



Ocean satellite account

Description of methods and sources

TALL

SOM FORTELLER

NOTATER / DOCUMENTS

2022/17

Tor Kristian Ånestad and Erlend Nickelsen

In the series Documents, documentation, method descriptions, model descriptions and standards are published.

© Statistics Norway

When using material from this publication, Statistics Norway shall be quoted as the source.

Published: 13 May 2022

ISBN 978-82-587-1523-5 (electronic)

ISSN 2535-7271 (electronic)

| Default characters in tables | Symbol |
|------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Unable to enter numbers Figures do not exist at this time because the category was not in use when the figures were collected. | . |
| Numerical basis is missing Figures have not entered our databases or are too uncertain to be published. | .. |
| Does not appear for confidentiality reasons Figures are not published to avoid identifying individuals or companies. | : |
| Decimal place | . |

Preface

The OECD report "The Ocean Economy in 2030" (OECD, 2016) stressed, among other things, "the need for greatly increased efforts to improve data quality, data coverage and measurement techniques in order to arrive at a more accurate assessment of ocean-based industries and their potential for the future." Through the Research Council of Norway, Norway has participated in OECD's work with the ocean economy since 2013, and in the current program period, the OECD has emphasized the development of satellite accounts for the ocean. A satellite account is an extraction of the national account, which focuses on a specific part of a country's economy - in this case the parts that can be linked to the ocean.

To this end, the OECD has worked with several coastal nations, including Norway through the Research Council of Norway and Statistics Norway (SSB), to establish an international standard for how an ocean economy is to be defined and measured. As part of this collaboration, Statistics Norway has prepared a pilot for a satellite account for the ocean for Norway, which is among the first such accounts in the world.

This project can be seen as part of a larger effort to establish a unified ocean account: The International High Level Panel for a Sustainable Ocean Economy ("Ocean Panel"), which is currently led by Norway, has recommended that a unified ocean account be established that sheds light not only on the ocean's contribution to a country's economic activity and the quality of life of its inhabitants, but also the impact of economic activity on the ocean itself. Such an ocean account will be an important source of information for decision-makers when they weigh various competing societal interests. The Ocean Panel proposes to carry out an ocean account under already established or soon-to-be established UN frameworks, such as the national accounts and the ecosystem accounts. It is precisely the former framework, the national accounts, that the OECD takes as its starting point, when they are now developing a standard for satellite accounts for the ocean.

These satellite accounts will hopefully be an important contribution to a unified ocean account, where the goal is that the satellite accounts will be compatible with both the national accounts and with the ocean ecosystem accounts when these are established. The rich flow of data that annually accrues to the national accounts makes it the main source of satellite accounts.

This is a pilot project, and it means that methodological choices can be reconsidered later. The figures must therefore be considered preliminary. Nevertheless, they are considered to be of sufficient quality for Statistics Norway to release them, with the hope that they can provide a basis for further work with measuring the ocean's economy at home and abroad.

The publication has been prepared by advisers Tor Kristian Ånestad and Erlend Nickelsen, both from the Section for National Accounts. The work is part-financed through support from the Research Council of Norway.

Statistics Norway, 30 March 2022

Lasse Sandberg

Summary

The satellite accounts for the ocean are a pilot and are co-financed by the Research Council of Norway and Statistics Norway (SSB). 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. In order 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.

This documentation describes the framework to which the satellite accounts are subject, the available source material and the estimation methods used.

This 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). The guide includes guidelines on principles and definitions, classifications, breakdown of numbers and tables to disseminate data. The guide is the result of numerous discussions between the OECD and coastal nations, including Norway.

The most important source for the satellite accounts for the ocean is the National Accounts' supply-use framework. This framework provides a detailed description of the supply (production and imports) of goods and services in the Norwegian economy, and how these are used. It indicates what proportion of the supply of a product is used for consumption, exports, product inputs or investments and also by whom (industries, exports, and consumer groups), and is updated every year in connection with the publication of the final annual national accounts. An SAS-based IT-system is the core and enables the flexibility in parameters and definitions that are needed when the follow-up work commences after this publication.

The satellite accounts for the ocean cover the years 2016 to 2019 and consist of supply and use tables as well as a summary table for key figures such as gross product, employment and investments.

The Ocean Panel has recommended that comprehensive ocean accounts be developed that reflect the true value of the ocean. This is necessary to achieve a more comprehensive and sustainable management of marine ecosystems and natural resources. Establishment of a satellite account for the ocean that shows the ocean's contribution to Norwegian value creation is a necessary first step on the road towards a comprehensive and unified ocean account. Such an account will be compatible with ecosystem accounts so that monetary value creation does not become the only indicator that decision-makers look to when making ocean-management policy.

Contents

| | |
|----------------------------------------------------------------------------------|-----------|
| Preface | 3 |
| Summary | 4 |
| 1. Introduction | 6 |
| 2. Background | 7 |
| 2.1. The Ocean Panel | 7 |
| 2.2. SNA and SEEA..... | 7 |
| 2.3. OECD | 8 |
| 3. Sources and calculations | 10 |
| 3.1. Definitions..... | 10 |
| 3.2. Calculations | 10 |
| 3.3. Technical solution | 13 |
| 3.4. Uncertainty | 14 |
| 4. How to read the access and application tables | 15 |
| 4.1. Supply table (first tab) | 15 |
| 4.2. Use table (second tab)..... | 16 |
| 4.3. OECD tables (third tab) | 17 |
| 5. Further work | 20 |
| References | 21 |
| Appendix: Products included in the satellite accounts for the ocean | 22 |

1. Introduction

The pilot for the satellite accounts for the ocean was first published on 1 April 2022. This document describes definitions, principles, sources and estimation methods used to prepare these accounts. This documentation consists of five chapters and is structured as follows: Chapter 2 deals with the purpose and history behind the satellite accounts for the ocean. Chapter 3 describes the sources, method, and technical solution used for the calculations, as well as the uncertainties associated with these, while Chapter 4 provides an introduction to how to read the results from the tables. The chapter also contains abbreviated versions of the tables contained in the satellite accounts. Chapter 5 briefly discusses further work.

