Economic Accounting for the ocean (SEEA Ocean). The latter decision was made due to high demand for and the importance of such accounts. The published white paper of SEEA EA devotes a whole section 13.5 to thematic Ocean accounting. Since then, an international Working group on SEEA Ocean has been established.

### 2.2. The Ocean Panel

At the initiative of the then-Prime Minister Erna Solberg, the High-Level Panel for a Sustainable Ocean Economy (Ocean Panel) was established in 2018. The Ocean Panel today consists of 17 countries from all populated continents and is represented by its heads of state.

The Ocean Panel is a unique global initiative by serving world leaders that is working to build momentum towards a sustainable ocean economy in which effective protection, sustainable production and equitable prosperity go hand-in-hand (Ocean Panel, 2022).

One of the five main recommendations of the Ocean Panel is to change the way ocean accounts are kept, so that it includes all the benefits provided by the ocean (Stuchtey et al., 2020). The Ocean Panel recommends that comprehensive ocean accounts be based on the internationally determined and accepted accounting frameworks: the System of National Accounts (SNA) and System of Environmental-Economic Accounting (SEEA) (Fenichel et al., 2020b). Economic/monetary value in these accounting frameworks is measured as transaction prices, the price for which goods are sold/purchased. Fenichel et al. (2020b) propose, however, that ocean accounts be further developed to include other measures of value such as quality of life and human welfare, thereby constituting a holistic set of national ocean accounts. The Ocean Panel additionally recommends that the ocean accounts figures be made easily accessible to users through visualization on interactive data dashboards (Stuchtey et al., 2020).

### 2.3. The structure of ocean accounts

Thematic ocean accounts can be constructed by extracting the ocean-related parts of the System of National Accounts and the System of Environmental Economic Accounting, both internationally accepted accounting frameworks. A prerequisite for extracting the ocean-related information from these accounts is that they are kept:

1. **System of National Accounting (SNA) (United Nations et al. 2010).** The marine economic activity must be extracted from the national accounts to create a so-called satellite ocean account.

2. **System of Environmental Economic Accounting Central Framework (SEEA CF) (United Nations et al. 2014).** This is an account of human-induced pressure factors, such as pollution, harvesting of biological resources, energy production and mining.
3. **SEEA Ecosystem Accounting (SEEA EA) (United Nations et al. 2021).** The SEEA EA provides a framework for keeping accounts of the extent and condition of ecosystems, and society's use of and benefit from ecosystem services.

These three accounting frameworks are compatible and in principle complementary, although there will be some overlap between the ocean satellite accounts and the other two accounts. This must be taken into account when compiling the thematic ocean accounts to avoid double counting. An example of items that appear in all three accounts are the quantity and value of harvested fish.

The accounting manual for SEEA Ecosystem Accounting (SEEA EA) summarises the structure of a thematic ocean account (United Nations 2021, chapter 13.5). It is proposed here that the thematic ocean accounts compile relevant information from three internationally accepted accounting frameworks.

Pollution and pressure factors: SEEA CF provide a framework developed for accounts for pressure factors and these can be aggregated by catchment area. Examples of pressure factors are discharges and runoff of polluted water from land, disposal of waste on the seabed, pollution from the extraction of minerals from the seabed, plastic litter, and lost/ghost fishing gear.

Ocean services: Information on ocean related economic activity can be extracted from the SNA. SEEA CF and SEEA EA can provide accounts for ecosystem services not included in the SNA.

Ocean assets: SEEA EA employs a spatially explicit accounting framework, not used in SEEA CF and SNA, for ecosystem assets where accounts are kept of the location and extent of different types of ecosystems - or ecosystem assets such as kelp forest areas and areas with a sandy bottom. The SEEA EA also includes accounts for the ecosystem condition as compared with a chosen reference situation, typically what is considered "good ecological condition". SEEA CF includes accounting framework certain ocean-related assets such as for minerals, oil, energy and fish stocks. The accounting framework for produced capital is found in the SNA ocean satellite accounts.

A guideline for how to extract ocean related information from the SNA to make ocean satellite accounts is described in the OECD's Blueprint for improved measurement of the international ocean economy: An exploration of satellite account for ocean economic activity (OECD 2021). This guideline is used in the pilot for the Norwegian ocean satellite account, described in chapter 4.

### 3. Development of Ocean Accounts in Norway

Considering the international progress on ecosystem accounting, and with the Ocean Panel's recommendations, ocean accounting has been put more clearly on the agenda also in Norway. A question was put forward on what can ocean management work in Norway glean from the international debate on ocean accounting? Building knowledge about what ocean accounting is and can be, what is happening in Norway in this field and what has been carried out in other countries is an important step in the work to further develop the field of ocean accounting in Norway (The Norwegian Environment Agency, 2021).

Several processes have begun to answer these questions. This chapter first presents the status of ocean management and the initial processes on exploring ocean accounting, and the following chapters elaborates on several of the processes in more detail.

