Last updated: 13 July 2020  
  
Goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development   
  
Target 14.4: By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics  
  
Indicator 14.4.1: Proportion of fish stocks within biologically sustainable levels   
  
  
  
Institutional information  
  
  
  
Organization(s):  
  
Food and Agriculture Organization of the United Nations (FAO)   
  
  
  
  
  
  
  
Concepts and definitions  
  
  
  
Definition:  
  
The indicator, Proportion of marine fish stocks within biologically sustainable levels, measures the sustainability of the world's marine capture fisheries by their abundance. A fish stock whose abundance is at or greater than the level that can produce the maximum sustainable yield (MSY) is classified as biologically sustainable. In contrast, when abundance falls below the MSY level, the stock is considered biologically unsustainable.   
  
  
  
MSY is defined as the greatest amount of catch that can be harvested continuously from a stock under constant and current environmental conditions (e.g., habitat, water conditions, species composition and interactions, and anything that could affect birth, growth, or death rates of the stock) without affecting the long-term productivity of the stock. The indicator measures the sustainability of fish resources based a good balance between human use and ecological conservation.  
  
  
  
MSY-based reference points are the most common type of reference points used in fisheries management today. This is primarily because, for decades, reference points from surplus production models have most often been set based on the concept of MSY and they are the basic benchmarks for the sustainability of fisheries set by the UN Convention on the Law of the Sea (UNCLOS, Article 61(3)).   
  
  
  
  
  
  
  
Rationale:  
  
The United Nations (UN) Convention on the Law of the Sea (UNCLOS), the United Nations Fish Stocks Agreement (UNFSA [UN, 1995]) and the FAO Code of Conduct for Responsible Fisheries (FAO, 1995a) all require maintaining or restoring fish stocks at levels that are capable of producing their maximum sustainable yield (MSY). To fulfil the objectives of these international treaties, fishery management authorities need to undertake assessment of the state of fish stocks and develop effective policies and management strategies. As a UN Agency with a mandate for fisheries, FAO endeavour to provide the international community with the best information on the state of marine fishery resources.  
  
  
  
Since 1974, FAO has been periodically assessing and reporting the state of marine fishery resources using a wide spectrum of methods from numerical models to data poor approaches. FAO global and regional estimates were also used as an MDG indicator for Goal 7 on environment during the period 2000-2015. This facilitated its approval as a Tier I SDG indicator by the 2nd IAEG-SDG in October 2015.  
  
  
  
The indicator has a peculiar nature compared to more conventional SDG indicators. The indicator estimates the sustainability of fish stocks that often move across national boundaries. This led the indicator to be initially reported only at global and regional levels, with regions not corresponding to continental MDG or SDG regions but to marine regions termed “FAO Major Fishing Areas”.  
  
  
  
The Global SDG Indicator Framework is a voluntary mechanism, but countries are required to report if data are available. As a custodian agency, the FAO works to put in action 2030 Agenda’s emphasis on country ownership and higher the incentive to take actions at country, regional and global levels. FAO has developed, since 2018, a questionnaire approach to allow individual countries to report on the sustainability of fish stocks. The approach 1) provides a framework for meaningful country-level reporting that complements but does not alter the core methodology of SDG indicator 14.4.1 at the global/regional levels, and 2) provides countries with simplified methods to carry out fish stock assessment in data-limited contexts, to some extent overcoming the technical barriers that traditional methods presented. This is because country-level reporting will be limited to the assessment of stocks that are found only within a country’s EEZ, and therefore not include straddling stocks, highly migratory species, or stocks in Areas Beyond National Jurisdiction (ABNJ). As a result, national data alone cannot be meaningfully aggregated at global/regional levels, but it can be used to inform country progress on fish stock sustainability within the EEZ. The FAO has developed an online platform to facilitate the estimation and a country’s own report of the indicator. The platform provides an E-learning course that help countries to understand the indicator, estimation methodology and report process as well as some simple stock assessment methods that can be used to estimate stock status when only limited data are available to help address the capacity insufficiency faced by many developing countries.  
  
In 2019, the FAO began sending a questionnaire to countries to collect national data with the aim to help countries in the reporting process.   
  
  
  
Concepts:  
  
Fish stock refers to a group of individuals of a single species or sometimes combined species living in a defined area from which catches are taken in a fishery.  
  
  
  
A reference list of stocks should be established by each country and consists of a list of stocks selected according to FAO guidelines, against which the indicator will be reported (Appendix 1). The reference list should include national and shared stocks but not straddling stocks as defined below.  
  
  
  
National stocks are located completely within an EEZ and/or territorial waters.   
  
  
  
Shared stocks are distributed within the EEZ and/or territorial waters of two or more adjacent countries.   
  
  
  
Straddling stocks are found to move across boundaries between EEZ waters or between EEZ and high seas (e.g. tuna stocks), and that are caught by multiple countries.   
  
  
  
Countries are asked to report on stocks listed in its reference list, including those monitored through official stock assessments by an authoritative agency, through a scientific process and using best available science and data. These assessments could be based on classic or data-limited methods.   
  
  
  
Stock assessment uses biological information, fishery data such as catch statistics and fishing effort, and scientific survey data to estimate population dynamics of fish stocks for management purposes. Stock assessment methods include biological dynamic models, age-structured models, length-based methods and stock recruitment models.  
  
  
  
Comments and limitations:  
  
The indicator measures the sustainability of fishery resources, and is an end-result measure of Target 14.4. Its derivation requires the data and technical expertise necessary to perform stock assessment. The indicator at global level is estimated by the FAO based on the methodology developed in the 1980s. Although regular updates were carried out to incorporate technical advances and changes in major fish species, some discrepancies between regions may occur in the representativeness of the reference list in practical fisheries. However, this will not pose a large impact on the reliability of the indicator’s temporal trends.  
  
  
  
For the national level, the composition of stocks within the reference list of stocks and the selection criteria used to develop the list will vary between countries, making the indicator suitable for checking countries’ own progress over time. However, this reduces the comparability of sustainability levels between countries.   
  
  
  
Methodology  
  
  
  
Computation Method:  
  
  
  
FAO currently reports the global and regional indicators calculated from FAO’s assessment of a selected list of fish stocks around the world. The methodology is described in the FAO Technical Paper (FAO 2011).   
  
 FAO has been developing the new approach for country-level reporting since 2017, and has consulted with countries in three dedicated expert consultation workshops: In November 2017, FAO convened a workshop to exchange views with national practitioners on the new proposed analytical methods to produce Indicator 14.4.1 at country level. In February 2019, FAO convened an expert consultation workshop on development of the methodologies for the global assessment of fish stock status, with participants from countries and regional fisheries organizations. In October 2019, FAO organized a capacity development workshop on stock status assessment and estimation methods of SDG Indicator 14.4.1 for the Asia Pacific Region, with participants from 17 countries. However, so far very few countries have started their own estimation and reporting of Indicator 14.4.1.  
  
  
  
Global/Regional:  
  
  
  
Global and regional estimates of stock sustainability have been performed for 584 fish stocks around the world since 1974, representing 70% of global landings. Each stock is estimated using the methodology described in the FAO Technical Paper (FAO, 2011).   
  
  
  
National:  
  
  
  
The indicator is calculated as the number of stocks with sustainable status divided by the number of stocks with known status in the reference list. This proportion is calculated based on stock numbers, without weighting either by its production volume or stock abundance; that is, every fish stock is considered to have the same importance.   
  
  
  
Countries are requested to report the status of a reference list of fish stocks, which should be determined based on the significance of a specific stock in a society, either in landings, economic contribution to society, or cultural and traditional values, rather than based on whether stock assessment exists.  
  
  
  
Disaggregation:  
  
By FAO major marine fishing areas for statistical purposes.  
  
Taxonomically, FAO publishes the indicator separately for straddling stocks (mostly tuna and tuna like).  
  
  
  
Treatment of missing values:  
  
  
  
At regional and global levels  
  
To ensure completeness of regional and global information on stocks, FAO gathers additional information outside of what is provided by each country, in particular concerning the highly migratory and straddling fishing stocks. For shared stocks, FAO may consult with Regional Fisheries Bodies (RFBs), who are mandated to assess and manage stocks with their contracting parties, in order to receive information and data and conduct stock assessment when necessary.   
  
  
  
At country level  
  
This indicator examines marine fish stocks. If a country has no marine capture fisheries then the indicator is not calculated for that country. In such case, no imputation is performed to derive estimates. For countries reporting limited marine fish stock data, additional data are compiled from scientific working groups and are peer reviewed and analyzed based on FAO expert knowledge. However, the estimation of the indicator at regional and global levels was estimated not based on country questionnaires, but by the FAO through a systematic assessment of a reference list selected globally.   
  
  
  
Regional aggregates:  
  
As explained in the “Rationale” section, national data alone cannot be meaningfully aggregated at global/regional level because country-level reporting will be limited to the assessment of stocks that are found only within a country’s EEZ, and therefore not include straddling stocks, highly migratory species, or stocks in Areas Beyond National Jurisdiction (ABNJ). Therefore, regional “aggregates” by FAO Major Fishing Area and the global indicator value are calculated with a specific approach, as described in the FAO Technical Paper (FAO 2011)  
  
  
  
Sources of discrepancies:  
  
The indicator is estimated by the FAO based on the methodology developed in the 1980s. Although regular updates were carried out to incorporate technical advances and changes in major fish species, some discrepancies between regions may occur in the representativeness of the reference list in practical fisheries. However, this will not pose a large impact on the reliability of the indicator’s temporal trends.  
  
  
  
Methods and guidance available to countries for the compilation of the data at the national level:  
  
In each country, the data available for each stock and expertise level to conduct different types of assessments will differ. Some countries may have classic stock assessments already conducted for many of their stocks, while others may have very few or no assessments available.   
  
  
  
For some countries, little stock assessment has been done. To help these countries and to facilitate their reporting, FAO prepared online materials and tools, including a selection of methods that can be used to evaluate stock status with data limited methods such as length-based and catch-only methods. The strengths and limitations of these methods are discussed in an eLearning course (Lesson 4), and caveats were also provided to avoid misuse and exercise cautions in practice. Furthermore, capacity building workshops have been organised to provide support to countries in stock assessment and reporting on the SDG 14.4.1.  
  
  
  
eLearning course: https://elearning.fao.org/course/view.php?id=502  
  
  
  
Quality assurance  
  
The FAO carries out a quality assurance review to help with consistency and correctness of this reporting process. The review is performed in two steps to quantify the level of confidence that can be attributed to national reporting: 1) to verify that the questionnaire has been correctly and sufficiently filled out and complies with the reporting guidelines, and 2) to assess the reliability of the responses relative to the supporting information reported by the country. Reliability is based on the compliance to the guidelines in developing the reference list of stocks, the proportion of stocks with official assessments, the source of stock assessments (e.g. RFB, peer-reviewed, expert knowledge), the amount of data available at the stock level, and the consistency with regional assessments (for shared stocks). FAO provides feedback to respondents, who have an opportunity to adjust their submission  
  
  
  
Data Sources  
  
  
  
Description:  
  
The MSY-based reference point is often established through a formal stock assessment process. The data to inform stock assessments can come from many different sources, including fishery-dependent and fishery-independent sources. Fishery-dependent data are collected from the fishery itself, using both commercial and recreational sources through reporting or sample-based surveys at sea, at landing sites, or within fishing communities. Data from these sources are generally compiled into fisheries statistics. They can include information on removals of fish from the sea, which can include landings and discards, and information on the fleet such as number of boats, number of tows, time spent on the sea.  
  
  
  
Fisheries-independent are obtained in ways not related to any fishing activity and are typically collected by scientists via surveys (often scientific cruises) designed to sample species abundance and biomass over long time series, and over consistent seasons and geographic areas. Typically, fisheries-independent data collect biological information on the species (age, length, weight, maturity, etc.), and habitat and environmental information (temperature, salinity, depth, etc.).  
  
  
  
Three primary categories of data inputs are required for stock assessment, including data on life history traits, and time series of catch and fishing effort. Stock abundance is often not known and relative abundance or indices are often used to reflect historical changes in population size. These data can be sourced from fishery-independent surveys, e.g. acoustic or trawl-based sampling, or from fishery-dependent estimates using catch and effort data. Life history parameters provides information on individual growth and stock productivity e.g. fish size, age, reproductive rates, and natural mortality. Catch is the amount of fish removed from a stock by all types of fishing.  
  
  
  
Global/Regional:  
  
Because of the high data demands of classical stock assessment methods, only a limited number of fish stocks have been assessed. These species account for 17–25 percent of the global catch (Branch et al., 2011), and most are caught by fisheries in developed countries. To balance the global representativeness of the assessment results and the goal of using the best available information, the FAO uses a wide spectrum of data and methods to extend its assessment to the fish stocks that account for the majority (70-80 percent) of the global catch (FAO, 2005).  
  
  
  
National:   
  
For country reporting, a questionnaire was sent out to all FAO member States with marine boundaries in 2019, and will be resent in 2020, 2021, and then on a two-year basis. For the complete list of questions used to inform this indicator, please refer to Appendix 2.  
  
  
  
Collection process:  
  
  
  
Global/regional:   
  
The fish stocks that FAO has monitored since 1974 represent a wide spectrum of data availability, ranging from data-rich and formally assessed stocks to those that have very little information apart from catch statistics by FAO major fishing area and those with no stock assessment at all. For the purposes of using the best available data and information and maintaining consistency among stocks and assessors, a procedure has been defined to identify stock status information (FAO 2011).   
  
  
  
National:   
  
FAO collects national data through a questionnaire sent to the Principal Focal Point (PFP) of each country. The PFP organises an institutional set-up which identifies the competent authorities to develop a reference list of stocks and completes the questionnaire. The information or data collected through the questionnaire from a country will initially only inform individual country progress. Depending on the evolution and further standardization of country reporting over the next 3-5 years, national data may be used to inform global/regional estimates.   
  