2. Background

2.1. The Ocean Panel

At the initiative of the then-Prime Minister Erna Solberg, the Ocean Panel was established in 2018. The Ocean Panel today consists of 16 countries from all populated continents and is represented by its heads of state.

The Ocean Panel has published or financed 16 reports, one of which discusses ocean accounts, namely *National Account for the Ocean and Ocean Economy* (Fenichel et al., 2020). One of the five main recommendations from the expert group that wrote the report is to see the financial contribution from the ocean as a result of human activity (often called value creation or gross product) in a context. Three indicators can shed light on the value of the ocean: the ocean product, which is what this satellite account will capture; changes in the ocean balance sheet, and ocean income, which sheds light on how the funds derived from the ocean products lead to prosperity. This may also include other measures of value that are not measured in a systematic way today, such as quality of life and human welfare.

As an important first step, the Ocean Panel proposed a comprehensive ocean account that can build on the internationally recognized account frameworks *System of National Accounts* (SNA) and the UN's *System of Environmental Economic Account* (SEEA).

2.2. SNA and SEEA

An ocean account will compile ocean-related information from other international account frameworks, such as SNA and SEEA, when these have been created (Grimsrud and Ånestad, 2021).

Three such account frameworks are relevant in this context and can together provide a basis for a comprehensive ocean account:

- The National Accounts (SNA). The economic activity related to the ocean is separated from the national accounts in a satellite account for the ocean, which is the main topic of this documentation.
- SEEA Central Framework (SEEA CF). This is an account of the impact on the ocean by human activity, such as pollution, harvesting of biological resources, energy production and mineral extraction.
- SEEA Ecosystem Account (SEEA EA). The ecosystem accounts provide a framework for creating an account of ecosystems' distribution, environmental condition, and of society's use of natural goods (UN, 2021a).

The latter framework for ecosystem account was adopted by the UN in March 2021 as a new international standard,¹ but more work remains. Among other things, during the same meeting, the UN Statistics Commission decided to further develop SEEA with the aim of creating an environmental-economic account framework for the ocean, SEEA Ocean (UN, 2021b). A first version of SEEA Ocean will be completed in 2023.

¹UN 2021a, Chapters 1-7 were adopted as statistical standards, while Chapters 8-11 on economic valuation of ecosystem services were adopted as internationally recognized statistical principles and recommendations.

The OECD has taken the lead in developing an international standard for satellite account for the ocean, i.e., a standard for how to separate ocean-related economic activity from the national accounts.

A satellite account for the ocean is one of several steps towards a complete ocean account and marks a good starting point for further expansion of the accounts. Establishment of a satellite account for the ocean that shows the ocean's contribution to Norwegian value creation is a necessary first step on the road to a comprehensive ocean account. Such an account will be compatible with ecosystem accounts so that economic value creation does not become the only indicator that decision-makers look to when determining ocean-management policy.

Satellite account

The satellite accounts "revolve" around the "planet" National Accounts, and are thus consistent with the national accounts, even if one uses external sources and has somewhat greater freedom to deviate from certain definitions of national accounts. Common to the satellite accounts prepared by the National Accounts is a special need to separate areas of activity and make them visible together, since these areas of activity in the ordinary national accounts span a number of different industries in different economic sectors. In order to determine the size of these activity areas, such as education, the figures are calculated by regrouping background material and by using the National Accounts' supply-use tables. Key users of the satellite accounts are ministries, business or interest organizations, researchers, and international organizations such as the OECD, Eurostat and UN specialized agencies.

2.3. OECD

Norway, through the Research Council of Norway, has from the beginning in 2013 participated in the project «The Future of the Ocean Economy », led by the OECD's STI² Ocean Economy Group. The project resulted in April 2016 in the publication "The Ocean Economy in 2030" (OECD, 2016), which contributed to the ocean being put even higher on the agenda in Norway and in many other countries. The Research Council invited Statistics Norway to contribute to the OECD's work, which is now in its fourth phase. This phase includes the development of an economic satellite account for the ocean.

In this phase, the OECD has prepared guidelines for a satellite account for the ocean based on the national accounts. A crucial question is how the ocean economy should be delimited. Economic activity related to the ocean varies from country to country, and in the work on an international standard, it is important to have a delimitation that facilitates comparable figures internationally. Statistics Norway has contributed to this process throughout 2021. With Norway's extensive ocean economy, with the petroleum and aquaculture sectors as particularly Norwegian features, it has been important for Norway that the OECD's definitions correspond to Norwegian conditions to the greatest possible extent.

The result is "Blueprint for Improved Measurement of the International Ocean Economy: An Exploration of Satellite Account for Ocean Economic Activity", published in April 2021 (OECD 2021). The publication is based on input from participating coastal nations and contains, among other things, the OECD's definition of economic ocean activities, which is also the basis of the parameters of this pilot account. Also included is a detailed list in the form of CPA and ISIC codes³ of products (goods and services) that satisfy one or more of the criteria for economic oceanic activity. In Norway's case, this list is not exhaustive: several activities that meet the criteria for ocean activity in

² Science, Technology and Innovation

³ CPA: Classification of Products by Activity. ISIC: International Standard Industrial Classification of All Economic Activities

Norway, such as seismic and geological surveys, are not included in the OECD's detailed list, but are included in the pilot as these accounts must be as relevant as possible for Norwegian users.⁴

At the same time, some products OECD defines as ocean activities are not included in this pilot, as more resources are needed to estimate the ocean component of these. The most important product is housing services, which are included in ordinary national accounts. By using the value of a home, a rent can be estimated, which is the price of a housing service. The OECD has proposed that a satellite account for the ocean estimates the part of the value of a dwelling that can be attributed to proximity to the ocean. Portugal has done this for homes located in municipalities bordering the ocean (INE, 2020). Given the Norwegian settlement pattern, Statistics Norway has so far not tried to quantify this for Norway. Norway has a large proportion of homes and cabins located near the ocean, and thus it is more difficult to give a precise measure of how much this increases the value of the home. This is something that can be re searched further if this pilot work is to be made into a permanent satellite account from Statistics Norway.