#### 3.1. Norway's ocean management plans

Since 2006, Norway has established management plans for the sea areas in Norway. This includes the Barents Sea and the sea areas outside Lofoten, the Norwegian Sea and the North Sea - Skagerrak. In April 2020, the first management plan covering all three sea areas was published: [Norway's integrated ocean management plans — Barents Sea-Lofoten area; the Norwegian Sea; and the North Sea and Skagerrak.](#)

##### **Integrated, ecosystem-based management**

As an ocean and coastal nation, Norway is responsible for managing a rich and varied natural environment. Norwegian waters support abundant natural resources that have been an important basis for the development of the welfare state. Norway's long-term approach to ocean resource management for the benefit of society has a long tradition. Value creation from ocean-based activities now and in the future depends on maintaining good environmental status and high biodiversity in the marine and coastal environment, safeguarding the oceans as a source of food and using ocean resources sustainably. In the integrated ocean management plans, the Government describes how it intends to continue and consolidate Norway's integrated, ecosystem-based ocean management plan system.

(*From the Report to the Storting<sup>1</sup>; Meld. St. 20 (2019–2020), p. 13.*)

The ocean management plans are intended to provide an overall balance between use and conservation, based on knowledge about ecological functions and the value and vulnerability of different areas together with information about economic activity now and forecasts for the future (Meld. St. 20 (2019–2020)). The management plan describes an environmental status for the Norwegian sea areas, including different pressure factors like pollution and climate change. The ocean-based industries are discussed, as well as the coordinated spatial management and coexistence between ocean-based industries.

##### **The environmental status**

To be able to measure the state of the environment in the sea areas and changes to it, a monitoring system has been put in place to monitor a set of indicators. Changes in the indicators alert management that there may have been influences to the marine environment that require measures to be implemented (Ministry of Climate and Environment, 2021).

The ocean management plans give comprehensive descriptions of the state of the sea areas and on the status of the environment by describing the development of the indicators from the monitoring

<sup>1</sup> Norwegian parliament

system. When describing the environmental status of the ocean, several areas are considered. Examples of indicators are:

- The sea temperatures
- The state of sugar kelp forests
- The fish stocks
- The stock of sea birds and marine mammals
- Pollution via the atmosphere and rivers

The trends of the different environmental indicators are thoroughly described and illustrated in figures and tables. An example is given in figure 3.1.

**Figure 3.1. Temperature time series in Skagerrak and the North Sea.**

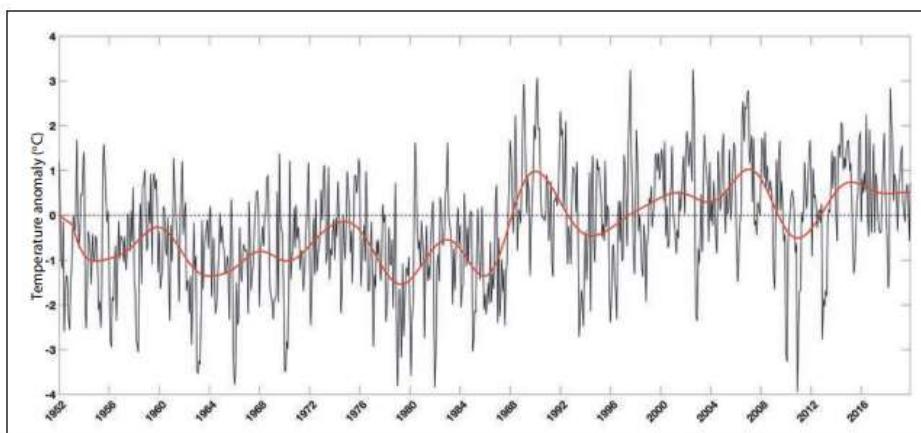


Figure 3.24 Temperature time series from 1952 to 2018 for Norwegian coastal waters in the Skagerrak and the North Sea, presented as anomalies relative to the period 1981–2010. Based on measurements by the Institute of Marine Research along the sections Torungen–Hirtshals and Utsira–Orkney (only measuring stations near the coast) and at the coastal stations Flødevigen, Lista, Utsira and Sognesjøen at depths of 0–10 m. The thin black line shows monthly values with the seasonal signal removed, while the red line shows the five-year rolling mean.

Source: Institute of Marine Research

## The ocean-based industries

In the ocean management plans, four ocean industries are comprised to show the economic aspect from the ocean to the economy. These four industries are seafood, petroleum, shipping and tourism. The variables included are value added and employment, where, in addition to be separated between the industries, also shows the values in each of the management plans areas.