  
  
  
  
Data Availability  
  
  
  
Description:  
  
The indicator has global data from 1974 to 2017. Regional breakdown is by FAO major fishing area. The regional and global indicators were calculated based on the reference list of fish stocks FAO established in 1974.  
  
  
  
  
  
Global/regional: the indicator has global and regional data from 1974 to 2017. Regional breakdown is by FAO major fishing area. Countries are not directly involved in the computation of the indicator at global/regional level.   
  
  
  
National: the national-level questionnaire was dispatched for the first time in November 2019; FAO identifies 165 countries with a marine border, and three countries with Caspian Sea border, as being eligible, in principle, to report. As the result of the first questionnaire call, ninety-seven countries expressed interest in the indicator (57%), of which 81 responded with completed questionnaires, 11 countries stated that they could not report due to lack of data or time, one responded with some catch data, and three countries reported their indicator separately.   
  
  
  
Time series:  
  
From 1974 to 2017.  
  
Global/regional level: from 1974 to 2018.  
  
National level: Not available yet (first questionnaire dispatched in November 2019).  
  
  
  
Calendar  
  
  
  
Data collection:  
  
National : Reporting every 2 years, i.e., 2019, 2021, 2023, 2025, etc.  
  
Global/regional: every 2 years, i.e. …, 2013, 2015, 2017, 2019, ...  
  
   
  
Data release:  
  
National: biennially.   
  
Global/regional: biennially  
  
  
  
Data providers  
  
FAO provides global and regional data. National-level data are generally reported by the National Statistics Office or the Ministry of Fisheries and/or Agriculture.  
  
  
  
Data compilers  
  
FAO  
  
  
  
References  
  
URL:   
  
  
  
SDG 14.4.1: http://www.fao.org/sustainable-development-goals/indicators/1441/en/  
  
  
  
eLearning course: https://elearning.fao.org/course/view.php?id=502  
  
  
  
References:  
  
Branch, T.A., Jensen, O.P., Ricard, D., Ye, Y. & Hilborn, R. (2011) Contrasting global trends in marine fishery status obtained from catches and from stock assessments. Conservation Biology, 25: 777–783. doi: 10.1111/j.1523-1739.2011.01687.x.  
  
  
  
FAO (1995) Code of conduct for responsible fisheries. 41 pp.  
  
  
  
FAO (2005) Review of the state of world marine fishery resources. FAO Fisheries Technical Paper No. 457. Rome. 235 pp  
  
  
  
FAO (2011) Review of the state of world marine fishery resources. FAO technical paper 569: http://www.fao.org/docrep/015/i2389e/i2389e00.htm.  
  
  
  
UN (1995) Agreement for the implementation of the provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the conservation and management of straddling fish stocks and highly migratory fish stocks. 40 pp.  
  
  
  
Related indicators  
  
Indicator 14.7.1: Sustainable fisheries as a percentage of GDP in small island developing States, least developed countries and all countries   
  
  
  
  
Appendix 1  
  
Guidelines to establish reference list of stocks.  
  
The reference list compiles a list of fish stocks based on data from the considered area, i.e. a country’s EEZ and/or territorial waters and/or possibly the competence area of a regional fisheries management organization. This list of fish stocks will ideally include existing Assessment units or Management units, and also possibly other unassessed fish stocks that are fished in a given country. The list will exclude stocks straddling in the high seas, mostly tuna and tuna-like species.  
  
This list should:  
  
Represent at least 60% (a higher percent is preferred when possible) of the national total landed and/or reported catch (Total in Tonnes excluding landings from straddling stocks). Information should be provided on all of the stocks that contribute to this top 60% (or more) of landings regardless of whether their status is known. Stocks should be input from left to right on the spreadsheet in the order of the largest to smallest total landings for each stock, by Tonnes. Species with multiple different stocks should be input as separate stocks.   
  
Contain stocks of major importance in terms of catch, ecosystem role, economic value, and social/cultural considerations. If possible, the list should represent stocks of each of these categories for a given country. For example, care should be taken to include fish stocks that are important to small-scale fisheries as well as large-scale industrial fisheries. Consideration for these different categories will vary between countries.  
  
Remain unchanged (i.e. for at least 5 years) to better reflect changes in stock status at the national level and minimize the effect of changing the reference list of stocks (i.e., adding, deleting, merging stocks) into the SDG indicator. This will ensure consistency in the indicator calculation and better reflect fish stock sustainability over time.  
  
  
  
  
Appendix 2  
  
Complete list of questions to countries to inform the indicator. Pink cells are mandatory, white cells are optional.   
  
1. REFERENCE LIST OF FISH STOCKS & STATUS  
  
1.1 Stock Name  
  
1.2 Stock Jurisdictional distribution  
  
(Please type "X" in the relevant box)  
  
National  
  
  
  
Shared between Nations  
  
1.3 For shared stocks only, please list the exploiting countries  
  
1.4 Please indicate whether the stock is Assessed (Yes) or Unassessed (No)  
  
1.5 Method of assessment  
  
If "Yes" assessed, please indicate which approach was used: (1) Classic; (2) Data-limited ; (3) Unspecified  
  
  
  
If "No" please indicate best available knowledge used to define stock status (e.g. trends over catch rates or abundance index)  
  
1.6 Current stock status  
  
Indicate whether the stock is biologically sustainable (Yes or No)  
  
  
  
Assessment year  
  
  
  
Indicate source references of the official stock assessment or other information, including web links to online documents when available  
  
1.7 Total landings for the entire stock  
  
Landings (in tonnes)  
  
  
  
Reference year  
  
  
  
Proportion of total landings from the total national landings (excluding landings from straddling stocks) (in percentage)  
  
   
  
2.1 STOCK INDIVIDUAL INFORMATION  
  
2.1.1 Stock name  
  
Name of the individual stock  
  
2.1.2 Scientific name  
  
Species scientific name, preferably according to ASFIS List of Species for Fishery Statistics Purposes  
  
2.1.3 Common name  
  
Species common name in English (if available)  
  
  
  
Species common name in local language (list more than one if relevant)  
  
2.1.4 FAO Major Fishing Area/ with sub-levels when appropriate  
  
Indicate the code of the FAO major fishing area  
  
  
  
Indicate the code of the area sub-levels where appropriate  
  
2.1.5 Stock is considered as ...  
  
(possible to select multiple answers, place "X" in the relevant cell(s))  
  
... Assessment Unit (for stocks with an available official stock assessment)  
  
  
  
… Management Unit (Unit that is used to implement management measures based on a stock assessment or not)  
  
  
  
… Other (i.e., Species x Area) unit (if none of the above)  
  
2.1.8 Management Agency/Advisory Body  
  
Management agency or advisory body responsible for assessment (if assessment unit) or management (if management unit)  
  
  
  
  
  
  
  
2.2 ASSESSMENT INFORMATION  
  
2.2.1 Assessment status (Yes, No)  
  
Indicate whether the stock is Assessed (Yes) or Unassessed (No)  
  
2.2.2 Overfished (Yes, No, Unknown)  
  
The official stock assessment concludes "Overfished" with respect to abundance reference points (Yes, No, Unknown). Note: if stock is overfished then is not biologically sustainable (please answer NO in question Line 15, Section 1). When possible, support your answer with information on Section 2.3 (for example, current biomass is less than biomass target reference point)  
  
2.2.3 Overfishing (Yes, No, Unknown)  
  
The official stock assessment concludes "Overfishing" with respect to fishing mortality reference points (Yes, No, Unknown). Note: see e-learning course on how to link fishing mortality reference points to biological sustainability.  
  
2.2.4 Assessment method/software  
  
If there is an official stock assessment available please indicate which method or software used. For example: stock synthesis; ASPIC, MULTIFAN-CL; VIT, CPUE trends, catch trends, size/length trends, none, others  
  
2.2.5 Assessment availability (Yes, No)  
  
The assessment is publicly available (Yes or No)  
  
2.2.6 Source references  
  
List of Source references used to collect information, including web links to online documents when available  
  
2.2.7 Reliability (L/M/H)  
  
High (H) – Formal stock assessment at the regional, national or local levels forms the foundation of the classification of stock status;  
  
Medium (M) – Grey data/information and catch trend analysis provide the basis for the classification of stock status;  
  
Low (L) – Black data/information and qualitative assessment (e.g. experts judgement) were used for the classification of stock status  
  
  
  
  
  
  
  
2.3 INPUT DATA  
  
Data availability (Yes, No)  
  
Input data needed for the stock assessment  
  
2.3.1 Abundance  
  
Current Biomass  
  
Most recent biomass or abundance in tonnes (NA if not available)  
  
  
  
Virgin/pristine stock biomass (B0)  
  
Value of the biomass or abundance target reference point in tonnes (i.e. prime stock biomass)  
  
  
  
Target Reference Point type  
  
Type of biomass or abundance reference point used (e.g. 0.4B0; BMSY, etc. )  
  
  
  
Reference year  
  
Last year of input data used in the assessment (i.e. year of Current Biomass)  
  
2.3.2 Fishing mortality  
  
Current F  
  
Most recent fishing mortality (F) or exploitation rate (U)  
  
  
  
F Reference Point  
  
Value of the fishing mortality reference point  
  
  
  
Reference Point type  
  
Type of fishing mortality reference point used (e.g. FMSY, F01, etc. )  
  
  
  
Reference year  
  
Last year of input data used in the assessment (i.e. year of Current F)  
  
2.3.3 CPUE  
  
Current CPUE  
  
Current value of catch per unit of effort  
  
  
  
Units of CPUE  
  
Unit (e.g. kg/trap), in case CPUE is not standardized  
  
  
  
Year of current CPUE  
  
Year of current CPUE  
  
2.3.4 Catches  
  
Current catch  
  
Current value of catch (in tonnes)  
  
  
  
Reference year  
  
Year of current catch  
  
  
  
Average Catch Max  
  
Value of maximum catch in the time series (in tonnes) (after 5 years smoothing)  
  
  
  
   
  
3. SUPPORTING TIME SERIES  
  
Time series are optional but recommended to be reported by stock fo all available years  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
Fish Stock ID  
  
Year  
  
Landings (in tonnes)  
  
Catches (in tonnes)  
  
Abundance  
  
CPUE  
  
Exploitation rate  
  
Fishing Effort  
  
  
  
  
  
  
  
  
  
Obs\_measure  
  
Unit  
  
Obs\_measure  
  
Unit  
  
Obs\_measure  
  
Unit  
  
Obs\_measure  
  
Unit  
  
  
  
   
  
METADATA  
  
1. The reference list of stocks represent at least 60% of the current total national landed and/or reported catch statistics?  
  
1a. If answered "No", please specify  
  
2. The reference list of stocks contains all stocks of major importance in terms of catch, ecosystem role, economic value, and social/cultural considerations  
  
3. Please indicate the frequency of stock assessment  
  
3a. If answered "Other", please specify  
  
2. If the SDG indicator 14.4.1 is reported in the national SDG portal, database, or other please indicate the address  
  
2a. Please provide additional addresses if available  
  
4. Any additional information:

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Goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development  
  
Target 14.c: Enhance the conservation and sustainable use of oceans and their resources by implementing international law as reflected in the United Nations Convention on the Law of the Sea, which provides the legal framework for the conservation and sustainable use of oceans and their resources, as recalled in paragraph 158 of “The future we want”  
  
Indicator 14.c.1: Number of countries making progress in ratifying, accepting and implementing through legal, policy and institutional frameworks, ocean-related instruments that implement international law, as reflected in the United Nations Convention on the Law of the Sea, for the conservation and sustainable use of the oceans and their resources  
  
  
  
Institutional information  
  
  
  
Organization(s):  
  
Division for Ocean Affairs and the Law of the Sea, Office of Legal Affairs, United Nations Secretariat  
  
  
  
Concepts and definitions  
  
  
  
Definition:  
  
Sustainable Development Goal (SDG) indicator 14.c.1 measures the number of countries making progress in ratification of, accession to and implementation of ocean-related instruments that implement international law, as reflected in the United Nation Convention on the Law of the Sea (UNCLOS), for the conservation and sustainable use of the oceans and their resources.  
  
  
  
There are two aspects to this indicator:  
  
the number of countries making progress in ratifying and acceding to ocean-related instruments that implement international law as reflected in UNCLOS for the conservation and sustainable use of the oceans and their resources, and   
  
the number of countries making progress in implementing such instruments through legal, policy and institutional frameworks.  
  
  
  
  
  
Rationale:  
  
Target 14.c seeks to enhance the conservation and sustainable use of oceans and their resources by implementing international law as reflected in UNCLOS.  
  
  
  
UNCLOS sets out the legal framework within which all activities in the oceans and seas must be carried out, including the conservation and sustainable use of oceans and their resources. It is a framework instrument, which provides for the development of other instruments that conform to the provisions of the Convention. Therefore, progress in the implementation of international law as reflected in UNCLOS can only be comprehensively measured if progress in the implementation of ocean-related instruments that in turn implement international law as reflected in UNCLOS, is also measured.   
  
  
  
Such instruments include, in particular, UNCLOS’s two implementing agreements - the Agreement relating to the implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982 (Part XI Agreement) and the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (UNFSA).   
  
  
  
Accordingly, following extensive consultation with Member States and other stakeholders, the methodology for indicator 14.c.1 measures the number of countries making progress in ratifying, acceding to and implementing UNCLOS, the Part XI Agreement and UNFSA through legal, policy and institutional frameworks.   
  
  
  
Data collected through the first administration of the questionnaire, which is based on the indicator, will provide a baseline of the current state of ratification of, accession to and implementation of UNCLOS and its two implementing agreements. Subsequent indicator-based data will then show progress made by countries.  
  
  
  
Countries that do not respond to the questionnaire, or do not approve the use of their responses to the questionnaire, will not receive indicator scores.  
  
  
  
Concepts:  
  
N/A.  
  