A number of countries have produced economic studies on their own initiative. In 2020, Portugal became the first EU country to publish satellite accounts for the ocean (INE, 2020), while a number of other EU and OECD countries have published economic studies of the importance of the marine economy, such as the United States (BEA and NOAA, 2020) and Australia (AIMS, 2018).

⁴The IT solution on which the satellite accounts are based can easily meet other definitions of an ocean economy, e.g. when figures are to be provided to the OECD.

3. Sources and calculations

3.1. 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.

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.

Many of these assessments will be evaluated in connection with follow-up work and feedback from users prior to any publication of the satellite accounts for the ocean as official statistics (something which pilot accounts such as this one are not).

All these economic activities trigger demand for goods and services produced in the rest of the economy. A common way of capturing such demand effects is through ripple effect analyses, such as the report «Ripple effects of the petroleum industry in the Norwegian economy» (Hungnes, Strøm and Ånestad, 2021). In these analyses, an attempt is made to map the overall effect of a demand shock directed at suppliers in several stages. The OECD's definition, on the other hand, is limited to only those goods and services that are specially adapted for ocean use.

3.2. Calculations

The national accounts' supply-use tables form the basis for the calculation of the ocean 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. The most important sources for the national accounts and the basis for the supply-use system are Structural Business Statistics (NØKU), which are based on business data submitted to the tax authorities and adapted surveys such as forms for turnover, costs and investments (the OKI-form),⁵ PRODCOM,⁶ KIS survey,⁷ foreign trade statistics, central government accounts, municipal accounts, etc. For some of the service industries, the information is less detailed

⁵Turnover, costs and investments in the business sector, a Statistics Norway survey.

⁶ **P**roduction **C**ommunautaire, an SSB / Eurostat survey for industry and mining.

⁷The survey «Investments in oil and gas, industry, mining and power supply»

and the supply-use tables rely on counter-sector information and professional assessments about which products the production, intermediary consumption, and investments consist of.

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. We have defined these as follows:

Table 3.1 Core ocean industries

| Nutrition | Business classification (NACE / SN07) |
|----------------------------------------------------------|---------------------------------------|
| Fishing | 03.1 |
| Aquaculture | 03.2 |
| Extraction of crude oil and natural gas | 06 |
| Services related to crude oil and natural gas extraction | 09.1 |
| Processing 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 ⁸ | 50 |
| Services related to maritime transport | 52.22 |

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, called intermediary consumption and investments. These goods and services are divided into two categories: Those that may be specially adapted to the ocean use and those that may not. For example, the product *animal feed* will have a share linked to ocean use, because a (large) share of the animal feed production in Norway is adapted to use in aquaculture. If fish feed and e.g. pigs feed was identical products this product would not have been included in these accounts, just as Christmas trees and blankets are not included, as they are too generic. The size of the ocean component of a product is calculated based on *the proportion of the total domestic use⁹ the ocean industries as a whole has of a particular product.*

$$\text{Ocean share of product } X = \frac{\Sigma(\text{Domestic use of product } X \text{ by ocean industry } Y_i)}{\text{Total domestic use of product } X}$$

Many of the products that are considered to be 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 3.1 to be considered as a marine product *per se*, regardless of its end use or producer, or

⁸This industry classification also includes ocean transport on rivers and lakes, which a satellite account for the ocean should not include, but the financial contributions from such activity are very small and no attempt to weed them out is necessary in Norway.

⁹Outside stock, where we have no information and assume reflects other application.

- it is not possible to extract an ocean portion based on the supply-use framework.

In the first category you will find, for example, *Rental of drilling rigs* where we through a manual input override the supply-use framework and include the *entire* product, regardless of its use.¹⁰ In the second category, where the supply-use framework does not provide any relevant information, one finds, for example, teaching services. Here, there are educational courses at upper secondary, vocational school, college and university level that are linked to the ocean.

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

Table 3.2 Ocean activities where the source is not the national accounts at the crossroads

| Ocean activity | Source |
|-------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| Education (vocational schools, upper secondary, higher education) | Admissions data, ¹¹ Directorate of Education ¹² |
| Sports activities | Membership in the relevant athletic associations that are part of the Norwegian Sports Association ¹³ |
| Offshore catering | Business and enterprise information ¹⁴ |
| Construction of port facilities | Business and enterprise information |
| Loading and unloading | Business and enterprise information |
| Storage | Business and enterprise information |
| Tourism | Map data ¹⁵ |
| Research and development | Business and enterprise information |

By combining production from the core ocean industries, suppliers and the products that are estimated by using external sources, total production is found in basic prices.¹⁶ Imports, taxes, subsidies and transport margins are then added. For some products, these sizes must be calculated because the product is not included in its entirety in the accounts. Animal feed is an example of this. Because animal feed is used by industries other than aquaculture (especially agriculture), one cannot include imports, tax subsidies and transport margins in their entirety. If aquaculture

¹⁰In practice, the supply-use model would include all the production of this service in most years since this service is delivered to the extractive industries (entirely ocean-based in Norway), but should it be delivered to another industry one year, such as a rental of equipment industry (which is not defined as a core ocean industry), the share would decrease, which is undesirable.