**Figure 3.2 Table from Norway's integrated ocean management plans – Meld St. 20 Report to the Storting (white paper)**  
**Table 5.1 Comparison of value added in four ocean industries in each of the management plan areas and the totals for Norway. Value added is shown in NOK billion (in current prices).**

Industry	Barents Sea–Lofoten		Norwegian Sea		North Sea–Skagerrak		Norway, total		
	2010	2016	2010	2016	2010	2016	2010	2016	2019
Seafood	11.9	21.4	12.3	20.3	8.9	16.8	33.1	57.9	64.7
Petroleum	21.2	25.3	143.9	112.0	431.4	341.1	596.6	478.5	566.8
Shipping	1.3	1.0	4.1	4.6	26.7	35.0	32.2	40.7	39.8
Tourism <sup>1</sup>	2.4	3.7	2.5	4.0	9.6	14.2	32.2	45.4	-
<b>Sum</b>	<b>36.8</b>	<b>51.4</b>	<b>162.8</b>	<b>140.9</b>	<b>476.6</b>	<b>407.1</b>	<b>694.1</b>	<b>622.5</b>	<b>671.3</b>

<sup>1</sup> No figures for tourism are available for 2019.

Source: Statistics Norway

The data on the ocean-based industries is produced by Statistics Norway and makes use of data from the national accounts and the regional national accounts. These data have been produced on an ad hoc basis for the management plans. In the future, the ocean satellite accounts may replace these ad hoc data. It remains to see how the need to separate the data on the different ocean areas.

### 3.2. The Norwegian Forum for Integrated Ocean Management

The professional basis for the ocean management plans discussed in the previous section is prepared by the Norwegian Forum for Integrated Ocean Management (from here referred to as the Forum). The Forum is led by the Norwegian Environment Agency. It reports to a steering group composed of relevant ministries. Relevant directorates and institutes are members of the Forum.

The Forum must prepare the professional basis for the report to the Storting every four years on comprehensive management plans for the Norwegian sea areas Barents Sea–Lofoten, Norwegian Sea and North Sea–Skagerrak.

The forum can also be given related tasks to improve the data and tools or relevant assignments from the steering group.

In February 2021, The Norwegian Forum for Integrated Ocean Management received a task from the steering group to:

*"... take a closer look at how the international debate related to the development of "Ocean Accounts" or a natural capital account for the ocean ("ocean accounting") can be followed up in Norway, and especially how it can contribute to the work on the management plan for the ocean areas in 2024 when it concerns value creation and ecosystem services. We are therefore asking the Forum to start professional work on this. The work should describe the necessary knowledge needs and data base, together with opportunities and utility. The work should also address uncertainties and limitations of such an ocean accounting. If possible, should specific examples be given of how an ocean account can look in practice. [...] The work will result in a document from the Forum to the steering group".*

#### Seminar on ocean accounting in August 2021

To begin the process of capacity building and to gather possible stakeholders, a seminar and a workshop was held by the Norwegian Environment Agency in cooperation with Statistics Norway in virtue of the Forum for Integrated Ocean Management. The aim was to increase the expertise on the topic among people involved in Norwegian marine management and other interested parties, and

to provide an overview of what is going on in relevant activities both in Norway and internationally. The seminar was open to all interested parties, while the workshop was reserved for invited participants.

Both national and international presenters were invited to the digital seminar, including experts from Australia, Netherlands, Canada, UK, and the Global Ocean Accounts Partnership.

The seminar and the workshop gave a lot of input to the status of ocean related data, thoughts and ideas on how to utilize ocean accounting and raised some relevant issues.

### **The conclusions of the task given to the Forum**

The task given to the Forum in February 2021 resulted in a written document which was handed over to the steering group in April 2022. In addition to the directions given in the assignment, the document also included recommendations on how to proceed with the work related to ocean accounting. The following recommendations were given:

1. Make use of the ocean satellite accounts from Statistics Norway
2. Undertake a pilot on an ecosystem account for marine areas
3. Investigate different concepts for a Norwegian ocean account
4. Prioritize research and development

The first recommendation was followed up by the Forum immediately by considering how the ocean satellite accounts could be utilized in the professional basis for the ocean management plans. The ocean satellite account is presented in chapter 4 of this paper.

In August 2022, the steering group adopted the recommendations and asked the Forum to suggest some alternatives for geographical areas to perform a pilot on marine ecosystem accounting. The selection of alternatives was recommended to be undertaken in close cooperation with Statistics Norway and the results of the work will be presented in early December. It is yet to be decided on how to set up the pilot and how comprehensive the pilot will be. This will be investigated in the future.

### **The benefits from an ocean account**

*[The text in this section is subtracted and translated from the document to the steering group on ocean accounts April 2022, (The Norwegian Environment Agency, 2022)]*

A thematic ocean account based on the UN's framework will be able to provide quality-assured and standardized information and indicators, including indicators for several sustainability goals. The indicators can be used to make national and international comparisons.

Even though Norway has managed its ocean areas for centuries, a need for an ocean account is prominent. The seminar/workshop highlighted this, and the Forum presented this to the steering group in May 2022.