  
  
Comments and limitations:  
  
Implementation of UNCLOS and its implementing agreements through legal frameworks (for example, through national legislation or executive acts) as well as policy and institutional frameworks will be scored on the basis of a self-analysis by countries of the extent of implementation. Countries will be invited in the questionnaire to share information regarding their methods of implementation.  
  
  
  
Methodology  
  
  
  
Computation Method:  
  
The indicator measures the number of countries making progress in ratifying, accepting and implementing UNCLOS and its two implementing agreements through legal, policy and institutional frameworks.   
  
  
  
This measurement of progress is computed on the basis of countries’ responses to the questionnaire, which contains three questions in respect to each of the three instruments.   
  
  
  
Countries will be invited to respond to questions which relate to ratification of or accession to UNCLOS and its two implementing agreements (Questions 1.1, 2.1 and 3.1). They are coded with simple “Yes/No” answers, with a score of “1” for “Yes” and “0” for “No”. Each country’s overall score for ratification or acceptance of these instruments will therefore be a number between 0 and 3, which will be reported as a percentage (with “100” representing a score of “3”, and “0” representing a score of “0”).  
  
  
  
Countries will also be invited to respond to questions which relate to implementation of UNCLOS and its two implementing agreements through legal frameworks (Questions 1.2, 2.2 and 3.2) by evaluating their own national implementation and assigning a score of between 1 and 9 – with “1” being “not at all” and “9” being “fully” – or indicating that the question of implementation is not applicable (“N/A”).   
  
  
  
Countries will further be invited to indicate whether they have a national policy and/or a national institution or another mechanism, such as a national focal point or an inter-agency or inter-departmental working group, with responsibility for ensuring that the problems of ocean space (UNCLOS), matters related to the deep seabed (Part XI Agreement) and matters related to [sustainable] fisheries (UNFSA) are considered through an integrated, interdisciplinary and inter-sectoral approach (Questions 1.3, 2.3 and 3.3). These questions are coded with simple “Yes”, “No” and “N/A” answers, with a score of “1” for “Yes” and “0” for “No”.   
  
  
  
The scoring methodology regarding implementation is the total of the scores reported by States regarding implementation through legal frameworks for UNCLOS and each of its two implementing agreements (in response to Questions 1.2, 2.2 and 3.2), added to the relevant scores achieved regarding implementation through national policy and/or national institutions for UNCLOS and each of its implementing agreements (in respect to Questions 1.3, 2.3 and 3.3). Pursuant to this scoring methodology, each State could achieve a maximum score of 30 points for implementation.  
  
  
  
These scores which will be reported as a percentage (with 100 representing an average score of 30, 80 representing an average score of 24, and so on). “N/A” responses will not be included as part of the overall score calculation.  
  
  
  
Disaggregation:  
  
Data will be disaggregated into two scores per country – one score for ratification of or accession to relevant instruments, and one score for implementation of relevant instruments. These scores could then be aggregated regionally or globally.  
  
  
  
Treatment of missing values:  
  
  
  
At country level  
  
Not imputed.   
  
  
  
At regional and global levels  
  
Not imputed. Data will only be aggregated from responding countries.  
  
  
  
Regional aggregates:  
  
  
  
Regional and global data regarding ratification of, accession to and implementation of UNCLOS and its implementing agreements would be aggregated by calculating the unweighted average of the scores of each country in that region (or globally) with respect to ratification/accession and with respect to implementation.   
  
  
  
Sources of discrepancies:  
  
  
  
N/A.  
  
  
  
Methods and guidance available to countries for the compilation of the data at the national level:  
  
  
  
A questionnaire, with accompanying instructions regarding its completion is used to collect national-level data.  
  
  
  
Quality assurance  
  
  
  
Data on ratification of and accession to UNCLOS and its two implementing agreements is available, and may be verified, through the Secretary-General, as depositary for those instruments.  
  
  
  
UNCLOS and UNFSA do not provide for a secretariat. OLA/DOALOS performs the role of secretariat for these instruments de facto but has received no mandate from the General Assembly to review or assess the status of implementation of these instruments.   
  
  
  
Respondent countries will be invited to share relevant information regarding the implementation of UNCLOS and its implementing agreements in their responses to the questionnaire.  
  
  
  
Data Sources  
  
  
  
Description:  
  
  
  
Data will be collected through a questionnaire, which has been developed to facilitate measurement of the number of countries making progress in ratifying, accepting and implementing through legal, policy and institutional frameworks, ocean-related instruments that implement international law, as reflected in UNCLOS, for the conservation and sustainable use of the oceans and their resources, as called for under indicator 14.c.1.  
  
  
  
Collection process:  
  
  
  
OLA/DOALOS will coordinate distribution/completion of the 14.c.1 questionnaire through the Permanent Missions to the United Nations in New York. The Permanent Missions would coordinate distribution of the questionnaire amongst relevant government ministries, departments and agencies, and submit the completed questionnaires to OLA/DOALOS, as necessary.  
  
  
  
  
  
  
  
Data Availability  
  
  
  
Description:  
  
  
  
Indicator 14.c.1 is a new indicator. The initial administration of the indicator 14.c.1 questionnaire will establish baseline data for this indicator. The only information that is currently publicly available is the number of parties to UNCLOS and its implementing agreements, since those treaties are deposited with the Secretary-General of the United Nations.  
  
  
  
Time series:  
  
  
  
N/A.  
  
  
  
Calendar  
  
  
  
Data collection:  
  
   
  
 Baseline data collection is planned for 2020. Data collection will be repeated every two to three years.  
  
   
  
Data release:  
  
  
  
2020.  
  
  
  
Data providers  
  
  
  
Data will be provided by relevant government ministries, departments and agencies.  
  
  
  
Data compilers  
  
  
  
OLA/DOALOS.  
  
  
  
References  
  
  
  
URL: https://www.un.org/Depts/los/convention\_agreements/convention\_overview\_convention.htm  
  
  
  
https://www.un.org/Depts/los/convention\_agreements/convention\_overview\_part\_xi.htm  
  
  
  
https://www.un.org/Depts/los/convention\_agreements/convention\_overview\_fish\_stocks.htm  
  
  
  
References: N/A  
  
  
  
Related indicators as of February 2020  
  
  
  
Implementation of target 14.c is linked to progress in all other targets of Sustainable Development 14, and the other ocean-related Goals of the 2030 Agenda.

Last updated: 12 February 2020  
  
  
  
Goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development  
  
Target 14.5: By 2020, conserve at least 10 per cent of coastal and marine areas, consistent with national and international law and based on the best available scientific information  
  
Indicator 14.5.1: Coverage of protected areas in relation to marine areas  
  
  
  
Institutional information  
  
  
  
Organization(s):  
  
UN Environment World Conservation Monitoring Centre (UNEP-WCMC)  
  
BirdLife International (BLI)  
  
International Union for Conservation of Nature (IUCN)  
  
  
  
Concepts and definitions  
  
  
  
Definition:  
  
The indicator Coverage of protected areas in relation to marine areas shows temporal trends in the mean percentage of each important site for marine biodiversity (i.e., those that contribute significantly to the global persistence of biodiversity) that is covered by designated protected areas.  
  
  
  
Rationale:  
  
The safeguard of important sites is vital for stemming the decline in biodiversity and ensuring long term and sustainable use of marine natural resources. The establishment of protected areas is an important mechanism for achieving this aim, and this indicator serves as a means of measuring progress toward the conservation, restoration and sustainable use of marine ecosystems and their services, in line with obligations under international agreements. Importantly, while it can be disaggregated to report on any given single ecosystem of interest, it is not restricted to any single ecosystem type.  
  
  
  
Levels of access to protected areas vary among the protected area management categories. Some areas, such as scientific reserves, are maintained in their natural state and closed to any other use. Others are used for recreation or tourism, or even open for the sustainable extraction of natural resources. In addition to protecting biodiversity, protected areas have high social and economic value: supporting local livelihoods; maintaining fisheries; harbouring an untold wealth of genetic resources; supporting thriving recreation and tourism industries; providing for science, research and education; and forming a basis for cultural and other non-material values.  
  
  
  
This indicator adds meaningful information to, complements and builds from traditionally reported simple statistics of marine area covered by protected areas, computed by dividing the total protected area within a country by the total territorial area of the country and multiplying by 100 (e.g., Chape et al.   
  
2005). Such percentage area coverage statistics do not recognise the extreme variation of biodiversity importance over space (Rodrigues et al. 2004), and so risk generating perverse outcomes through the protection of areas which are large at the expense of those which require protection.  
  
  
  
The indicator is used to track progress towards the 2011–2020 Strategic Plan for Biodiversity (CBD 2014, Tittensor et al. 2014), and was used as an indicator towards the Convention on Biological Diversity’s 2010 Target (Butchart et al. 2010).  
  
  
  
Concepts:  
  
Protected areas, as defined by the International Union for Conservation of Nature (IUCN; Dudley 2008), are clearly defined geographical spaces, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values. Importantly, a variety of specific management objectives are recognised within this definition, spanning conservation, restoration, and sustainable use:  
  
  
  
- Category Ia: Strict nature reserve  
  
- Category Ib: Wilderness area  
  
- Category II: National park  
  
- Category III: Natural monument or feature  
  
- Category IV: Habitat/species management area  
  
- Category V: Protected landscape/seascape  
  
- Category VI: Protected area with sustainable use of natural resources  
  
  
  
The status "designated" is attributed to a protected area when the corresponding authority, according to national legislation or common practice (e.g., by means of an executive decree or the like), officially endorses a document of designation. The designation must be made for the purpose of biodiversity conservation, not de facto protection arising because of some other activity (e.g., military).  
  
  
  
Sites contributing significantly to the global persistence of biodiversity are identified following globally criteria set out in A Global Standard for the Identification of Key Biodiversity Areas (IUCN 2016) applied at national levels. Key Biodiversity Areas encompass (a) Important Bird & Biodiversity Areas, that is, sites contributing significantly to the global persistence of biodiversity, identified using data on birds, of which >13,000 sites in total have been identified from all of the world’s countries (BirdLife International 2014, Donald et al. 2018); (b) Alliance for Zero Extinction sites (Ricketts et al. 2005), that is, sites holding effectively the entire population of at least one species assessed as Critically Endangered or Endangered on the IUCN Red List of Threatened Species, of which 853 sites have been identified for 1,483 species of mammals, birds, amphibians, reptiles, freshwater crustaceans, reef-building corals, conifers, cycads and other taxa; (c) Key Biodiversity Areas identified under an earlier version of the Key Biodiversity Area criteria (Langhammer et al. 2007), including those identified in Ecosystem Hotspot Profiles developed with support of the Critical Ecosystem Partnership Fund. These three subsets are being reassessed using the Global Standard, which unifies these approaches along with other mechanisms for identification of important sites for other species and ecosystems (IUCN 2016).  
  
  
  
Comments and limitations:  
  
Quality control criteria are applied to ensure consistency and comparability of the data in the World Database on Protected Areas. New data are validated at UNEP-WCMC through a number of tools and translated into the standard data structure of the World Database on Protected Areas. Discrepancies between the data in the World Database on Protected Areas and new data are minimised by provision of a manual (UNEP-WCMC 2019) and resolved in communication with data providers. Similar processes apply for the incorporation of data into the World Database of Key Biodiversity Areas (BirdLife International 2019).  
  
  
  
The indicator does not measure the effectiveness of protected areas in reducing biodiversity loss, which ultimately depends on a range of management and enforcement factors not covered by the indicator. A number of initiatives are underway to address this limitation. Most notably, numerous mechanisms have been developed for assessment of protected area management, which can be synthesised into an indicator (Leverington et al. 2010). This is used by the Biodiversity Indicators Partnership as a complementary indicator of progress towards Aichi Biodiversity Target 11   
  
(http://www.bipindicators.net/pamanagement). However, there may be little relationship between these measures and protected area outcomes (Nolte & Agrawal 2013). More recently, approaches to “green listing” have started to be developed, to incorporate both management effectiveness and the outcomes of protected areas, and these are likely to become progressively important as they are tested and applied more broadly.  
  
  
  
Data and knowledge gaps can arise due to difficulties in determining whether a site conforms to the IUCN definition of a protected area, and some protected areas are not assigned management categories. Moreover, “other effective area-based conservation measures”, as specified by Aichi Biodiversity Target   
  
11 of the Strategic Plan for Biodiversity 2011–2020, recognise that some sites beyond the formal protected area network, while not managed primarily for nature conservation, may nevertheless be managed in ways which are consistent with the persistence of the biodiversity for which they are important (Jonas et al. 2014). However, the formally agreed definition of an OECM (“A geographically defined area other than a Protected Area, which is governed and managed in ways that achieve positive and sustained long-term outcomes for the in situ conservation of biodiversity, with associated ecosystem functions and services and, where applicable, cultural, spiritual, socioeconomic, and other locally relevant values”) were only agreed in November 2018 and measures are only recently in place for countries to submit OECM data to UNEP-WCMC. OECMs are now collated by UNEP-WCMC in a separate database, the WD-OECM.  
  
  
  
Regarding important sites, the biggest limitation is that site identification to date has focused mainly on specific subsets of biodiversity, for example birds (for Important Bird and Biodiversity Areas) and highly threatened species (for Alliance for Zero Extinction sites). While Important Bird and Biodiversity Areas have been documented to be good surrogates for biodiversity more generally (Brooks et al. 2001, Pain et al. 2005), the application of the unified standard for identification of Key Biodiversity Areas (IUCN 2016) sites across different levels of biodiversity (genes, species, ecosystems) and different taxonomic groups remains a high priority, building from efforts to date (Eken et al. 2004, Knight et al. 2007, Langhammer et al. 2007, Foster et al. 2012). Birds now comprise <50% of the species for which Key Biodiversity Areas have been identified, and as Key Biodiversity Area identification for other taxa and elements of biodiversity proceeds, such bias will become a less important consideration in the future.  
  