¹¹The following programs are included: Aquaculture and seafood, marine technology, fish health, climate, atmospheric and marine physics, petroleum and process technology, fisheries and aquaculture science, nautical science, aquamedicine, shipping management, biomarine innovation, shipping management, engineering, ship design, petroleum science, marine engineering, marine engineering, marine technology, aquaculture operations and management, marine logistics and business, petroleum logistics and business, petroleum technology, marine and offshore technology, shipping and logistics, and marine engineering

¹²Upper secondary: the number of students in boat building subjects, maritime electrician subjects, fishing, aquaculture, well-technology, and maritime subjects. Vocational schools: the number of students in the education areas «Tekno - Maritime» and «Tekno - Petroleum». Higher education: The number of students in all fields of study that are explicitly linked to the ocean, in addition to the petroleum subjects, a total of 30 programs. The numbers are then divided by the total number of students.

¹³Dykkerforbundet, Roforbundet, Seilforbundet, og Vannski- og Wakeboardforbundet (The national associations for diving, rowing, sailing, waterskiing, and wakeboarding)

¹⁴"Business and enterprise information" means either that the activity has a NACE code at the five-digit level (most detailed level) that indicates ocean activity (the supply-use system is more aggregated than the NACE five-digit level and thus this information does not exist within the supply-use system) or that each economically significant enterprise in the relevant NACE-industry has been manually reviewed (accounts, websites) to estimate the share of a company's gross product that can be linked to ocean activity.

¹⁵Every company in the business area accommodation and restaurant business, except cafeterias (where only offshore companies are included), is plotted on a map of Norway. Thereafter, all companies located further than 100 meters from the coastline were filtered out. The ocean share of this activity is thus the gross product of the remaining companies divided by the entire population of companies in accommodation and restaurants.

¹⁶The value before net tax, transport margin and profit has been added.

accounts for x per cent of total domestic use, x per cent of imports, exports, stocks,¹⁷ taxes, subsidies, transport margins will be added after the production at purchaser's prices¹⁸ has been estimated.

The process described in the previous section estimated the "ocean share" of each product. To calculate the gross product, one needs to know how big the production is and then subtract the intermediary consumption that was used in the production process. To do this, all the products in the satellite accounts for the ocean must be summed up and distributed among the approximately 150 industries that produced them.¹⁹ The reason is that there is no information about how much intermediary consumption was used to make each individual product, only how much intermediary consumption was used by the entire industry to make all the different products that the industry made.

Each industry will now have produced a number of different ocean products. The value of these is then summed up and divided by the total production of the industry (which includes both products that can be linked to the ocean and not linked to the ocean). If the share of ocean production in an industry is 50 per cent, the share of intermediary consumption, gross investment and employment²⁰ related to the ocean will also be 50 per cent.

3.3. Technical solution

In order to prepare the satellite accounts for the ocean, Statistics Norway has developed a production system based on the SAS Enterprise Guide platform. The program uses a set of different directories in which the user has defined specific industries as marine industries, indicated whether a product can be tailored to ocean use and whether its "ocean share" should be calculated using the supply-use framework or whether external sources are to be used. In addition, the directories control the type of aggregation level to be used with different users in mind. All this is controlled via prompts that will appear on the screen when the program is run. The program is designed so that it will be easy to use with only basic knowledge of SAS.

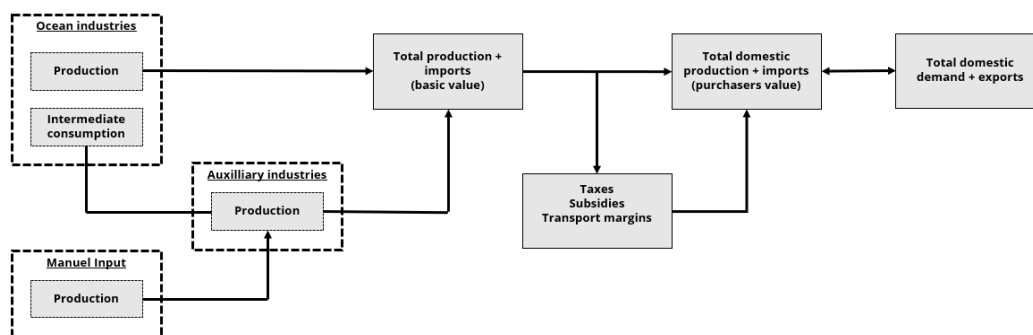
Due to a major revision in 2019, there are no supply-use tables in the format the SAS program needs before 2016. Thus, the time series starts in 2016. The flow chart illustrates how the SAS program works.

¹⁷Many goods are not used in their entirety by industries, consumers, the state, or for export within a year, and end up in stock, which in the Norwegian national accounts is both physical storage and statistical discrepancies. As "the warehouse" does not provide any information about what the product is used for, it is assumed in these accounts that the ocean share of goods that were put in stock is the same as for the goods that were actually used.

¹⁸Basic value + net tax, transport margin and profit.

¹⁹This is done by proportional distribution. For example, if 90 per cent of animal feed were produced by the *Concentrations industry* and 10 per cent of the *Fish processing industry*, 90 per cent of the animal feed that can be linked to aquaculture (read: fish feed) are attributed to the *Animal feed industry* and 10 per cent to the industry *Fish processing industry* in the satellite accounts for the ocean.

²⁰The source is the National Accounts's labor force accounts.