Some of the benefits from an ocean account can be summarized by the following:

**Policy making.** Ocean accounts can be a useful tool for assessing whether the development of the marine economy is sustainable. It could be used to develop indicators that describe developments in e.g. value added, certain ecosystem services and environmental condition, and contribute to regular measurements of these.

**Comprehensive knowledge base.** Ocean accounts can contribute to a more holistic knowledge base in that it helps to collect and structure data and knowledge across different topics. New ways of putting together existing knowledge can contribute to new knowledge that is relevant for administration. It can help to highlight connections between the economy, impact factors and the state of the environment. This is supported by countries that have carried out pilot studies which also highlight the benefit of ocean accounting increasing awareness of the various values and services that ecosystems contribute to.

**Spatial planning.** The ecosystem accounting of an ocean account is geographically explicit (map-based) and will therefore be useful in spatial planning by providing a better knowledge base on where different values are located.

**New data.** The development of ocean accounts can contribute to the acquisition of new data and the development of new knowledge that can be of value to the administration.

In general, the usefulness of an ocean account will increase with the level of detail and how the data is made available. Certain beneficial effects will also depend on the accounts having a certain degree of detail for them to be triggered.

### 3.3. The national programme for official statistics

Norway has a national programme that defines and delimits official statistics. The programme encompasses economic, demographic, social and environmental statistics. Statistics Norway and 11 other public authorities have responsibility for official statistics. The current programme runs from 2021 to 2023 and are now being revised for a new period from 2024.

As a result of the ongoing process of expanding the EU-regulation 691/2011 on European environmental economic accounts with new modules, including a module in ecosystem accounts, there are ongoing processes to also include ecosystem accounts in the programme for official statistics from 2024. This will hopefully also include ocean accounts. Statistics Norway is currently working on a proposal on developing ecosystem accounts, in cooperation with the Norwegian Environment Agency and possibly other stakeholders.

### 3.4. Further progress

Since the successful seminar that was held on ocean accounting in August 2021, several other processes have begun. This includes the following:

- A pilot of an ocean satellite accounts
- International cooperations on ocean accounts
- Memberships in international organizations

These topics are further elaborated in the chapters to follow.

## 4. Ocean satellite account

[The text in this chapter has been extracted largely from the document on ocean satellite accounts published on Statistics Norway's webpage: Ocean satellite account – Description of methods and sources.]

The satellite accounts for the ocean are a pilot and are co-financed by the Research Council of Norway and Statistics Norway (SSB). The work was undertaken in 2021 and 2022 and was published in May 2022, see [Ocean satellite account – Description of methods and sources](#) (Statistics Norway, 2022). It is part of the fourth phase of the OECD project «Future of the Ocean Economy» in which Norway has participated since the beginning in 2013.

Common to many of the satellite accounts<sup>2</sup> derived from the national accounts is a need to separate areas of activity from the whole and make them visible as a separate grouping, since in the ordinary national accounts these areas of activity span several different industries in different economic sectors. Determining the size of these areas of activity, such as education, involves calculating the accounting figures by regrouping supporting material or using the national accounts' supply-use tables. Key users of the satellite accounts are ministries, businesses and interest organizations, researchers, and international organizations such as the OECD, Eurostat and UN specialized agencies.

To make visible the size and structure of the mainland industries linked to the ocean, the satellite accounts are based on figures and concepts from the national accounts but that are processed and reclassified. The figures in the satellite accounts for the ocean are thus consistent with the national accounts, but the presentation is more detailed.

The establishment of a satellite account for the ocean that shows the ocean's contribution to Norwegian value creation can be seen as a necessary first step on the road towards a comprehensive and unified ocean account, in line with the recommendations from the Ocean Panel.

The pilot is based on the framework presented in the OECD's Blueprint for improved measurement of the international ocean economy: An exploration of satellite account for ocean economic activity (OECD 2021).

### 4.1. Definitions, sources and calculations

#### Definitions

Statistics Norway has used the OECD's definition of economic activities related to the ocean, which are activities that

- a) takes place on or in the ocean;
- b) produces goods and services primarily for use on or in the ocean;
- c) extracts non-living resources from the marine environment;
- d) harvests living resources from the marine environment;
- e) use living resources harvested from the marine environment as intermediate inputs;
- f) would likely not take place were they were not located in proximity to the ocean; or
- g) gain a particular advantage by being located in proximity to the ocean.

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<sup>2</sup> Satellite accounting is the term for accounting that is based primarily on national accounting concepts and figures, but which is specially adapted to shed light on a specific economic phenomenon or area in more detail, or from a different point of view than in the ordinary national accounts. Statistics Norway currently produces satellite accounts for tourism, education, health, non-profit and voluntary organizations.