  
  
Key Biodiversity Area identification has been validated for a number of countries and regions where comprehensive biodiversity data allow formal calculation of the site importance (or “irreplaceability”) using systematic conservation planning techniques (Di Marco et al. 2016, Montesino Pouzols et al. 2014).  
  
  
  
Future developments of the indicator will include: a) expansion of the taxonomic coverage of marine Key Biodiversity Areas through application of the Key Biodiversity Areas standard (IUCN 2016) to a wide variety of marine vertebrates, invertebrates, plants and ecosystem type; b) improvements in the data on protected areas by continuing to increase the proportion of sites with documented dates of designation and with digitised boundary polygons (rather than coordinates).  
  
  
  
  
  
  
  
Methodology  
  
  
  
Computation Method:  
  
This indicator is calculated from data derived from a spatial overlap between digital polygons for protected areas from the World Database on Protected Areas (UNEP-WCMC & IUCN 2020) and digital polygons for marine Key Biodiversity Areas (from the World Database of Key Biodiversity Areas, including Important Bird and Biodiversity Areas, Alliance for Zero Extinction sites, and other Key Biodiversity Areas). Sites were classified as marine Key Biodiversity Areas by undertaking a spatial overlap between the Key Biodiversity Area polygons and an ocean raster layer (produced from the ‘adm0’ layer from the database of Global Administrative Areas (GADM 2019)), classifying any Key Biodiversity Area as a marine Key Biodiversity Area where it had ≥5% overlap with the ocean layer (hence some sites were classified as both marine and terrestrial). The value of the indicator at a given point in time, based on data on the year of protected area establishment recorded in the World Database on Protected Areas, is computed as the mean percentage of each Key Biodiversity Area currently recognised that is covered by protected areas.  
  
  
  
Year of protected area establishment is unknown for ~12% of protected areas in the World Database on Protected Areas, generating uncertainty around changing protected area coverage over time. To reflect this uncertainty, a year was randomly assigned from another protected area within the same country, and then this procedure repeated 1,000 times, with the median plotted.   
  
  
  
Prior to 2017, the indicator was presented as the percentage of Key Biodiversity Areas completely covered by protected areas. However, it is now presented as the mean % of each Key Biodiversity Area that is covered by protected areas in order to better reflect trends in protected area coverage for countries or regions with few or no Key Biodiversity Areas that are completely covered.  
  
  
  
Disaggregation:  
  
Given that data for the global indicator are compiled at national levels, it is straightforward to disaggregate to national and regional levels (e.g., Han et al. 2014), or conversely to aggregate to the global level. Key Biodiversity Areas span all ecosystem types through the marine environment (Edgar et al. 2008) and beyond. The indicator can therefore be reported in combination across marine systems along with terrestrial or freshwater systems, or disaggregated among them. However, individual Key Biodiversity Areas can encompass marine, terrestrial, and freshwater systems simultaneously, and so determining the results is not simply additive. Finally, the indicator can be disaggregated according to different protected area management categories (categories I–VI) to reflect differing specific management objectives of protected areas.  
  
  
  
In addition to the aggregation of the coverage of protected areas across important sites for marine biodiversity as an indicator towards SDG 14.5, other disaggregations of coverage of protected areas of particular relevance as indicators towards SDG targets (Brooks et al. 2016) include:  
  
  
  
SDG 15.1.2 Proportion of important sites for terrestrial and freshwater biodiversity that are covered by protected areas, by ecosystem type.  
  
SDG 15.4.1 Coverage by protected areas of important sites for mountain biodiversity.  
  
  
  
Protected area coverage data can be combined with other data sources to yield further, complementary, indicators. For example, protected area overlay with eco-regional maps can be used to provide information on protected area coverage of different broad biogeographical regions. Protected area coverage of the distributions of different groups of species (e.g., mammals, birds) can similarly provide indicators of trends in coverage of biodiversity at the species level. Protected area coverage can be combined with the Red List Index to generate indicators of the impacts of protected areas in reducing biodiversity loss (Butchart et al. 2012). Finally, indicators derived from protected area overlay can also inform sustainable urban development; for example, the overlay of protected areas onto urban maps could provide an indicator of public space as a proportion of overall city space.  
  
  
  
Treatment of missing values:  
  
 At country level  
  
Data are available for protected areas and Key Biodiversity Areas in all of the world’s countries, and so no imputation or estimation of national level data is necessary.  
  
   
  
 At regional and global levels  
  
Global indicators of protected area coverage of important sites for biodiversity are calculated as the mean percentage of each Key Biodiversity Area that is covered by protected areas. The data are generated from all countries, and so while there is uncertainty around the data, there are no missing values as such and so no need for imputation or estimation.  
  
  
  
Regional aggregates:  
  
UNEP-WCMC is the agency in charge of calculating and reporting global and regional figures for this indicator, working with BirdLife International and IUCN to combine data on protected areas with those for sites of importance for biodiversity. UNEP-WCMC aggregates the global and regional figures on protected areas from the national figures that are calculated from the World Database on Protected Areas and disseminated through Protected Planet. The World Database on Protected Areas and Protected Planet are jointly managed by UNEP-WCMC and IUCN and its World Commission on Protected Areas. The World Database on Protected Areas is held within a Geographic Information System that stores information about protected areas such as their name, size, type, date of establishment, geographic location (point) and/or boundary (polygon). Protected area coverage is calculated using all the protected areas recorded in World Database on Protected Areas whose location and extent is known apart from protected areas without digital boundaries and those sites who have a status of ‘proposed’ or ‘not reported’.  
  
  
  
Sources of discrepancies:  
  
National processes provide the great bulk of the data that are subsequently aggregated into both the World Database on Protected Areas and the World Database of Key Biodiversity Areas, and so there are very few differences between national indicators and the global one. One minor source of difference is that the World Database on Protected Areas incorporates internationally-designated protected areas (e.g., UNESCO World Heritage sites, Ramsar sites, etc), a few of which are not considered by their sovereign nations to be protected areas.   
  
  
  
Note that because countries do not submit comprehensive data on degazetted protected areas to the WDPA, earlier values of the indictor may marginally underestimate coverage. Furthermore, there is also a lag between the point at which a protected area is designated on the ground and the point at which it is reported to the WDPA. As such, current or recent coverage may also be underestimated.  
  
  
  
Methods and guidance available to countries for the compilation of the data at the national level:  
  
The WDPA has its origins in a 1959 UN mandate when the United Nations Economic and Social Council called for a list of national parks and equivalent reserves Resolution 713 (XXVIII). More details are available here: https://www.protectedplanet.net/c/world-database-on-protected-areas. The UN List of Protected Areas has been published in 1961/62, 1966/71, 1972 (addendum to the 1966/71 edition), 1973, 1974, 1975, 1980, 1982, 1985, 1990, 1993, 1997, 2003, 2014 and 2018 which have resulted in a global network of national data providers for the WDPA. For example, in 2014 all Convention on Biological Diversity (CBD) National Focal points and all National Focal points for the CBD Protected Areas Programme of Work (PoWPA) to request data for the 2014 Un List of Protected Areas (https://www.protectedplanet.net/c/united-nations-list-of-protected-areas/united-nations-list-of-protected-areas-2014). Protected areas data is therefore compiled directly from government agencies, regional hubs and other authoritative sources in the absence of a government source. All records have a unique metadata identifier (MetadataID) which links the spatial database to the Source table where all sources are described. The data is collated and standardised following the WDPA Data Standards and validated with the source. The process of collation, validation and publication of data as well as protocols and the WDPA data standards are regularly updated in the WDPA User Manual (https://www.protectedplanet.net/c/wdpa-manual) made available through www.protectedplanet.net where all spatial data and the Source table are also published every month and can be downloaded.  
  
  
  
The process for compilation of data on sites contributing significantly to the global persistence of biodiversity (Key Biodiversity Areas) is documented online (http://www.keybiodiversityareas.org/home). Specifically, (http://www.keybiodiversityareas.org/what-are-kbas), the Key Biodiversity Area identification process is a highly inclusive, consultative and bottom-up exercise. Although anyone with appropriate scientific data may propose a site to qualify as a Key Biodiversity Area, wide consultation with stakeholders at the national level (both non-governmental and governmental organizations) is required during the proposal process. Key Biodiversity Area identification builds off the existing network of Key Biodiversity Areas, including those identified as Important Bird & Biodiversity Areas through the BirdLife Partnership of 120 national organisations (http://www.birdlife.org/worldwide/partnership/birdlife-partners), for the Alliance for Zero Extinction by 93 national and international organisations (http://www.zeroextinction.org/partners.html), and as other Key Biodiversity Areas by civil society organisations supported by the Critical Ecosystem Partnership Fund in developing ecosystem profiles, named in each of the profiles listed here (http://www.cepf.net/resources/publications/Pages/ecosystem\_profiles.aspx), with new data strengthening and expanding expand the network of these sites. Any site proposal undergoes independent scientific review. This is followed by the official site nomination with full documentation meeting the Documentation Standards for Key Biodiversity Areas. Sites confirmed by the Key Biodiversity Areas Secretariat to qualify as Key Biodiversity Areas then appear on the Key Biodiversity Areas website (http://www.keybiodiversityareas.org/home).  
  
  
  
The WDPA User Manual (https://www.protectedplanet.net/c/wdpa-manual) published in English, Spanish, and French provides guidance to countries on how to submit protected areas data to the WDPA, what are the benefits of providing such data, which are the data standards and which quality checks are performed. We also provide a summary of our methods to calculate protected areas coverage to all WDPA users: https://www.protectedplanet.net/c/calculating-protected-area-coverage. The “Global Standard for the Identification of Key Biodiversity Areas” (https://portals.iucn.org/library/node/46259) comprises the standard recommendations available to countries in the identification of Key Biodiversity Areas, with further guidelines available on the Key Biodiversity Areas website (http://www.keybiodiversityareas.org/home). Specifically (http://www.keybiodiversityareas.org/get-involved), the main steps of the Key Biodiversity Area identification process are the following:   
  
submission of Expressions of Intent to identify a Key Biodiversity Area to Regional Focal Points;   
  
Proposal Development process, in which proposers compile relevant data and documentation and consult national experts, including organizations that have already identified Key Biodiversity Areas in the country, either through national Key Biodiversity Area Coordination Groups or independently;  
  
review of proposed Key Biodiversity Areas by Independent Expert Reviewers, verifying the accuracy of information within their area of expertise; and  
  
a Site Nomination phase comprising the submission of all the relevant documentation for verification by the Key Biodiversity Areas Secretariat (see section 3.3 below).   
  
Once a Key Biodiversity Area is identified, monitoring of its qualifying features and its conservation status is important. Proposers, reviewers and those undertaking monitoring can join the Key Biodiversity Areas Community to exchange their experiences, case studies and best practice examples.  
  
  
  
Quality assurance  
  
The process on how the data is collected, standardised and published is available in the WDPA User Manual at: https://www.protectedplanet.net/c/wdpa-manual which is available in English, French and Spanish. Specific guidance is provided at https://www.protectedplanet.net/c/world-database-on-protected-areas on, for example, predefined fields or look up tables in the WDPA: https://www.protectedplanet.net/c/wdpa-lookup-tables, how WDPA records are coded how international designations and regional designations data is collected, how regularly is the database updated, and how to perform protected areas coverage statistics.   
  
  
  
The process of identification of Key Biodiversity Areas is supported by the Key Biodiversity Areas Partnership (http://www.keybiodiversityareas.org/kba-partners). Among the roles of the partnership is establishment of the Key Biodiversity Areas Secretariat, which checks information submitted in the Site Nomination phase for the correct application of the Key Biodiversity Areas Standard ((https://portals.iucn.org/library/node/46259), and the adequacy of site documentation and then verifies the site, which is then published on the Key Biodiversity Areas Website (http://www.keybiodiversityareas.org/get-involved). In addition, the Chairs of the IUCN Species Survival Commission and World Commission on Protected Areas (both of whom are elected by the IUCN Membership of governments and non-governmental organisations), appoint the Chair of an independent Key Biodiversity Areas Standards and Appeals Committee, which ensures the correct application of the Global Standard for the identification of Key Biodiversity Areas. The R code for calculating protected area coverage of Key Biodiversity Areas is documented as Dias, M. (2017) “R code for calculating protected area coverage of KBAs”. (http://www.keybiodiversityareas.org/userfiles/files/R\_code\_for\_calculating\_protected\_area\_coverage\_of\_KBAs\_March\_2017.pdf).   
  
  
  
In addition to dissemination via the Protected Planet website (https://www.protectedplanet.net/), the UN List process described in 3.1 the fact that protected areas data is collected from national agencies acknowledged in the WDPA metadata, and Key Biodiversity Areas website (http://www.keybiodiversityareas.org/home), Protected Planet and Key Biodiversity Areas data are disseminated through the Integrated Biodiversity Assessment Tool, available for research and conservation online (https://www.ibat-alliance.org/ibat-conservation/). This incorporates Country Profile documents for all of the world’s countries, which includes documentation of the indicator of protected area coverage of Key Biodiversity Areas. Each annual update to these Country Profiles are sent for consultation to National Focal Points of the Convention on Biological Diversity (https://www.cbd.int/information/nfp.shtml), National Statistics Offices SDG Representatives and UN Permanent Missions (Geneva) representatives.  
  
  
  
Data Sources  
  
  
  
Description:  
  
Protected area data are compiled by ministries of environment and other ministries responsible for the designation and maintenance of protected areas. Protected Areas data for sites designated under the Ramsar Convention and the UNESCO World Heritage Convention are collected through the relevant convention international secretariats. Protected area data are aggregated globally into the World Database on Protected Areas by the UN Environment World Conservation Monitoring Centre, according to the mandate for production of the United Nations List of Protected Areas (Deguignet et al. 2014). They are disseminated through Protected Planet, which is jointly managed by UNEP-WCMC and IUCN and its World Commission on Protected Areas (UNEP-WCMC 2016).  
  