3.4. Uncertainty

There will always be uncertainty associated with accounts that are based on data collected for a purpose other than statistics and that are processed according to specific rules. Large parts of the supply-use system are based on such sources. Much of the work ahead with this pilot is to consult with other sources to see how well the supply-use system reflects the facts. The following is a non-exhaustive list of uncertainties that are important to be aware of:

- The entire supply-use framework is updated every year, but not all the coefficients that distribute production and intermediary consumption on different products. There is a difference in the level of detail in the information among the different industries, with better information on the manufacturing industries (where the distributions of products are updated every year via the production statistics PRODCOM) than on the service industries, where the product distribution is based on the assumption that the industry classification (NACE) determines the product. The information about production is assumed to be better than the information about intermediary consumption. As a consequence, the numbers in the tables are rounded to the nearest hundred million (or zero). Improving the supply-use framework means improving the satellite accounts for the ocean.
- For products that are only partially related to the ocean, this share of the ocean is calculated based on the Norwegian ocean industries' use of this product. Products can also be exported or included in the increase/reduction of inventories. The supply-use system has no such information. The ocean share is thus assumed to be the same for these uses. If e.g. 50 per cent of the supply of animal feed is used by aquaculture in Norway, the satellite accounts assume that also 50 per cent of the imports, exports and changes in inventory of animal feed are linked to the ocean (and are thus fish feed). Note that this does not take into account that much of the intermediary consumption used to produce the fish feed itself is imported, as this is too far out in the supply chain to be included in an ocean account. Review of other sources (such as customs data) will be important for quality assurance of future versions of the satellite account.
- As mentioned, the share of intermediary consumption, gross investment and employment associated with the ocean is the same as it is for production in the relevant industry. This assumption is probably less problematic than the above.
- The figures for tourism are mainly based on restaurants and hotels located 100 meters from the coastline. This is obviously an arbitrary length and will include a number of companies that do not enjoy a particular advantage of being close to the coast.
- There may be different degrees of organization among the different sports; e.g. it is not a given that surfers to the same extent as handball players join a federation and will thus be underrepresented in these accounts.

4. How to read the access and application tables

[The pilot version of the satellite accounts for the ocean is initially published in the form of three tables which are published on Statistics Norway's website.](#) Here is an overview of how the tables are structured. The published tables contain some more details than what is reproduced in this note.

4.1. Supply table (first tab)

The supply table shows where the marine products in the Norwegian economy come from. In this pilot account, we only distinguish between Norwegian mainland production, other Norwegian production and imports, instead of showing detailed business information. In the vast majority of cases, there is little to be gained from showing which industries produce which products: there is typically one industry that makes up the majority of a single product and related products, with only minor production among other industries. To take one example: three industries in the food industry produce some animal feed in Norway according to the National Accounts' cycle, but one industry, namely the animal feed production industry, accounts for 99% of this. There will be great uncertainty associated with such small numbers as the remaining percentage and then one encounters confidentiality problems without analytical gain.

Let's go through two examples of how to read the table. The cells refer to the first tab of the spreadsheet itself, not to the abbreviated table below.

- Let's look at line 33, *Ship brokerage and chartering services*. The Norwegian marine economy had a total supply of NOK 7,100 million of such services at purchaser's prices (see cell K33). Norwegian enterprises accounted for NOK 5,300 million (see C33 + E33), while imports accounted for the rest (NOK 1,800 million, see cell G33), in basic prices, i.e. without net taxes, margins and transport margins. These sums are found in columns H-J; in this example, VAT, transport margins and sales margins are so low that they are rounded down to zero (see H33-J33), which is not unexpected since this is a service (no transportation costs).
- The sum of column F corresponds to the total production (in basic prices, i.e. without taxes, subsidies, etc.) in the Norwegian ocean economy in 2019, which is the same sum found in the summary table in current prices, i.e. the table in the third tab (NOK 1,274,800 million in 2019, see T22 or N46 in the tab «Summary»).²¹

The table on the next page is an abbreviated version of the table in the first tab of the spreadsheet.

²¹Due to rounding errors, the sums will not always be exactly the same.

Table 4.1 Supply of ocean-related products in 2019. NOK million.

| Product | Norwegian mainland production | Extraction of oil and gas + transport | Overseas shipping | Imports | Net taxes, margins, profit | Total supply in purchaser's prices |
|-----------------------------------------------------|-------------------------------|---------------------------------------|-------------------|----------------|----------------------------|------------------------------------|
| Agriculture, forestry and fishing | 107 100 | | | 1 600 | 7 900 | 116 600 |
| Mining and extraction | 98 200 | 485 300 | | 17 600 | 8 600 | 609 700 |
| Industry | 208 800 | 37 100 | | 87 800 | 38 400 | 372 100 |
| Plumbing, power, construction and civil engineering | 2 700 | | | 400 | 100 | 3 200 |
| Transportation | 51 200 | | 122 300 | 8 800 | 1 300 | 183 600 |
| Accommodation and dining | 15 100 | | | | 3,000 | 18 100 |
| Various services | 120 200 | 8,000 | 8 200 | 27 300 | -10 200 | 153 500 |
| Own investment work | 1 900 | 1 500 | 100 | | 0 | 3 500 |
| Miscellaneous | 6 800 | 300 | | 83 100 | 0 | 90 200 |
| Sum | 612 000 | 532 200 | 130 600 | 226 600 | 7900 | 1 550 500 |

4.2. Use table (second tab)

The products in column A are the same as in the supply table, while the columns are now somewhat more detailed. In short, the use table shows how the supply of ocean-related products were used in the Norwegian economy. It is divided into intermediary consumption, consumption, gross investment, and exports. If you look at the same row as we did last time, row 33 *Ship brokerage and chartering services*, you will see that the sum of its use is the same as the sum of the supply of *Shipbroking and chartering services* in the supply table, namely NOK 7,100 million (see cell O33 in the usage table and compare with K33 in the supply table. The deviation of NOK 100 million is due to rounding error). A number of industries use this product, but the largest user by far is, as expected, *Maritime industries* (NOK 3,300 million, see cell I33), while NOK 1,800 million go to exports (N33). Not surprisingly, this product is not used for household consumption, see K33). It is not used as an investment by either the petroleum industries (see cell M33) or other industries (L33), which is not surprising as this is a typical "short-lived" intermediary consumption product.