As an example, production of ship propellers made by the metal goods industry is included in the satellite accounts, since ship propellers are specially adapted for use on or in the ocean, while production of electricity or diesel on the mainland is not included as these products are not "tailored" for use at ocean, regardless of the fact that many of the end users of these products are among the ocean industries. Other activities are more difficult to assess whether they are specially adapted to ocean use: marine insurance and production of bunker oil are included in this pilot, while cleaning and freight forwarding services are not included.

## Data sources

The national accounts' supply-use tables form the basis for the calculation of the ocean satellite accounts. These tables provide a detailed description of the supply (production and import) of goods and services in the Norwegian economy, and how these are used (consumption, exports, intermediary consumption or investments) and by whom (Norwegian industries and consumers and the rest of the world). The supply-use system is updated every year in connection with the publication of the final national accounts.

From the supply-use tables, information is obtained on production, intermediary consumption and investments for the industries that are defined as the core of the ocean industries.

## 4.2. Step-by-step on making the ocean satellite account

Using data currently available in Norway, the work of creating an ocean satellite account can roughly be divided into four processes:

**1. Make a list of predefined marine industries.** All production delivered by the ocean industries is included in the accounts. The ocean industries use a number of goods and services to manufacture their products, i.e., intermediary consumption and investments.

There are over 120 industries in the national accounting system in addition to a number of consumer groups. About 15 of these, such as fishing, shipping, and aquaculture, will be defined as marine industries.

**Table 4.1 Core Ocean industries**

Industry	Standard Industrial Classification (NACE / SN07)
Fishing	03.1
Aquaculture	03.2
Extraction of crude petroleum and natural gas	06
Support activities for petroleum and natural gas extraction	09.1
Processing and preserving of fish, shellfish, and molluscs	10.2
Construction of ships and boats	30.1, excluding 30.113 and 30.116
Construction of oil platforms and modules	30.113 and 30.116
Pipe transport (of oil and gas)	49.5
Shipping	50
Services related to maritime transport	52.22

**2. Define goods and services in the national accounts as marine, partially marine or fully marine.** Many of the products that are partially linked to the ocean are produced by industries that are not defined as ocean industries. For example, most animal feed is produced by the industry Manufacture of prepared animal feeds (NACE 10.9). This industry and all other industries that produce goods and services that are partially linked to the ocean, but which are not defined as a

core ocean industry are defined as “suppliers.” Their ocean production is included in these accounts. There are also some products where:

- the product satisfies enough criteria in section 4.1 to be considered as a marine product per se, regardless of its end use or producer, or
- it is not possible to extract an ocean portion based on the supply-use framework.

The national accounts consist of just over 900 goods and services, all of which must be reviewed to identify marine goods and services so that these can be categorized into the following three groups:

1. Fully marine: all products which, by definition, are marine regardless of their manner of use in marine industries, such as boats, cod, and sea transport.
2. Non-marine: all products that cannot be said to have any marine use that requires them to be especially adapted for such use. Examples of such products are Christmas trees and buses. This means that even if a predefined marine industry (see step 1) such as shipping uses Christmas trees, Christmas trees will nevertheless not be considered part of the Norwegian ocean economy. In the pilot, these evaluations may require expert opinion, as many products are ambiguously marine: for instance, is repairing electronic equipment on a ship a marine activity, i.e., are the adaptations needed to perform this activity on a ship sufficient for this to be called a marine activity?
3. Partially marine: to the extent that a product in this category is used by one of the marine industries listed in step 1, it will be marine. For example, if the marine industry aquaculture uses animal feed, then animal feed will be considered partially marine, because animal feed is included in the list of goods and services that have a marine adaptation when used by a marine industry (fish feed production is a special adaptation of animal feed production for maritime use. Had fish feed been identical to pig feed, the situation would have been different). To summarize this point: the contribution to the marine economy of a wide range of goods and services will be assessed according to the degree to which they are used (such as intermediate input, investment, consumption, etc.) by the predefined marine industries (or consumer groups).

The following product categories belong to the third group of products, where the supply-use framework is not used but rather external sources.

**Table 4.2 Ocean activities where the source is not the national accounts SUT**

Ocean activity	Source
Education (vocational schools, upper secondary, higher education)	Admissions data, Directorate of Education
Sports activities	Membership in the relevant athletic associations that are part of the Norwegian Sports Association
Offshore catering	Business and enterprise information
Construction of port facilities	Business and enterprise information
Loading and unloading	Business and enterprise information
Storage	Business and enterprise information
Tourism	Map data
Research and development	Business and enterprise information

**3. Design a program/model, which performs the calculations described above when the list of products as well as the marine industries are defined.** The program will calculate the marine share for each product, based on the production and import shares (supply) used by the predefined marine industries. For instance, if the share of the animal feed supplied to the predefined marine industries is 60 per cent in 2020, the satellite accounts say that animal feed is 60 per cent marine in

2020, regardless of which industry produces it. The advantage of developing such a program is that it enables quick annual updates of the accounts. This is because the supply-use framework of the national accounts forms the basis for the model's calculations. These supply-use tables are updated annually along with the national accounts.