  
  
Key Biodiversity Areas are identified at national scales through multi-stakeholder processes, following standard criteria and thresholds. Key Biodiversity Areas data are aggregated into the World Database on   
  
Key Biodiversity Areas, managed by BirdLife International. Specifically, data on Important Bird and Biodiversity Areas are available online at http://datazone.birdlife.org/site/search and data on Alliance for Zero Extinction sites are available online at https://zeroextinction.org. Both datasets, along with Key Biodiversity Areas identified through other processes, are available through the World Database on Key Biodiversity Areas, and along with the World Database on Protected Areas, are also disseminated through the Integrated Biodiversity Assessment Tool for Research and Conservation Planning.  
  
  
  
Collection process:  
  
See information under other sections.  
  
  
  
Data Availability  
  
  
  
Description:  
  
This indicator has been classified by the IAEG-SDGs as Tier 1. Current data are available for all countries in the world, and these are updated on an ongoing basis.  
  
  
  
Time series:  
  
~150 years   
  
  
  
Calendar  
  
  
  
Data collection:  
  
UNEP-WCMC produces the UN List of Protected Areas every 5–10 years, based on information provided by national ministries/agencies. In the intervening period between compilations of UN Lists, UNEP-WCMC works closely with national ministries/agencies and NGOs responsible for the designation and maintenance of protected areas, continually updating the WDPA as new data become available. The World Database of Key Biodiversity Areas is also updated on an ongoing basis, as new national data are submitted.   
  
  
  
Data release:  
  
The indicator of protected area coverage of important sites for biodiversity is anticipated to be released annually.   
  
  
  
Data providers  
  
  
  
Protected area data are compiled by ministries of environment and other ministries responsible for the designation and maintenance of protected areas. Key Biodiversity Areas are identified at national scales through multi-stakeholder processes, following standard criteria and thresholds.  
  
  
  
Data compilers  
  
  
  
Name:  
  
UNEP-WCMC and IUCN  
  
  
  
Description:  
  
Protected area data are aggregated globally into the World Database on Protected Areas by the UN Environment World Conservation Monitoring Centre, according to the mandate for production of the United Nations List of Protected Areas (Deguignet et al. 2014). They are disseminated through Protected Planet, which is jointly managed by UNEP-WCMC and IUCN and its World Commission on Protected Areas (UNEP-WCMC 2016). Key Biodiversity Areas data are aggregated into the World Database on Key Biodiversity Areas, managed by BirdLife International (2019). Specifically, data on Important Bird and Biodiversity Areas are available online at http://datazone.birdlife.org/site/search and data on Alliance for Zero Extinction sites are available online at http://www.zeroextinction.org/search.cfm. Both datasets, along with the World Database on Protected Areas, are also disseminated through the Integrated Biodiversity Assessment Tool for Research and Conservation Planning.  
  
  
  
References  
  
  
  
URL:  
  
http://www.unep-wcmc.org/; http://www.birdlife.org/; http://www.iucn.org/  
  
  
  
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These metadata are based on http://mdgs.un.org/unsd/mi/wiki/7-6-Proportion-  
  
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Last updated: 27 December 2017  
  
Goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development  
  
Target 14.3: Minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels  
  
Indicator 14.3.1: Average marine acidity (pH) measured at agreed suite of representative sampling stations  
  
  
  
Institutional information  
  
  
  
Organization(s):  
  
Intergovernmental Oceanographic Commission (IOC) of UNESCO  
  
  
  
Concepts and definitions  
  
  
  
Definition:  
  
Ocean acidification is the reduction in the pH of the ocean over an extended period, typically of decades or longer, which is caused primarily by the uptake of carbon dioxide from the atmosphere.   
  
This indicator is based on observations that constrain the ocean carbon system and which are required to describe the variability of ocean acidity. The carbon system in this context mainly refers to the four measureable parameters: pH (the concentration of hydrogen ions on a logarithmic scale), DIC (CT; total dissolved inorganic carbon), pCO2 (carbon dioxide partial pressure), and TA (AT, total alkalinity). Average, as used here, is the equally weighed annual mean.   
  
  
  
A agreed suite of representative sampling stations are sites that have a measurement frequency that is adequate for describing variability and trends in carbonate chemistry in order to deliver critical information on the exposure of and impacts on marine systems to ocean acidification, and which provide data of sufficient quality and with comprehensive metadata information to enable integration with data from other sites in the country.   
  
  
  
Rationale:  
  
The ocean absorbs around 30% of anthropogenic carbon from the atmosphere annually. This carbon dioxide (CO2) reacts with the seawater, changing its chemical composition and progressively acidifying the ocean. The observed decrease in seawater pH has been shown to affect a range of organisms and ecosystems, biodiversity and food security. Fisheries and aquaculture can be negatively affected, as can other services provided by the ocean, including tourism, transportation and coastal protection. Observations from the last 20 – 30 years have shown a clear trend of ocean acidification (decreasing pH) in open ocean locations. For coastal areas, however, the pattern is often confounded by natural processes like freshwater input, coastal upwelling, biological activities and temperature changes, among others. These factors complicate the prediction of and possible management responses to ocean acidification in the highly dynamic and productive coastal areas. Guidelines on how to improve monitoring, what to measure and what to report are provided in this methodology. The associated data and metadata files ensure that the data collected is traceable and can be quality controlled, stored and shared in a manner that allows it to be used for better understanding and predictions of ocean acidification observations.   
  
  
  
Concepts:  
  
Ocean acidification is caused by an increase in the amount of dissolved atmospheric CO2 in the seawater. The average marine acidity is expressed as pH, the concentration of hydrogen ions on a logarithmic scale. In order to be able to constrain the carbonate chemistry of seawater, it is necessary to measure at least two of the four parameters, i.e. pH, pCO2, DIC (CT), and TA (AT). pH (the concentration of hydrogen ions on a logarithmic scale, expressed on total scale), DIC (total dissolved inorganic carbon, in μmol kg-1), pCO2 (carbon dioxide partial pressure, in ppt or μatm), and TA (AT, total alkalinity, in μmol kg-1).  
  
  
  
Comments and limitations:  
  
The methodology for this indicator has been developed with the technical support of experts in the field of ocean acidification. It provides globally accepted and adapted guidelines and best practices established by scientists and published in peer-reviewed literature.   
  
  
  
As this is a highly complex indicator, the technical infrastructure necessary for the correct measurement is a potentially constraining factor. The Methodology for the indicator describes how to avoid comparability issues of the data, which have been problematic in the past, measurement errors and advises on the most appropriate technical and methodological procedures to guarantee high-quality data that can be used for the global assessment of ocean acidification. The addition of metadata to the methodology for this indicator is crucial for adding traceability and transparency to the data, by providing information on the precise equipment and methodology used, as well as specifying the location, accompanying biogeochemical variables and the person taking the measurement.   
  
  
  
Methodology  
  
Detailed information in Attachment I IOC/EC-LI/2 Annex 6  
  
  
  
Computation Method:  
  
This indicator calls for the collection of multiple observations, in the form of individual data points, to capture the variability in ocean acidity. Individual data points for pH either are measured directly or can be calculated based on data for two of the other carbonate chemistry parameters, these being TA (AT), DIC (CT) and pCO2. Calculation tools developed by experts in the field are freely available, and they are introduced and linked in the methodology. Average pH is defined as the annual equally weighed mean of multiple data points at representative sampling stations. The exact number of samples and data points depends on the level of variability of ocean acidity at the site in question. The minimum number of samples should enable the characterisation of a seasonal cycle at the site. Detailed guidelines on the minimum number of observations required are provided in the Methodology. In addition to the data value, standard deviation and the total range (minimum and maximum values measured), as well as underlying data used to provide traceability and transparency (metadata information) should be reported. If historical data is available, this should be released to enable calculations about the rate of change and to compare natural variability and anthropogenic effects.   
  
  
  
Disaggregation:  
  
Countries provide complete data sets with respective site-specific data and metadata files.   
  
  
  
Treatment of missing values:  
  
At country level  
  
Some missing values may be modelled or calculated if established methodologies exist (see Recommendations for calculation of the carbonate system in IOC/EC-LI/2 Annex 6).  
  
At regional and global levels  
  
Regional aggregates are permissible if more than 50% of coastal nations have reported values.   
  
  
  
Regional aggregates:  
  
Every country or nominated IODE National Oceanographic Data Centre (NODC)/Associated Data Unit (ADU) will provide annually updated data sets. Aggregations across regions will require data of comparable quality and all relevant metadata with site-specific information be included in the data sets. Due to the variability of measurements and the prevalence of areas with high variability in ocean acidity, the aggregation of measurement averages (equally weighed annual mean) across coastal marine habitat and ecosystem types is difficult to interpret and is therefore discouraged.   
  
  
  
Sources of discrepancies:  
  
As this indicator only takes into account data submitted by Member States only, there are no discrepancies between estimates and submitted data sets. In the past differences between countries in the measurement of pH and other ocean acidification data were mainly attributable to technical difficulties and the lack of comprehensive guidelines for the best practice of measurements. The present Methodology and the guidelines contained within provide detailed instructions on the measurement, collection, treatment and quality control of data in a way that will enable countries to avoid future discrepancies.   
  
  
  
Methods and guidance available to countries for the compilation of the data at the national level:  
  
The SDG 14.3.1 Indicator Methodology presented here provides guidelines for the collection of measurements towards the Indicator. Data and metadata files in which all of the relevant measurements should be compiled will be provided to the data centre or data originator. This data will be collected by the relevant national data centers, such as National Statistical Offices (NSOs) and National Oceanographic Data Centers (NODCs), and shared with the Indicator’s custodian agency, the IOC of UNESCO.   
  
The Indicator Methodology comprises an overview of statements on best practice and links to several Standard Operating Procedures (SOPs). These procedures represent the best practices compiled by the leading researcher in the field and have been made freely available. A list of relevant material, as referenced in the Indicator Methodology, can be found here: http://www.ioccp.org/index.php/documents/standards-and-methods  
  
IOC/EC-LI/2 Annex 6  
  
Table 1  
  
  
  
Table 1. List of standard operating procedures to measure different parameters of the carbonate system (procedures marked with \* are able to attain climate quality).   
  
  
  
Discrete  
  
Underway  
  
Fixed autonomous sensors  
  
pH  
  
Spectrophotometric \*  
  
Potentiometric   
  
Spectrophotometric  
  
ISFET  
  
Spectrophotometric  
  
ISFET  
  
CT   
  
IR detection  
  
Coulometry \*  
  
  
  
  
  
AT  
  
Potentiometric titration (open and closed cell; open recommended) \*  
  
  
  
  
  
pCO2  
  
  
  
Equilibration, headspace \*  
  
Membrane-based  
  
Equilibration \*  
  
Membrane-based  
  
  
  
Quality assurance  
  
Data quality control and validation processes were developed in close consultation with experts in the field of ocean acidification, amongst them members of the Global Ocean Acidification Observing Network (GOA-ON) and data management experts, like the ones at IODE. Data quality control is a critical component of the data analysis, submission and processing. Scientists and technicians who collected the submitted data will be responsible for the primary quality control of the data and accompanying detailed metadata. The metadata submitted with the data must also describe the quality control standard operating procedures (SOPs) followed for each parameter.  
  
  
  
Primary quality control consists of:  
  
Quality control that is attached to the methodology (CRMs, tris buffer calibration, SOPs are provided),  
  
Quality control and quality assurance of the actual data (SOPs are provided) and usage of community agreed quality flags,  
  
Identifying and flagging of outliers,   
  
Making determinations regarding validity of those outlying points,  
  
Estimating uncertainty of the measurement,  
  
Identifying all the sources of uncertainty in the measurements,  
  
Rolling up the individual uncertainties into overall uncertainty (error propagation).  
  
  
  
Secondary quality control:  
  
Harmonization of the data and ensuring metadata completeness,  
  
External quality control/audit – Expert QC Group applying the weather and climate levels as defined by GOA-ON (following the example of SOCAT),  
  
Feedback to data holders.  
  
Following the quality control assessment described above, three categories of measurement quality will be attributed by the Expert QC Group:  
  
Established oceanographic climate quality (Category 1)  
  
Weather quality data including that from sensors and capacity building simplified pH and alkalinity measurements, with appropriate uncertainty assessment (Category 2)  
  
Measurements of undefined quality (Category 3) (will not be displayed in the visualization of annual weighted means and variance of pH).  
  
  
  
  
  
Data Sources  
  
  
  
Description:  
  
The general IOC data collection process is described in Document IOC-XXIX/2Annex 14.  
  
The novelty of assessing ocean acidification at the global level, as in indicator 14.3.1, requires the IOC secretariat to collect the data via different pathways. Future data collections are expected to be a mixture of:  
  
direct requests to National Statistical Offices (NSOs), as new national reporting mechanisms are now installed allowing them to provide the required information,  
  
annual requests to the IOC national focal points,  
  
collaboration with National Oceanographic Data Centres, international data centres and   
  
directly with data providers via the GOA-ON data portal (Figure 1).  
  
  
  
  
  
Figure 1. Scheme to illustrate the proposed data collection and publication process related to national contributions of data related to 14.3.1 (SDG: Sustainable Development Goal; IOC-UNESCO: Intergovernmental Oceanographic Commission of UNESCO; GOA-ON: Global Ocean Acidification – Observing Network; JCOMM: WMO-IOC Joint Technical Commission for Oceanography and Marine Meteorology; WMO: World Meteorological Association; IODE: International Oceanographic Data and Information Exchange of IOC UNESCO; GDAC: Global Data Assembly Center; BGC ARGO: Biogeochemical Argo floats; QC: Quality Control; NODC: National Oceanographic Data Centre; DOI: Digital Object Identifier; BP: Best Practice; CD: Capacity Development; PI: Principal Investigator; RTC: Regional Training Centre).  
  
  
  
Global scientific efforts (GO-SHIP, SOCAT, GCOS) which host and feature data from various ocean observing efforts and/or focus on collecting measurements in international waters will also be queried for annual or more likely multi-year data sets representing status and change of ocean acidification variables in the open ocean.   
  