The total use of marine products adds up to the same as the total supply one saw in the access table, namely NOK 1 550 500 million (compare the sum of column O in the use table with the sum of column K in the supply table). Exports in the Norwegian marine economy amounted to NOK 772,000 million (see cell N52), where unprocessed fish, to take a random example, accounted for NOK 62,200 million (see cell N3).

An enterprise in one industry will often supply products to other businesses in the same industry. For example, the shipping companies provided foreign shipping services to other shipping companies for NOK 7,000 million (see cell I27).

To see which industries are included in, for example, the category «Maritime industries» (column I), see the tab «Industry categories», under the column «Use aggregates» (column D) and see which industries belong to "Maritime industries." Should there be a need to know down to the five - digit NACE level, the values in column A «National accounts aggregates» can be looked up in the tab «NACE-keys».

The table on the next page is an abbreviated version of the table in the second tab of the spreadsheet.

Table 4.2 Use of marine -related products in 2019. NOK million

| Product | Intermediary consumption | Consumption | GFCF (oil and gas) | GFCF (other) | Exports | Total use in purchaser's prices |
|-----------------------------------------------------|--------------------------|---------------|--------------------|---------------|----------------|---------------------------------|
| Agriculture, forestry and fishing | 51 600 | 2 300 | | 400 | 62 200 | 116 600 |
| Mining and extraction | 82 000 | | 69 800 | 200 | 457 600 | 609 600 |
| Industry | 174 200 | 19 800 | 32 700 | 34 200 | 111 100 | 372 000 |
| Plumbing, power, construction and civil engineering | 900 | | 1 300 | 500 | 400 | 3 100 |
| Transportation | 43 700 | 10 100 | 4 800 | | 125 000 | 183 600 |
| Accommodation and dining | 16 400 | 1 500 | 100 | | 100 | 18 100 |
| Various services | 86 100 | 700 | 51 300 | 200 | 14 900 | 153 200 |
| Own investment work | | | 100 | 3 400 | | 3 500 |
| Miscellaneous | 62 900 | | 27 000 | | 400 | 90 300 |
| Sum | 518 200 | 34 300 | 187 000 | 39 000 | 772 000 | 1 550 500 |

4.3. OECD tables (third tab)

The OECD has proposed the following categorization of ocean economic activity:

Table 4.3 OECD list of economic activities at ocean

| | Description |
|----|--------------------------------------------------------------------|
| 1 | Marine fishing |
| 2 | Marine aquaculture |
| 3 | Maritime passenger transport |
| 4 | Maritime freight transport |
| 5 | Offshore extraction of crude petroleum and natural gas |
| 6 | Marine and oceanbed mining |
| 7 | Offshore industry support activities |
| 8 | Processing and preserving of marine fish, crustaceans and molluscs |
| 9 | Maritime ship, boat and floating structure building |
| 10 | Maritime manufacturing, repair and installation |
| 11 | Offshore wind and marine renewable energy |
| 12 | Maritime ports and support activities for maritime transport |
| 13 | Ocean scientific research and development |
| 14 | Marine and coastal tourism |

Source: OECD (2021)

We have made some adjustments, as several of the activities are not suitable as a separate category in a Norwegian context.

- Category 6 does not exist to any meaningful extent in Norway. The definitions f) and g) in 3.1, do allow for the inclusion of mining operations that benefit from being able to dump mining waste into the ocean. How large this benefit is as a percentage of the mining industry's value creation is challenging to measure, and no attempt has been made to do this in this pilot.
- Category 11 is discussed in more detail in the fact box below.
- In addition to the OECD's categories, we have added categories to shed light on the importance of the extractive industries by splitting shipping and the shipbuilding industry: The category « Supply activities » contains the two industries *50,204 Supply and other sea transport offshore services* and the part of *51 Air transport* that includes helicopter services to the offshore oil fields. The category «Oil platforms and modules» comprises the industries

30.113 Construction of oil platforms and modules and 30.116 Furnishing and installation work carried out on drilling rigs and modules. Shipping is also divided to distinguish between foreign and domestic shipping, which is an important distinction in the national accounts as only the last category is covered by the mainland industry concept. "Other service production" includes service production that all maritime industries use, such as employment agencies and rental services.

Brief note on offshore wind and the satellite accounts for the ocean

One activity that may become important in the future that is not very visible in these accounts is offshore wind. No commercial offshore wind projects have been realized in Norway yet, but deliveries to projects on the North Sea and abroad are related to electricity production from offshore wind. As this is "new activity," consequently there is no separate industry classification (NACE-code) for electricity produced from offshore wind or the production of goods or services specifically associated with offshore wind. In the report «Survey of the Norwegian-based renewable energy industry in 2019» (Multiconsult, 2020), Multiconsult estimates that the turnover in offshore wind activity in Norway was around NOK 7 billion, with 2,400 employed.²² The companies responsible for this turnover are to a large extent already included in the satellite accounts in that they belong to one of the industries in Table 1, but the proportion of their activity related to offshore wind is challenging to estimate because over 80 per cent of production ends up as exports, according to Multiconsult. The national accounts' supply-use system has no information on how exports are used abroad and thus it is demanding to isolate the ocean share, which is normally estimated based on national use (which does not exist in Norway yet).

The spreadsheet will contain these tables in current and fixed prices, back to 2016. The IT-system we employ unfortunately does not allow timelines further back in time, other than for the industries that are already visible in the traditional national accounts (in italics in the table below). The other categories are calculated on the basis of, among other things, the supply-use framework.

Table 4.4 summarizes the Norwegian marine economy in 2019. Note that the sum of production is the same as the sum of Norwegian production in the supply table (Norwegian mainland production + extraction and pipe transport + foreign shipping), namely NOK 1,274,800 million.

²²Domestic market: NOK 4.8 billion. Foreign market, of which exports: NOK 5.3 billion.