**4. There are products for which information outside the national accounts must be used.** This applies to products such as defense (e.g., the navy's share of the defense budget), education (identifying maritime-focused institutes and educational courses) and hotel accommodation. For the latter, geographical information systems in combination with the business registry can be used to include all hotels located within a certain distance of the waterfront.

The marine share generated by the supply-use framework in point 3 will be compared, if possible, with alternative information to assess the quality of the results. If there are large discrepancies, the supply-use framework must be adjusted. This supply-use framework is useful in the production of quarterly national accounts, economic ripple effect analysis, etc.

### 4.3. Main results

The ocean is a major contributor to the Norwegian economy, representing 22 percent of total-GDP in 2019. In comparison, the ocean economy accounted for 1.7 percent of US GDP in 2020. The highly lucrative petroleum and gas extraction industry contributes to

most of the value added; however, as it is a capital-intensive industry, the majority of employment is connected to industries not related to oil, such as aquaculture, fishing, tourism, shipyards, and shipping.

**Table 4.3 Summary Ocean related activities, by industry, Norwegian kroner, and full-time equivalents. 2019**

Industry	Production	Intermediate consumption	Gross product	GFCF	Full-time equivalents
Aquaculture	87 300	59 700	27 600	7 000	8 600
Fishing	22 300	6 800	15 500	2 400	8 600
Processing and preservation of fish shellfish and molluscs, fish feed	109 700	93 900	15 700	3 700	12 200
Tourism	15 100	8 200	6 900	600	12 400
Foreign shipping	130 600	104 000	26 700	25 100	20 800
Domestic shipping	16 600	13 100	2 000	9 200	9 100
Services related to maritime transport	13 500	7 300	6 200	1 200	5 700
Transportation offshore services	20 600	12 700	8 000	2 700	5 600
Extraction of crude oil and natural gas Services related to the extraction of crude oil and natural gas, geological surveys, etc.	532 300	58 500	465 800	178 800	24 300
Oil platforms and modules	185 700	119 600	66 100	6 700	54 300
Shipyards (excluding oil platforms and modules)	27 000	17 600	9 400	900	9 600
Equipment suppliers, repair and construction activities	29 300	22 400	6 900	900	7 700
Research and teaching	42 400	29 300	13 100	5 800	16 000
Other service production	4 900	1 700	3 200	1 600	2 300
<b>Total without oil and gas extraction</b>	<b>742 300</b>	<b>524 200</b>	<b>215 100</b>	<b>73 300</b>	<b>206 800</b>
<b>Total without oil and gas extraction and closely related industries</b>	<b>508 900</b>	<b>374 200</b>	<b>131 700</b>	<b>62 900</b>	<b>137 300</b>
<b>Total sum*</b>	<b>1 274 800</b>	<b>582 600</b>	<b>680 900</b>	<b>252 100</b>	<b>231 100</b>

\* The individual figures in fixed prices do not add up to the sum due to chaining and rounding deviations

## 5. The research project MAREA (MARine Ecosystem Accounting)

The research department at Statistics Norway is involved in several research projects exploring the use of non-market valuation for ecosystem services. One of these is MAREA (MARine Ecosystem Accounting), which is a project that applies accounting compatible non-market valuation methods for the study of recreational coastal ecosystem services. The aim of the project is to prepare a regional ecosystem account for the Oslofjord and to study user conflicts more closely. The research project is a collaborative project between the Norwegian Institute for Water Research (NIVA) (owner, led by W. Chen), Norwegian Institute for Nature Research (NINA), Menon Economics AS and Statistics Norway, starting in the autumn of 2021. The project will run for four years to the fall of 2025.

In addition to the study of recreational coastal ecosystem services, MAREA will demonstrate how biophysical indicators and monetary values of ecosystem services can be used for differentiated and targeted decision-support for different coastal-marine planning layers (MAREA, 2021). MAREA will also demonstrate trade-offs between coastal ecosystem services, including behavioral change in recreational fisheries (MAREA, 2021). MAREA will test how ecosystem service trade-offs can be quantified and communicated for the main planning concerns in the Oslofjord – water pollution, benthic habitat loss and fish stock decline, recreation access limitation and shoreline property densification (MAREA, 2021).

As part of the project, Statistics Norway contributes to the work packet which is using housing-sales data. The goal is to use hedonic pricing to derive estimates of the value to the residents of local recreation areas. In the project we will estimate the recreation amenity values accruing to private properties within 100m of the coastal zone. We will then aggregate these values per recreation area, and the total value for each municipality with a coastline to the Oslofjord. To contribute to and test out the policy relevance of ecosystem accounting applied to the Oslofjord we will develop case studies to demonstrate the use of a hedonic property value assessment tool that we develop for public purchase guidelines and local property tax recommendations.