  
  
As mentioned the data collection process will take place in close collaboration with the IOC Project Office for IODE Oostende, Belgium and relevant data providers/national archives, the GOA-ON data portal, and entities such as the marine chemistry part of the European Marine Observation and Data Network (EMODnet).  
  
  
  
The GOA-ON data portal features open access data, in addition to a global monitoring asset inventory. The portal is designed to offer two levels of access: 1) visualization and 2) download capabilities. Combining different open-access data sets may provide incentives to create new observing systems in under-sampled areas and to increase the application of open access data policies worldwide, according to the IOC Criteria and Guidelines for the Transfer of Marine Technology.The detailed SDG 14.3.1metadata and data forms (part of the final methodology to ensure inter-comparability between measurements) will be included on the GOA-ON website. The information requested will include a detailed habitat description, which will be required to assess the natural and anthropogenic causes of variability within the data sets.  
  
  
  
Collection process:  
  
(I) Counterparts:  
  
The official counterparts are the IOC focal points. They, as well as National Oceanographic Data Centres (NODCs), will initially be contacted by IOC to request relevant data from the appropriate national oceanographic data centres and/or relevant scientists, agencies or programmes. An annual data submission request will be sent out directly to the member states asking for the respective data and metadata. It is envisaged that an online submission interface, to be developed in collaboration with existing ocean carbon data centres and biogeochemical data platforms will facilitate the submission process in the future.   
  
(II) Validation and consultation process:  
  
The counterparts are invited to provide references (metadata) for the information provided. The quality control mechanisms are described in more detail later in this document (see Quality Control).  
  
  
  
Data Availability  
  
  
  
Description:  
  
IODE and IOC HQ conducted an online survey among NODCs and ADUs in February 2018 requesting information about the national and institutional 14.3.1 related data sets. A total of 30 data centres replied positively that they host and serve biogeochemical data sets; 21 data centres serve all 4 parameters (DIC, TA, pH, pCO2). However, only 14 centres also provide the corresponding metadata.  
  
The list of 21 data centres that host all 4 parameters are:   
  
Europe: RBINS (Belgium), BODC (UK), VLIZ (Belgium), Marine Institute (Ireland), Bjerknes Climate Data Centre / RI ICOS Ocean Thematic Centre (Norway)  
  
North America: University of South Florida (USA), DFO (Canada), NCEI/OCADS (USA), WHOI (USA), NCEI (USA), NCEI (USA), Scripps (USA)  
  
South America: Univeridad Simon Bolivar (Venezuela), Instituto Nacional de Investigación y Desarrollo Pesquero (INIDEP) (Argentina)  
  
Africa: KMFRI (Kenya)  
  
Pacific: National Institute of Water & Atmospheric Research (New Zealand)  
  
Asia: JODC (Japan), JMA (Japan), MIRC (Japan), MHI/RAS (Russian Federation), RSE Kazhydromet (Kazakhstan)  
  
  
  
Time series:  
  
The first assessment in 2018 will include first-level quality controlled data, since and including 2010, if available (all of the years or a subset).  
  
  
  
Calendar  
  
  
  
Data collection:  
  
National data sets should be reported annually (at the least). The next data collection will start in February 2019.  
  
  
  
Data release:  
  
The first requests for data were sent to NODCs in August 2018, and the data received are currently undergoing secondary quality control. The next data points will become available in the second quarter of 2019.   
  
  
  
Data providers  
  
The general IOC data collection process is described in Document IOC-XXIX/2Annex 14.  
  
The novelty of assessing ocean acidification at the global level, as for this indicator 14.3.1, requires the IOC secretariat to collect the data via a range of different pathways. This will include direct requests to National Statistical Offices (NSOs), annual requests to the IOC national focal points, and NODCs and associated data agencies in the member states, as well as international data centres and data providers which have made data available to the GOA-ON data portal.   
  
  
  
Data compilers  
  
The Intergovernmental Oceanographic Commission (IOC) of UNESCO is the custodian agency for this Indicator. In collaboration with the International Oceanographic Data and Information Exchange (IODE) of IOC, the data will be collected and stored in a transparent and traceable manner, allowing the ocean acidification data to be shared.  
  
  
  
References  
  
  
  
URL:  
  
IOC-UNESCO http://www.ioc-unesco.org/  
  
IODE https://www.iode.org/  
  
GOA-ON http://goa-on.org/  
  
GOA-ON data portal http://portal.goa-on.org/  
  
Document IOC/EC-LI/2 Annex 6 -14.3.1 Methodology http://ioc-unesco.org/index.php?option=com\_oe&task=viewDocumentRecord&docID=21938  
  
Document IOC-XXIX/2Annex 14 http://www.ioc-unesco.org/index.php?option=com\_oe&task=viewDocumentRecord&docID=19589  
  
  
  
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Riebesell U., Fabry V. J., Hansson L. & Gattuso J.-P. (Eds.) (2011) Guide to best practices for ocean acidification research and data reporting. Luxembourg, Publications Office of the European Union, 258pp. (EUR 24872 EN).   
  
  
  
  
  
  
  
  
  
Related indicators as of February 2020  
  
  
  
14.a Increase scientific knowledge, develop research capacity and transfer marine technology, taking into account the Intergovernmental Oceanographic Commission Criteria and Guidelines on the Transfer of Marine Technology, in order to improve ocean health and to enhance the contribution of marine biodiversity to the development of developing countries, in particular small island developing States and least developed countries

Last updated: 29 May 2018  
  
  
  
Goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development  
  
Target 14.a: Increase scientific knowledge, develop research capacity and transfer marine technology, taking into account the Intergovernmental Oceanographic Commission Criteria and Guidelines on the Transfer of Marine Technology, in order to improve ocean health and to enhance the contribution of marine biodiversity to the development of developing countries, in particular small island developing States and least developed countries  
  
Indicator 14.a.1: Proportion of total research budget allocated to research in the field of marine technology.  
  
  
  
Institutional information  
  
  
  
Organization(s):  
  
Intergovernmental Oceanographic Commission of UNESCO  
  
  
  
  
  
Concepts and definitions  
  
  
  
Definition:  
  
Definitions and mechanisms used in the development of the SDG indicator 14.a.1 are based on the IOC Criteria and Guidelines on Transfer of Marine Technology- IOCCGTMT (originally published and endorsed by IOC Member States in 2005, these guidelines provide an internationally agreed definition of what is understood by the term marine technology. These Guidelines have been referenced in various UN General Assembly Resolutions and specifically in the formulation of SDG target 14.a). These are further explained in the Global Ocean Science Report (GOSR) referenced below.  
  
  
  
Marine technology as defined in the IOCCGTMT refers to instruments, equipment, vessels, processes and methodologies required to produce and use knowledge to improve the study and understanding of the nature and resources of the ocean and coastal areas. Toward this end, marine technology may include any of the following components:  
  
Information and data, in a user-friendly format, on marine sciences and related marine operations and services;  
  
Manuals, guidelines, criteria, standards, reference materials;  
  
Sampling and methodology equipment (e.g., for water, geological, biological, chemical samples);  
  
Observation facilities and equipment (e.g. remote sensing equipment, buoys, tide gauges, shipboard and other means of ocean observation);  
  
Equipment for in situ and laboratory observations, analysis and experimentation;  
  
Computer and computer software, including models and modelling techniques;  
  
Expertise, knowledge, skills, technical/scientific/legal know-how and analytical methods related to marine scientific research and observation.  
  
  
  
Indicator 14.a.1 shows the annual national research budget allocated by governments in the field of marine technology, relative to the overall national governmental research and development budget in general.  
  
  
  
Unit: percentage; raw data in national currency. The proportion can be calculated, and if needed, data can be converted by the international agency into USD.  
  
  
  
  
  
Rationale:  
  
Sustained investment in research and development (R&D), including ocean research, remains essential to advance knowledge and to develop new technology needed to support modern economies. The ocean economy yields various benefits in terms of employment, revenues and innovation in many domains. Its current developments are largely based on decades of science and R&D investments by governments around the world. Baseline information on ocean science funding, as delivered by the indicator 14.a.1 can be used as a starting point for more directed, tailored investment and new capacity development strategies, and to support the case for ensuring maximum impact of ocean research, for example through marine technology and knowledge transfer from government-funded marine and maritime R&D projects. Annual (2009-2013) baseline information for 24 countries is presented in the GOSR (Isensee, K., Horn, L. and Schaaper, M. 2017. The funding for ocean science. In: In: IOC UNESCO, Global Ocean Science Report—The current status of ocean science around the world. L. Valdés et al. (eds). Paris, UNESCO, pp. 80–97).  
  
  
  
Concepts:  
  
The concepts used for the definition and calculation of the indicator 14.a.1 are based on similar concepts used in the UNESCO Science Report (2010, 2015).These reports present GERD data (gross domestic expenditure on research and experimental development) as a share of GDP (gross domestic product) and further provide the R&D (research and development) expenditure by sector of performance in % (Table S2 in the 2015 report). In addition UIS publishes science field specific R&D, e.g. natural science (http://data.uis.unesco.org/).  
  
  
  
The definitions and classifications used to collect R&D data are based on the ‘Frascati Manaual: Proposed Standard Practice for Surveys on Research and Experimental Development’ (OECD).  
  
  
  
Comments and limitations:  
  
Due to the fact that no agreed mechanism to assess ocean science capacity existed untill the first edition of the Global Ocean Science Report, national reporting mechanisms are scarce and/or are not harmonised. However, with the framework of 14.a and the new reporting mechanism in place, global and regional technology and knowledge transfer can be conducted in a resource- and need-adapted manner based on global inventories and comparisons.  
  
  
  
Methodology  
  
  
  
  
  
Computation Method:  
  
Indicator 14.a.1 = National governmental research expenditure in marine technology / National governmental R&D expenditure  
  
  
  
National governmental R&D expenditure data are assessed annually by the UNESCO Institute for Statistics (UIS).  
  
  
  
National governmental ocean science expenditures are envisaged to be assessed biannually via the GOSR data portal (IOC-XXIX/2 Annex 10).  
  
  
  
The development of the GOSR data repository/data portal will take place in close collaboration with UIS and IOC (at Headquarters and at the IOC Project Office for IODE, Oostende, Belgium).  
  
  
  
Disaggregation:  
  
National data set with updated every two years, possibility for regional and global aggregation  
  
  
  
  
  
Treatment of missing values:  
  
 At country level  
  
In case countries do not provide data, no estimate will be calculated.  
  
  
  
  
  
 At regional and global levels  
  
For regional and global estimates/averages, only data received from Member States will be taken into  
  
account, missing values are not imputed or otherwise estimated.  
  
  
  
  
  
Regional aggregates:  
  
Each national contribution is weighted equally to calculate average values for the regional and global estimates.  
  
  
  
Sources of discrepancies:  
  
As this indicator only takes into account data submitted by Member States, there are no discrepancies between estimates and submitted data sets.  
  
  
  
Methods and guidance available to countries for the compilation of the data at the national level:  
  
No particular guidance for the national data compilation exists as the organization of ocean science differs among Member States. Ways introduced to obtain relevant data are through IOC national focal points (IOC official national designated Coordinating Bodies for Liaison with the IOC) consult the respective ministry responsible for ocean science to obtain the data; IOC focal points contact universities and institutions individually.  
  
IOC is an intergovernmental body of 148 Member States, the IOC national focal points may act as national coordinating bodies for relevant government departments, universities and research institutions actively involved in marine science and technology and other related aspects of ocean affairs.  
  
The novelty of the GOSR and therefore also the data it contains required the IOC secretariat to collect the data via IOC national focal point until now. Future data collections are expected to be a mixture of direct requests to NSOs, as new national reporting mechanisms are now installed allowing them to provide the required information (e.g. Colombia, Canada, Italy; document IOC- XXIX/2 Annex 14), questionnaires to the IOC national focal points and collaboration with National Oceanographic Data Centres. The GERD (gross domestic expenditure on research and development) data are obtained from the UNESCO Institute for Statistics, based on information directly provided from NSOs.  
  
  
  
Quality assurance  
  
IOC national focal points and experts from UIS assist in the data quality assessment, comparing indicator values with the national expenditure for Natural Sciences (UIS), this allows the identification of discrepancies. In the future new values will be compared to previously obtained information. In case of discrepancies, the IOC secretariat will consult the data providers individually.  
  
Combination of: Automated quality control by data portal; National quality control; IOC.  
  
  
  
  
  
  
  
Data Sources  
  
  
  
Description:  
  
Data sources: biannual direct submission to the GOSR data portal (currently in development) and the GOSR questionnaire biannual.  
  
  
  
The questionnaire used for the first edition of the GOSR will be reviewed by the Editorial Board of the GOSR as well as by UIS in 2017/2018 prior to the next data collection exercise. Assessment from 2018 on will be conducted with an improved questionnaire.  
  
  
  
As mentioned previously the novelty of the GOSR and required the IOC secretariat to collect the data via its national focal point until now. Future data collections are expected to be a mixture of direct requests to NSOs, as new national reporting mechanisms are now installed allowing them to provide the required information (e.g. Colombia, Canada, Italy; (document IOC-XXIX/2 Annex 14), questionnaires to the IOC national focal points and collaboration with National Oceanographic Data Centres. The GERD (gross domestic expenditure on research and development) data were obtained from the UNESCO Institute for Statistics, based on information directly provided from NSOs.  
  
  
  
  
  
Collection process:  
  
 National Counterparts:  
  
As mentioned in the previous paragraph the official counterparts are the IOC focal points and well as National Oceanographic and Statistical Data Centres.  
  
 Validation and consultation process by IOC Secretariat.  
  
These counterparts are invited to provide metadata information for the data provided.  
  
  
  
  
  
  
  
Data Availability  
  
Description:  
  
The table below shows the result of research budget allocated to research in the field of marine technology. The first assessments include information for 25 countries for the time period from 2009- 2013 (or for a sub-set of these years). These data were published in the Global Ocean Science Report (2017).  
  