Table 4.4 Summary table ocean-related activity 2019. NOK million

| Nutrition | Production | Intermediary consumption | Gross product | Gross investments | Labor costs | Full-time equivalent |
|-------------------------------------------------------------------------------------------|------------------|--------------------------|----------------|-------------------|----------------|----------------------|
| <i>Aquaculture</i> | 87 300 | 59 700 | 27 600 | 7,000 | 6 600 | 8 600 |
| <i>Fishing</i> | 22 300 | 6 800 | 15 500 | 2 400 | 1 800 | 8 600 |
| Processing and preservation of fish shellfish and molluscs, fish feed | 109 700 | 93 900 | 15 700 | 3 700 | 7 700 | 12 200 |
| Tourism | 15 100 | 8 200 | 6 900 | 600 | 5 500 | 12 400 |
| <i>Foreign shipping</i> | 130 600 | 104 000 | 25 200 | 25 000 | 11 600 | 20 800 |
| <i>Domestic shipping</i> | 16 600 | 13 100 | 2,000 | 9 200 | 7,000 | 9 100 |
| <i>Services related to maritime transport</i> | 13 500 | 7 300 | 6 200 | 1 200 | 5 200 | 5 700 |
| Transportation offshore services | 20 600 | 12 700 | 8,000 | 2 700 | 5 300 | 5 600 |
| <i>Extraction of crude oil and natural gas</i> | 532 300 | 58 500 | 465 800 | 178 800 | 41 800 | 24 300 |
| Services related to the extraction of crude oil and natural gas, geological surveys, etc. | 185 700 | 119 600 | 66 100 | 6 700 | 57 000 | 54 300 |
| <i>Oil platforms and modules</i> | 27 000 | 17 600 | 9 400 | 900 | 8 900 | 9 600 |
| <i>Shipyards (excluding oil platforms and modules)</i> | 29 300 | 22 400 | 6 900 | 900 | 5 300 | 7 700 |
| Equipment suppliers, repair and construction activities | 42 400 | 29 300 | 13 100 | 5 800 | 13 200 | 16 000 |
| Research and teaching | 4 900 | 1 700 | 3 200 | 1 600 | 2 100 | 2 300 |
| Other service production | 37 200 | 27 800 | 9 400 | 5 500 | 21 300 | 33 900 |
| Total without oil | 742 300 | 524 200 | 215 100 | 73 300 | 158 600 | 206 800 |
| Total without oil and closely related industries | 508 900 | 374 200 | 131 700 | 62 900 | 87 400 | 135 200 |
| Total* | 1 274 800 | 582 600 | 680 900 | 252 100 | 200 300 | 228 900 |

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

5. Further work

These pilot accounts are published by Statistics Norway for a general public, but will also be submitted to the OECD, with a presentation. The OECD conducts bilateral consultations with a number of coastal nations and will, when sufficient figures are available, compile these into a new and preliminary global ocean account.

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.

References

- AIMS (2018): "The AIMS Index of Marine Industry."
<https://www.aims.gov.au/sites/default/files/2018%20AIMS%20Marine%20Index.pdf>
- BEA and NOAA (2020): "Defining and Measuring the US Ocean Economy, Bureau of Economic Analysis", <https://www.bea.gov/system/files/2021-06/defining-and-measuring-the-united-states-ocean-economy.pdf>
- Forum for Norwegian ocean areas (2019): "Value creation in the industries",
<https://www.miljodirektoratet.no/publikasjoner/2019/oktober-2019/verdiskaping-i-naringene/>
- Fenichel, Eli P., Ethan T. Addicott, Kristine M. Grimsrud, Glenn-Marie Lange, Ina Porras and Ben Milligan (2020): "Modifying national accounts for sustainable ocean development",
<https://www.nature.com/articles/s41893-020-0592-8?proof=t>
- FN (2021a): "System of Environmental-Economic Account - Ecosystem Account",
https://seea.un.org/sites/seea.un.org/files/documents/EA/seea_ea_white_cover_final.pdf
- FN (2021b): "UN Statistical Commission side events on Ocean Account and Measuring the Sustainability of Tourism", <https://seea.un.org/ar/news/un-statistical-commission-side-events-ocean-account-and-measuring-sustainability-tourism>
- Grimsrud, Kristine and Tor Kristian Ånestad (2021): "Ocean accounts - a background note" (distributed to participants in a seminar on oat accounts 24 August 2021)
- Hungnes, Håvard, Birger Strøm and Tor Kristian Ånestad (2021): "Ripple effects of the petroleum industry in the Norwegian economy", https://www.ssb.no/nasjonalregnskap-og-konjunkturer/konjunkturer/artikler/ringvirkninger-av-petroleumsnaeringen-i-norsk-okonomi/_/attachment/inline/e194b68a-c7c1-4ebd-abe8-e65c2568d4fb:932c6de2bb912d11d9f7f3b92b93afe2139e0b02/RAPP2021-35.pdf
- INE (2020): "Satellite Account for the Ocean 2016-2018",
https://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_destaques&DESTAQUESdest_boui=459803212&DESTAQUEStema=55505&DESTAQUESmodo=2
- Menon (2020): "Maritime Value Creation Report", <https://www.maritimt-forum.no/om-maritimt-forum/rapporter>
- Multiconsult (2020): "Mapping of the Norwegian-based renewable energy industry in 2019",
https://www.multiconsult.no/assets/Fornybarnaeringen-i-2019_Rapport-Multiconsult.pdf
- NFD (2020): «Greener and smarter - tomorrow's maritime industry»,
<https://www.regjeringen.no/contentassets/391f633b512b4866a4193ba67be27c3b/no/pdfs/stm202020210010000dddpdfs.pdf>
- OECD (2021): "Blueprint for improved measurement of the international ocean economy: An exploration of satellite account for ocean economic activity", https://www.oecd-ilibrary.org/science-and-technology/blueprint-for-improved-measurement-of-the-international-ocean-economy_aff5375b-en
- OECD (2016): "The Ocean Economy in 2030", https://read.oecd-ilibrary.org/economics/the-ocean-economy-in-2030_9789264251724-en#page1
- SINTEF (2020): "National significance of the oceanfood industry",
<https://www.sintef.no/globalassets/nasjonal-verdiskapning-sintef-2004-2019.pdf>