### Previous research projects related to marine ecosystem accounting

In 2019, the Norwegian Institute for Water Research (NIVA) published the collaborative report *Verdier i Oslofjorden: Økonomiske verdier tilknyttet økosystemtjenester fra fjorden og strandsonen* [Values in the Oslofjord: Economic values associated with ecosystem services from the fjord and the coastal zone] (Chen et al., 2019). The report was produced in collaboration with the Norwegian Institute for Nature Research (NINA), Menon Economics AS and Statistics Norway and used several data sources. Although this report is not an ecosystem account per se, its structure follows the SEEA EA framework. The report collates knowledge about the available figures on economic value (market and non-market values) where the values are to some degree dependent on the condition of the ecosystems in the Oslofjord, including in the 100-metre coastal zone. In addition, the report identifies potential user conflicts concerning the Oslofjord today and in the future. To the extent possible, the report divides the value estimates geographically into two regions, based on proximity to the capital city of Oslo.

Furthermore, Chen et al. (2019) tested parts of the SEEA EA accounting framework on a study of Norwegian kelp forests. The study confirmed that SEEA EA will have many benefits through highlighting relationships between ecosystems and the economy and that such accounting helps improve government transparency.

## 6. International processes

Internationally, Statistics Norway is involved in international work on ocean accounting, through its recent membership in Global Ocean Accounts Partnership [and International development programs cooperating](#) with Indonesia. This May, Indonesia and Norway signed a mutual contract for collaboration on ocean accounting with a focus on ocean satellite accounting and Ecosystem services accounts, a collaboration that is expected to be mutually beneficial because it will contribute to knowledge-exchange, and thus progress on ocean accounting in both countries.

### 6.1. Global Ocean Accounts Partnership

In June 2022, Statistics Norway accepted an invitation to become a member of the Global Ocean Accounts Partnership (GOAP). GOAP is a coordination and communication structure for its member institutions, which have a common interest in ensuring that the values linked to the ocean are made visible and form the basis for decisions about social and economic development. GOAP develops a common technical framework for ocean accounting and contributes to collaboration that supports capacity building, development, maintenance of comprehensive ocean accounting that links social, environmental, and economic statistics that can be used continuously in decision-making.

For Statistics Norway, a membership in GOAP support the work to further develop the various components of ocean accounting linked to SNA, SEEA EA and SEEA CF (Central Framework) for Norway. Ongoing work at Statistics Norway as of today includes Statistics Norway's Investment Proposal to lay the foundations for work that can guide the preparation of the SEEA EA in the long term, the Satellite Account for the ocean, the work with the Ocean for Development program, as well as research projects that include testing and work with the research agenda for ocean accounting (MAREA). This work could hopefully contribute to the work internationally and the experience gained will be shared with GOAP.

### 6.2. International development programs – Ocean for Development

It is increasingly recognized that the ocean plays a critical role both in supporting life on earth and mitigating climate change. Improved ocean management and governance therefore becomes vital to ensure sustainable use of the oceans. Recognizing these facts have made the Norwegian Agency for Development Cooperation (Norad) establish the Oceans for Development programme (OfD). The overarching objective of this program is to promote a strengthened, sustainable and inclusive ocean economy in cooperating countries. OfD is also one of Norway's contributions to achieving Sustainable Development Goal 14, conserve and sustainably use the oceans, seas and marine resources for sustainable development, and the broader United Nations 2030 Agenda. The programme is demand driven and an important element is to establish institutional cooperation between Norwegian institutions and counterpart institutions in cooperating countries.

A technical agreement was signed between Norad and the Ministry of Marine Affairs and Fisheries of the Republic of Indonesia 19<sup>th</sup> May 2022. The agreement constitutes the overall framework for the OfD programme between Norway and Indonesia and ocean accounting will be fundamental. Statistics Norway and Statistics Indonesia (BPS) together with the Indonesian Directorate General for Marine Spatial Management under the Ministry of Marine Affairs and Fisheries (MMAF), are collaborating in this work. As members of the High-Level Panel (HLP) for a Sustainable Ocean Economy both countries are very committed to improve the management of the ocean. With the HLP recommendations and the emphasis on developing ocean accounts important steps have already been taken. As this work is still on a developmental stage the potential for synergies is high. Potential areas of collaboration between SSB, other Norwegian institutions and our Indonesian partners will be further developed as the planning continues and a programme document is

developed. Technical meetings with BPS, SSB and MMAF have already identified important collaboration areas, such as ocean satellite accounting, ecosystem services accounts for marine protected areas (MPA's), ocean economy data visualization and exploring how ecosystem accounting methods can provide decision support in different levels.