  
  
Table 1. Percentage national governmental research expenditure in marine technology of GERD for countries which provided information regarding ocean science expenditure via the GOSR questionnaire (sources GERD,: UIS, 2015; ocean science expenditure: GOSR questionnaire, 2015; average non-weighted). Note: green fields indicate a percentage higher than 1.5 and yellow fields indicate percentages higher than 0.5.  
  
  
  
Percentage (%) governmental research expenditure in marine  
  
technology of GERD  
  
  
  
  
  
  
  
Country  
  
Average 2009-  
  
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Australia  
  
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Belgium  
  
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Canada (DFO)  
  
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0.53  
  
Chile  
  
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0.36  
  
  
  
0.11  
  
  
  
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0.20  
  
  
  
  
  
Colombia  
  
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0.43  
  
  
  
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0.35  
  
Croatia  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
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Ecuador  
  
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Finland  
  
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Norway  
  
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Republic of Korea  
  
  
  
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Trinidad & Tobago  
  
  
  
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Turkey  
  
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USA  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
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Time series:  
  
To date data are available for the years 2009-2013.  
  
  
  
  
  
Calendar  
  
  
  
Data collection:  
  
The next data collection is planned in 2018 for the years 2014-2016.  
  
  
  
Data release:  
  
Expected dates of release of new data: End of 2018 for the years 2014-2016.  
  
  
  
  
  
Data providers  
  
  
  
IOC focal points   
  
NSOs  
  
UIS  
  
  
  
  
  
Data compilers  
  
  
  
Intergovernmental Oceanographic Commission of UNESCO (IOC-UNESCO)   
  
UNESCO Institute for Statistics (UIS)  
  
  
  
References  
  
  
  
IOC-UNESCO (2017), Global Ocean Science Report—The current status of ocean science around the world, L. Valdés et al. (eds), UNESCO Publishing, Paris  
  
  
  
Isensee, K., Horn, L. and Schaaper, M. 2017. The funding for ocean science. In: In: IOC-UNESCO, Global  
  
Ocean Science Report—The current status of ocean science around the world. L. Valdés et al. (eds). Paris, UNESCO, pp. 80–97.  
  
  
  
GOSR report (relevant chapters 2 and 4)  
  
http://en.unesco.org/gosr  
  
  
  
  
  
UNESCO Science Report 2010, 2015  
  
https://en.unesco.org/unesco\_science\_report  
  
  
  
  
  
IOC Assembly Decisions: IOC-XXIX/5.1. and IOC-XXIX/9.1.)  
  
http://www.ioc-unesco.org/index.php?option=com\_oe&task=viewDocumentRecord&docID=19770  
  
  
  
  
  
IOC-XXIX/2 Annex 14  
  
http://ioc-unesco.org/index.php?option=com\_oe&task=viewDocumentRecord&docID=19589  
  
  
  
  
  
R&D relevant data  
  
http://data.uis.unesco.org/  
  
  
  
Definition/Concepts: Frascati Manaual: Proposed Standard Practice for Surveys on Research and  
  
Experimental Development’ (OECD)  
  
http://www.oecd.org/sti/inno/frascatimanualproposedstandardpracticeforsurveysonresearchandex perimentaldevelopment6thedition.htm  
  
  
  
  
  
IOC Critreria and Guidelines on the Transfer of Marine Technology  
  
http://unesdoc.unesco.org/images/0013/001391/139193m.pdf  
  
  
  
  
  
Related indicators as of February 2020  
  
  
  
Links to SDG 17, SDG 5;  
  
Targets: to all other SDG 14 targets as science is crucial to protect and conserve the oceans’ resources.

Last updated: March 2019  
  
  
  
Goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development  
  
Target 14.7: By 2030, increase the economic benefits to Small Island Developing States and least developed countries from the sustainable use of marine resources, including through sustainable management of fisheries, aquaculture and tourism  
  
Indicator 14.7.1: Sustainable fisheries as a percentage of GDP in small island developing States, least developed countries and all countries  
  
  
  
Institutional information  
  
Organization:   
Food and Agriculture Organization of the United Nations (FAO)  
  
  
  
Concepts and definitions  
  
Definitions:  
  
This indicator expresses the value added of sustainable marine capture fisheries as a proportion of Gross Domestic Product (GDP).   
  
  
  
Rationale:  
  
Although target 14.7 promotes the sustainable use of marine resources “including of fisheries, aquaculture and tourism”, this indicator as selected by the IAEG-SDG focuses only on the sustainable use of marine resources by fisheries. The methodology hereby proposed by FAO thus measures sustainable fisheries as a percentage of GDP, in accordance to the agreed indicator formulation.  
  
  
  
The share of value added from an industry in GDP is commonly used as an indication of its economic importance. Accordingly, the value added of marine capture fisheries indicates the prominence of marine fish related activities in the country’s economy and its importance for livelihoods. Both GDP and the VA are measured in constant prices and domestic currency.  
  
  
  
Stocks that are fished at sustainable levels are able to support the communities and industries which rely on them, without compromising reproduction and long-term sustainability. By contrast, a stock that is exploited to a point where it cannot replenish itself will ultimately provide sub-optimal long-term economic returns for stakeholders.   
  
  
  
The status of a fish stock is evaluated through a various processes of assessment that commonly combines biological and statistical information to assess changes in its abundance in response to fishing, which also enables forecasting of future trends.   
  
  
  
FAO has been periodically analysing and compiling the status of marine fish stocks combining the results of formal stock assessments available, including the assessments carried out at the regional level and a finer scale by national institutions and scientific working groups. For stocks that do not have a formal stock assessment, effort is made to collect relevant data and information from the literature, or from local experts, that could be used to infer stock status (for instance trends in catch rates, size frequency distribution of the catch, occasional fishing mortality estimates through surveys, etc.). The information from various sources is analysed and synthesized to classify the exploitation status of fish stocks. FAO monitoring of stocks will be enhanced with the implementation of SDG indicator 14.4.1, which tracks progress towards more fish stocks within biologically sustainable levels at national, regional (across FAO Major Fishing Areas) and global levels.  
  
Based on FAO’s monitoring of stocks at regional and global level, the percentage of fish resources that are within biologically sustainable levels has exhibited a downward trend from 90 percent in 1974 to 67 percent in 2015, while 33 percent are considered to be overexploited. Overexploitation not only has negative ecological consequences, but also reduces long-term fishery yields, which have adverse social and economic effects, particularly for dependent communities in developing countries and Small Island Developing States (SIDS).  
  
  
  
Concepts:  
  
The Gross Domestic Product (GDP) is the value of all final goods and services produced in an economy in a given period, which is equivalent to the sum of the value added (VA) from all sectors in an economy.  
  
  
  
The value added of marine capture fisheries measures the value of fish harvested from marine stocks, minus the value of goods and services that are used in the production process (such as raw materials and utilities). It includes activities that are normally integrated into the process of production and occur at sea, such as fishing vessels which process or preserve their catch on board. However, it does not include the processing or preserving of fish when it occurs in land based facilities.  
  
  
  
A fish stock is a subset of a species (fish, crustacean, mollusc, etc.) or a population inhabiting a geographical area and participating in the same reproductive process.  
  
  
  
Maximum sustainable yield (MSY) is the highest theoretical equilibrium yield that can be continuously taken (on average) from a stock under existing (average) environmental conditions without significantly affecting the reproduction process. A stock fished at (MSY) is referred to as biologically sustainable, as it may remain stable or grow while sustaining losses from fishing and natural sources of mortality.  
  
  
  
FAO Fishing Areas for Statistical Purposes are arbitrary areas to facilitate comparison of data, improving the possibilities of cooperation in statistical matters.  
  
  
  
The basic concepts associated with this indicator are part of the following international instruments and classification schemes:  
  
  
  
The 1982 United Nations Convention on the Law of the Sea (UNCLOS)  
  
This instrument is the basis upon which all the subsequent instruments are built. UNCLOS defines the rights and responsibilities of nations concerning their use of the world's oceans, establishing guidelines for businesses, the environment, and the management of marine natural resources. It is a binding instrument, although its principles may also be applied by countries who are not a party to it.  
  
  
  
The 1995 FAO Code of Conduct for Responsible Fisheries (CCRF)  
  
This instrument provides the necessary framework for national and international efforts to ensure sustainable exploitation of aquatic living resources in harmony with the environment by establishing principles and standards applicable to the conservation, management, and development of all fisheries.  
  
The FAO Code of Conduct for Responsible Fisheries relies on the concept of MSY when setting general principles and standards for fisheries management. Article 7.2.1 details how management measures should be “based on the best scientific evidence available” and “designed to maintain or restore stocks at levels capable of producing maximum sustainable yield, as qualified by relevant environmental and economic factors, including the special requirements of developing countries.”  
  
  
  
United Nation’s International Standard Classification of All Economic Activities (ISIC)   
  
All components of marine capture fisheries are clearly defined within section A 0311 ISIC revision  
  
  
  
Comments and limitations:  
  
The indicator measures the value added of sustainable marine capture fisheries as a proportion of GDP. However, the vast majority of countries report only aggregated data for value added for the fisheries and aquaculture sector. To overcome this problem it is necessary to separate the value added for marine capture fisheries from the aggregated data. Preferably this would be done using the value of marine capture fisheries as a proxy. However, in the absence of value data, the quantity of marine capture fisheries as a proportion of total production is used as a proxy for the proportion of value added.  
  
For marine capture fisheries, despite the expanded coverage of FAO’s assessments in recent years, data deficiencies may lead to uncertainty as to the level of exploitation of a stock. While data limitations exist, the methodology employed by FAO seeks to eliminate discrepancies and provide a representative assessment of marine fish stocks. The time series for which stock assessment is available starts with the first public release of FAO stock assessment, in 2011 for each FAO Major Fishing area. FAO continues to release this information biennially.  
  
  
  
National fish stock assessments are only available for a few countries, and therefore are not globally or regionally representative. Therefore, the sustainability multiplier used in the compilation of this indicator is based on the average fish stock sustainability calculated by FAO for each Major Fishing Area. For each country, the sustainability multiplier will be the average sustainability weighted by the proportion of the quantity of marine capture for each respective fishing area in which the country performs fishing activities.   
  
  
  
Currently, FAO aims to begin compiling country-level estimates for SDG indicator 14.4.1 (proportion of fish stocks within biologically sustainable levels) in 2020. Once these estimates become available, the computation method for the current indicator will use country-level estimates rather than estimates based on FAO Major Fishing Areas to determine the sustainability multiplier and hence estimate the value added of sustainable marine capture fisheries as a proportion of GDP.  
  
  
  
Quality assurance:  
  
In order to provide continuity of collection of data for value added for fisheries and aquaculture, and GDP across different versions of the Systems of National Accounts (SNA) and ISIC revisions, FAO Fisheries and Aquaculture Department ensures its consistency by the use of backwards and forwards linkages when collecting and validating the information.  
  
  
  
While SDG indicator 14.7.1 is completely constructed on data already provided by countries to FAO, to the United Nations Statistics Division (UNSD) and to the Organization for Economic Cooperation and Development (OECD), countries are invited to collaborate with FAO to increase the precision of their results, by providing otherwise unavailable inputs for the calculation of the indicator.  
  
  
  
Methodology  
  
At a country level, the contribution of sustainable marine capture fisheries to the GDP is calculated as follows:  
  
   
  
   
  
 The percentage contribution of fisheries and aquaculture to GDP is estimated by simply dividing the value added of fisheries and aquaculture by national GDP.  
  
   
  
  
  
  
In order to disaggregate for the value added of marine capture fisheries and the value added of aquaculture, the quantity of fish produced from marine capture fisheries will be divided by total quantity of national production of fish, and then multiplied by the percentage of GDP from fisheries and aquaculture. As such, the quantity of production of marine capture fisheries is used as a proxy for the value of marine capture fisheries.  
  
   
  
 The sustainability multiplier will be calculated based on the average sustainability published periodically for each FAO major marine fishing area.  
  
   
  
   
  
   
  
For each country, the sustainability multiplier will be the average sustainability weighted by the proportion of the quantity of marine capture for each respective fishing area in which the country performs fishing activities. When a country fishes in only one FAO fishing area, its sustainability multiplier will be equal to the average sustainability of stocks in that area.  
  
   
  
  
  
  
  
The value added of marine capture fisheries (b) will be adjusted by the sustainability multiplier (c) to get the sustainable marine capture fisheries as a percentage of GDP  
  
  
  
  
  
  
  
  
  
  
  
In summary, the computation method for GDP from sustainable marine capture fisheries may also be expressed as:  
  
Disaggregation:  
  
Currently there are no disaggregation dimensions for this indicator.   
  
Treatment of missing values:  
  
At country level  
  
This indicator examines economic contribution from marine capture fisheries. If a country has no marine capture fisheries then the indicator is not calculated for that country.  
  
No imputation is performed to derive estimates for countries or years when the value added of fisheries and aquaculture is not available.   
  
FAO employs a wide spectrum of data and analysis to assess 500 fish stocks, which accounts for 70–80 percent of global landings. A detailed description of the approach used by FAO is available at the Review of the State of World Marine Fishery Resources.   
  
At regional and global level  
  
Not applicable. Regional aggregates will only be calculated based on contribution of sustainable fisheries to the GDP of those countries that have reported value added for fishing and aquaculture in a given year.   
  
  
  
Regional and Global aggregates:  
  
Regional and global aggregates will be generated by taking the average value of the indicator for countries in each SDG region.  
  
When interpreting regional aggregates, it is important to consider that a country’s geographic region is not necessarily indicative of how or where it fishes. Countries may fish in completely different fishing areas from others in their region, and therefore land-based regional aggregates can be inappropriate when dealing with marine resources.  
  