Appendix: Products included in the satellite accounts for the ocean

All production of the marine industries (defined in Table 3.2) is included in its entirety in the satellite accounts for the ocean. This means that all products with CPA codes that match the NACE codes of these industries are included, but also other production that these industries may have in a given year. (A full overview of the CPA codes in the entire economy can be found here: <https://www.ssb.no/klass/klassifikasjoner/46>). In addition, a number of products are included that are also made by industries that are not part of the maritime industries, and which have a maritime share calculated based on either information from the supply-use system, as explained in 3.2., or based on external sources. These products have been considered to be able to be tailor-made for ocean use:

| CPA | Name |
|--------|--------------------------------------------------------------------------|
| 109100 | Animal feed for livestock and farmed fish |
| 131000 | Textile fibers |
| 132000 | Woven fabrics and textile finishing |
| 139230 | Tarpaulins, tents, awnings, sails |
| 139290 | Life jackets, scarves, flags, pennants |
| 139400 | Ropes and nets |
| 162120 | Veneer and densified wood |
| 192280 | Heavy petroleum oils, including marine diesel, bunker oils |
| 192289 | Heavy petroleum oils, incl. Marine diesel, bunker oils, purchased abroad |
| 203010 | Paint, varnish |
| 251120 | Metal buildings, prefabricated |
| 251130 | Iron and steel constructions otherwise |
| 251200 | Doors, windows, etc. of iron, steel or aluminum |
| 256000 | Surface treatment and processing of metals |
| 259960 | Ship propellers and propeller blades |
| 261000 | Electronic components and circuit boards |
| 262000 | Computer equipment |
| 265110 | Navigation, meteorological and geophysical instruments |
| 265120 | Radar devices and radio navigation devices |
| 265160 | Other instruments and apparatus for measuring, checking and testing |
| 265180 | Parts and accessories for measuring, checking and navigating equipment |
| 271100 | Electric motors, generators and transformers |
| 271200 | Electrical distribution and control panels and panels |
| 272000 | Batteries and electric accumulators |
| 273100 | Insulated wire, cable and other electrical conductors |
| 274000 | Lighting equipment |
| 281110 | Ship engines, outboard engines , etc. |
| 281220 | Turbines |
| 281310 | Pumps for liquids, centrifugal pumps , etc. |
| 281320 | Pumps for air and gas |
| 281410 | Taps and valves for pipes, boilers, tanks , etc. |
| 281420 | Parts for cranes, valves, etc. |
| 282200 | Lifting and handling equipment |
| 282500 | Refrigeration and ventilation systems except for household use |
| 289000 | Other special machines |
| 310900 | Furniture otherwise |
| 323000 | Sporting goods |
| 331100 | Repairs of machined metal products |
| 331200 | Repairs of machines |
| 331300 | Repairs of electrical, electronic, optical equipment |
| 331510 | Repair of ships and fishing boats |
| 331520 | Repair of oil platforms |
| 331540 | Repair and maintenance of leisure boats |
| 331800 | Repair of oil and gas pipelines |
| 331900 | Repair of equipment not mentioned elsewhere |

| CPA | Name |
|--------|-----------------------------------------------------------------------------------|
| 332000 | Installation of industrial machinery and equipment |
| 383100 | Disassembly, dismantling, sorting and processing of waste for material recycling |
| 390000 | Environmental clean-up, environmental clean-up, and the like |
| 420000 | Civil engineering |
| 511030 | Helicopter transport for oil activities |
| 520002 | Services related to transport, government consumption |
| 520003 | Services associated with transportation state fee |
| 520004 | Services related to transport, municipal consumption |
| 520005 | Services related to transport, municipal fee |
| 521000 | Storage of goods |
| 522400 | Loading and unloading |
| 522917 | Transport margin, forwarding services |
| 551000 | Accommodation activities |
| 553000 | Operation of campsites and tourist cabins |
| 559090 | Accommodation otherwise |
| 561010 | Serving at eateries |
| 561020 | Serving at fast food etc. |
| 562000 | Canteen and catering services |
| 563000 | Serving at pubs |
| 582000 | Software, computer games, including download services |
| 613000 | Satellite telecommunications |
| 651210 | Other non-life insurance services |
| 691000 | Legal services |
| 711230 | Geological surveys |
| 711290 | General consulting engineering services etc. |
| 712000 | Technical testing and analysis |
| 720003 | Technical testing and analysis, government fee |
| 720010 | Consulting related to research and development |
| 750090 | Veterinary services |
| 773400 | Rental of ships and boats |
| 773910 | Rental of machinery and equipment |
| 773920 | Rental of drilling rigs |
| 780000 | Labor services |
| 811000 | Combined services related to real estate management, including caretaker services |
| 853000 | Educational services, upper secondary schools |
| 853002 | Educational services, high schools, government consumption |
| 853003 | Tuition services, high schools, government fee |
| 853004 | Educational services, upper secondary schools, municipal consumption |
| 853005 | Tuition services, high schools, municipal fee |
| 854100 | Teaching services, vocational schools |
| 854104 | Educational services, vocational schools, municipal consumption |
| 854105 | Tuition services, vocational schools, municipal fee |
| 854200 | Educational services, higher education |
| 854202 | Educational services, higher education, government consumption |
| 854203 | Tuition services, higher education, government fee |
| 931200 | Sports teams and clubs |
| 932100 | Operation of amusement establishments |
| 941000 | Services from business, employers' organizations and professional associations |