### **Exploring a new form of peer-to-peer learning on ocean accounting with Indonesia**

Statistics Norway's "Division for international development cooperation", a specialized division working with international development cooperation projects, will have the responsibility of coordinating SSB's contribution to the OfD programme. Subject matter expertise from the department of economic, business and environmental statistics- and research- and communications departments will be used in the OfD collaboration with Indonesia. The technical cooperation is a mixed mode of online and shoulder-to-shoulder cooperation.

The work of developing complete ocean accounts is still on an early stage in both Indonesia and Norway making the potential for synergies very high when using each other's comparative knowledge advances. One theme that will be further explored is the accounts as a ground for policy support combined with Indonesia's practical experience in the implementation of Ocean Accounts in MPA's (MMAF 2022). The knowledge that will be gained from the research project MAREA on testing and evaluating how ecosystem accounting methods can provide decision support to different planning levels will be of great importance on the experience sharing with Indonesia; both when they continue the work on piloting ocean accounts for further MPA's and when developing the accounting at the national scale.

National accounts experts of BPS and SSB will cooperate on a detailed level to develop the ocean satellite accounts of Indonesia. An important starting point here is developing the supply and use framework. There are several ocean activities that cannot be estimated by using this framework. Hotel and restaurants are one example, since it is their geographic location that determine their ocean-ness. The estimation of these will also be an area of cooperation between Norway and Indonesia.

Statistics Norway plans to contribute with technical assistance on assembling the ecosystem services accounts in both physical and monetary units for the MPAs. An important topic here will be related to sharing experience on the different valuation techniques that have been used and will be used within the SEEA EA framework. This will also give Norway valuable input when developing ecosystem accounts for Norwegian marine areas.

## 7. Future plans

The ocean satellite account is the area within the Norwegian ocean accounting that has the most concrete plans. However, the very positive signals from the steering group of The Norwegian Forum for Integrated Ocean Management on conducting a pilot on ocean accounts on the near future is a great second step towards the development of ocean accounts for Norway.

It is not a question about *if*, but a question about *when* an ocean account will be developed in Norway.

### 7.1. Ocean satellite account

[*The text in this section has been largely extracted from the document on ocean satellite accounts published on Statistics Norway's webpage: Ocean satellite account – Description of methods and sources*]

The content of the satellite accounts is planned to be disseminated through a separate report that provides a description of the various Norwegian ocean industries. Topics that will be discussed are whether these industries are part of an ocean industry cluster and the export intensity of the various parts of the ocean economy. Depending on how far the OECD's data collection has come, some international comparisons can also be made.

The satellite accounts are a pilot and will be subject to improvements and audits in connection with further quality work. The accounts are only as good as the National Accounts' supply-use framework is, and improvements of the former thus includes improvements of the parts of the framework where the estimates are more uncertain, i.e. the service industries, and especially intermediary consumption.

A useful extension of the satellite accounts would be to prepare an input-output matrix. Such a matrix combines the supply and use tables in a matrix with supply-use coefficients. It will be able to provide a basis for analyzing ripple effects in the economy of external shocks in a given ocean industry.

Many users want regional figures. The supply-use estimates are based on national figures, where it is known that a certain proportion of the production of an industry is linked to the ocean nationally. If the ocean share is 20 per cent, the supply-use tables cannot answer whether all production related to the ocean originates from for example Western Norway or whether the share is 20 per cent in all counties where the industry operates. If one assumes the latter, such accounts can be prepared relatively quickly as the National Accounts produce county-distributed figures each year and one can distribute the ocean activity proportionally based on these. If a county-based ocean account is to be prepared, one must review how problematic such an assumption is, which will require a review of company data.

Finally, it is a question of whether the satellite accounts will become official statistics and thus be published every year. This question concerns, among other things, the use of resources. By having developed an IT-system that does much of the calculations of the accounts, production of the accounts is not resource-intensive, but if it is to be quality-assured and improved (which includes improving the entire National Accounts' supply-use system) it will require more resources.

### 7.2. Pilot on marine ecosystem accounts

The first steps on conducting a pilot for ocean accounts for Norway is commencing. As stated previously, the steering group has asked the Forum of Integrated Ocean Management to suggest

some alternatives for geographical areas to perform a pilot on marine ecosystem accounting. The selection of alternatives was recommended to be undertaken with close cooperation with Statistics Norway and the results of the work are to be presented in early December. It is yet to be decided on how to set up the pilot and how comprehensive the pilot will be. This will be investigated in the future.

A pilot will provide increased knowledge about how parts of a Norwegian ocean account can look in practice and what types of management needs it can help to cover and will help to reveal what we have and do not have of the necessary data and knowledge. Furthermore, it will contribute to building up capacity and expertise in ocean accounting in Norway. This will be useful for the implementation of a complete ocean account and make Norway better able to contribute to and influence the development of international standards. The adopted standard and GOAP's technical manual should be used as a basis, while at the same time it should be kept open to testing alternative solutions where the standard has not been adopted or clearly does not suit Norwegian conditions.

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