  
  
Data Sources  
  
Description:  
  
The data series on the value added of fisheries and aquaculture and GDP are derived from UNSD National Accounts Official Country Data. In case of missing values, supplementary data is retrieved from OECD Annual National Accounts Database.   
  
Economic data are specifically taken from:  
  
UNSD National Accounts Official Country Data  
  
Table 2.1. Value added by industries at current prices (ISIC Rev. 3)  
  
Table 2.4. Value added by industries at current prices (ISIC Rev. 4)  
  
OECD Annual National Accounts  
  
Table 6. Value added and its components by activity, ISIC rev3  
  
Table 6A. Value added and its components by activity, ISIC rev4  
  
  
  
The base data from which stock status is modelled and a detailed description of the approach used by FAO is available in:  
  
FAO Review of the State of World Marine Fishery Resources  
  
Tables D 1-D 19. State of exploitation and annual nominal catches.  
  
  
  
Data Availability  
  
Description:  
  
The indicator may be calculated based on currently available data for 128 countries which have marine capture fisheries and have reported the value added of fisheries and aquaculture at least once since 2011. This includes 35 SIDS, 68 developing countries and 23 least developed countries.  
  
Breakdown of country data availability by region, starting in 2011:  
  
  
  
  
  
2011  
  
2013  
  
2015  
  
Overall coverage  
  
Global  
  
126  
  
122  
  
111  
  
128  
  
Developing  
  
68  
  
67  
  
60  
  
68  
  
Least Developed Countries  
  
20  
  
18  
  
18  
  
23  
  
SIDS  
  
35  
  
33  
  
30  
  
35  
  
Africa  
  
26  
  
25  
  
23  
  
29  
  
Northern Africa  
  
2  
  
1  
  
1  
  
2  
  
Sub-Saharan Africa  
  
24  
  
24  
  
22  
  
27  
  
Eastern Africa  
  
6  
  
7  
  
7  
  
7  
  
Middle Africa  
  
6  
  
6  
  
5  
  
6  
  
Southern Africa  
  
2  
  
2  
  
2  
  
2  
  
Western Africa  
  
10  
  
9  
  
8  
  
12  
  
Americas  
  
36  
  
36  
  
31  
  
36  
  
Latin America and the Caribbean  
  
32  
  
32  
  
28  
  
32  
  
Caribbean  
  
16  
  
16  
  
13  
  
16  
  
Latin America  
  
16  
  
16  
  
15  
  
16  
  
Northern America  
  
4  
  
4  
  
3  
  
4  
  
Asia  
  
22  
  
22  
  
22  
  
22  
  
Central Asia  
  
0  
  
0  
  
0  
  
0  
  
Eastern Asia  
  
1  
  
1  
  
1  
  
1  
  
Southern Asia  
  
6  
  
6  
  
6  
  
6  
  
South-Eastern Asia  
  
8  
  
8  
  
8  
  
8  
  
Western Asia  
  
7  
  
7  
  
7  
  
7  
  
Europe  
  
29  
  
28  
  
26  
  
30  
  
Eastern Europe  
  
5  
  
4  
  
4  
  
5  
  
Northern Europe  
  
11  
  
11  
  
10  
  
11  
  
Southern Europe  
  
9  
  
9  
  
8  
  
9  
  
Western Europe  
  
4  
  
4  
  
4  
  
4  
  
Oceania  
  
12  
  
10  
  
9  
  
12  
  
Australia and New Zealand  
  
1  
  
1  
  
1  
  
1  
  
Melanesia  
  
4  
  
2  
  
2  
  
4  
  
Micronesia  
  
3  
  
3  
  
3  
  
3  
  
Polynesia  
  
4  
  
4  
  
3  
  
4  
  
Time Series:  
  
Regional state of the world’s marine fish stock: 2011, 2013 and 2015  
  
Value added from UNSD: from 1990 to 2017  
  
Calendar   
  
Data Collection:  
  
Data for GDP and value added is retrieved by FAO from UNSD (or the OECD in case of missing values) once a year every February.  
  
FAO compiles and releases stock status information biennially in the SOFIA publication. When data reported by countries for SDG indicator 14.4.1 (“proportion of fish stocks within biologically sustainable levels”) becomes available it will be used to replace the current sustainability multiplier for SDG indicator 14.7.1.  
  
Data release:  
  
New data for this indicator is expected to be released biennially in March.  
  
Data Providers  
  
National governmental agencies reporting to:  
  
Food and Agriculture Organization of the United Nations (FAO).  
  
United Nations Statistics Division (UNSD).   
  
The Organization for Economic Cooperation and Development (OECD).  
  
  
  
Data Compilers  
  
Food and Agriculture Organization of the United Nations.  
  
  
  
  
References  
  
Sustainable Development Goal 14.7.1: http://www.fao.org/sustainable-development-goals/indicators/1471/en  
  
FAO. 2018. Fishery and Aquaculture Statistics. Global capture production 1950-2016 (FishstatJ). In: FAO Fisheries and Aquaculture Department [online]. Rome. Updated 2018. www.fao.org/fishery/statistics/software/fishstatj/en  
  
 FAO. 2018. FAO yearbook. Fishery and Aquaculture Statistics 2016. Rome: http://www.fao.org/fishery/static/Yearbook/YB2016\_USBcard/index.htm  
  
FAO. 2018. The State of World Fisheries and Aquaculture 2018 - Meeting the sustainable development goals. Rome: http://www.fao.org/3/i9540en/I9540EN.pdf  
  
FAO. 2011. Review of the State of World Marine Fishery Resources. Rome: http://www.fao.org/docrep/015/i2389e/i2389e.pdf  
  
FAO. 1995. Code of Conduct for Responsible Fisheries. Rome: http://www.fao.org/3/a-v9878e.pdf  
  
ICTSD. 2018. Overfishing, Overfished Stocks, and the Current WTO Negotiations on Fisheries Subsidies: https://www.ictsd.org/themes/environment/research/overfishing-overfished-stocks-and-the-current-wto-negotiations-on  
  
OECD Annual National Accounts: http://stats.oecd.org/   
  
The United Nations International Standard Industrial Classification of All Economic Activities, revision 4: https://unstats.un.org/unsd/publication/seriesm/seriesm\_4rev4e.pdf  
  
The United Nations International Standard Industrial Classification of All Economic Activities, revision 4: https://unstats.un.org/unsd/statcom/doc02/isic.pdf  
  
System of National Accounts 2008 - 2008 SNA: https://unstats.un.org/unsd/nationalaccount/sna2008.asp  
  
System of National Accounts 1993 - 1993 SNA: https://unstats.un.org/unsd/nationalaccount/sna1993.asp  
  
System of National Accounts 1968 - 1968 SNA: https://unstats.un.org/unsd/nationalaccount/docs/1968SNA.pdf  
  
Related indicators as of February 2020  
  
Linkages with other goals and targets: SDG 1, SDG 2, SDG 8 (in particular 8.1 and 8.4), SDG 12, SDG 13, SDG 14 (in particular 14.4.1)  
  
Last updated: 28/03/2020 03:08  
  
  
- 8 -

Last updated: 29 May 2018  
  
  
  
Goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development  
  
Target 14.6: By 2020, prohibit certain forms of fisheries subsidies which contribute to overcapacity and overfishing, eliminate subsidies that contribute to illegal, unreported and unregulated fishing and refrain from introducing new such subsidies, recognizing that appropriate and effective special and differential treatment for developing and least developed countries should be an integral part of the World Trade Organization fisheries subsidies negotiation  
  
Indicator 14.6.1: Progress by countries in the degree of implementation of international instruments aiming to combat illegal, unreported and unregulated fishing  
  
  
  
Institutional information  
  
  
  
Organization(s):  
  
Food and Agriculture Organisation of the United Nations  
  
   
  
Concepts and definitions  
  
  
  
Definition:  
  
Progress by countries in the degree of implementation of international instruments aiming to combat illegal, unreported and unregulated fishing.  
  
  
  
Rationale:  
  
The purpose of this indicator is to show a picture of the state of implementation of the instruments to combat IUU fishing, at a national, regional and global level. The first edition of the indicator will provide a baseline of the current state of implementation of these agreements. Subsequent indicator estimates will then be able to show any progress made by countries.   
  
  
  
Although the exact score will be important from one reporting year to the next for determining the progress made by a country, to aid the interpretation of this indicator, the score will then be converted into one of five bands as following:  
  
  
  
Score  
  
Bands  
  
>0 –< 0.2  
  
Band 1: Very low implementation of applicable instruments to combat IUU fishing  
  
0.2 –< 0.4  
  
Band 2: Low implementation of applicable instruments to combat IUU fishing  
  
0.4 –< 0.6  
  
Band 3: Medium implementation of applicable instruments to combat IUU fishing  
  
0.6 –< 0.8  
  
Band 4: High implementation of applicable instruments to combat IUU fishing  
  
0.8 – 1.0  
  
Band 5: Very high implementation of applicable instruments to combat IUU fishing  
  
  
  
Additionally, a State may receive an indicator score of “N/A”, in the case that none of the instruments are applicable. This would only be the case if the country is land locked and does not flag any vessels that conduct fishing or fishing related activities.   
  
  
  
Countries that do not submit a response to the questionnaire on which the indicator is based or do not approve the use of their responses to the questionnaire for use in this indicator, will not receive an indicator score.  
  
  
  
Concepts:  
  
The definitions and concepts associated with the indicator and utilized in the methodology are defined in the FAO term portal: http://www.fao.org/faoterm/collection/fisheries/en/  
  
  
  
This indicator is based on a country’s implementation of the different international instruments that combat illegal, unreported and unregulated fishing (IUU fishing). IUU fishing undermines national and regional efforts to conserve and manage fish stocks and, as a consequence, inhibits progress towards achieving the goals of long-term sustainability and responsibility as set forth in, inter alia, Chapter 17 of Agenda 21 and the 1995 FAO Code of Conduct for Responsible Fisheries. Moreover, IUU fishing greatly disadvantages and discriminates against those fishers that act responsibly, honestly and in accordance with the terms of their fishing authorizations. This is a compelling reason why IUU fishing must be dealt with expeditiously and in a transparent manner. If IUU fishing is not curbed, and if IUU fishers target vulnerable stocks that are subject to strict management controls or moratoria, efforts to rebuild those stocks to healthy levels will not be achieved. To efficiently curb the IUU fishing a number of different international instruments have been developed over the years that focus on the implementation of the different responsibilities of States.   
  
  
  
The instruments covered by this indicator and their role in combatting IUU fishing are as follows:  
  
  
  
The 1982 United Nations Convention on the Law of the Sea (UNCLOS)  
  
This instrument is the basis upon which all the subsequent instruments are built upon. UNCLOS defines the rights and responsibilities of nations with respect to their use of the world's oceans, establishing guidelines for businesses, the environment, and the management of marine natural resources. It is a binding instrument, although its principles may also be applied by countries who are not party to it.  
  
  
  
The Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (UN Fish Stocks Agreement)  
  
The UN Fish Stocks Agreement entered into force on 11 December 2001, and is the most comprehensive of the binding international instruments in defining the role of Regional Fisheries Management Organisations and elaborating measures that could be taken in relation to IUU fishing activities. Although the UN Fish Stocks Agreement applies primarily to the highly migratory and straddling fish stocks on the high seas, its broad acceptance and application is evidenced by the reinforcement of other international instruments, implementation at the regional level, and to some extent by State practice within areas of national jurisdiction.  
  
  
  
The International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (IPOA-IUU)  
  
The objective of the IPOA is to prevent, deter and eliminate IUU fishing by providing all States with comprehensive, effective and transparent measures by which to act, including through appropriate regional fisheries management organizations established in accordance with international law. This instrument covers all the aspects of a State’s responsibilities including, flag State responsibilities, coastal State measures, port State measures, internationally agreed market-related measures, research and regional fisheries management organizations.  
  
  
  
The 2009 FAO Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (PSMA)  
  
The FAO Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing entered into force on the 5th of June 2016. The main purpose of the Agreement is to prevent, deter and eliminate illegal, unreported and unregulated (IUU) fishing through the implementation of robust port State measures. The Agreement envisages that parties, in their capacities as port States, will apply the Agreement in an effective manner to foreign vessels when seeking entry to ports or while they are in port. The application of the measures set out in the Agreement will, inter alia, contribute to harmonized port State measures, enhanced regional and international cooperation and block the flow of IUU-caught fish into national and international markets.  
  
  
  
The FAO Voluntary Guidelines for Flag State Performance (VG-FSP)  
  
The FAO Voluntary Guidelines for Flag State Performance spell out a range of actions that countries can take to ensure that vessels registered under their flags do not conduct IUU fishing, including monitoring, control and surveillance (MCS) activities, such as vessel monitoring systems (VMS) and observers. They promote information exchange and cooperation among countries so that flag states are in a position to refuse to register vessels that are "flag-hopping" by attempting to register with another flag state or to refuse vessels that have been reported for IUU fishing. The Guidelines also include recommendations on how countries can encourage compliance and take action against non-compliance by vessels, as well as on how to enhance international cooperation to assist developing countries to fulfil their flag state responsibilities.  
  
  
  
The FAO Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas (Compliance Agreement)  
  
The 1993 FAO Compliance Agreement entered into force on the 24th of April 2003. Its main purpose is to encourage countries to take effective action, consistent with international law, and to deter the reflagging of vessels by their nationals as a means of avoiding compliance with applicable conservation and management rules for fishing activities on the high seas. With respect to the role of RFBs, the preamble calls upon States which do not participate in global, regional or sub regional fishery organizations or arrangements to do so, with a view to achieving compliance with international conservation and management measures.  
  
  
  
Comments and limitations:  
  
Aside from the status of a country as party or non-party to an international agreement which is available as public record, the indicator is a self-analysis by the country of their state of implementation of the various international instruments. Although questions in the questionnaire will be accompanied by pop up guides describing any technical aspects or terms, there may be a small variance in interpretation by different respondents.  
  
  
  
Additionally, due to the fact that responses are not provided by an independent source, responses could in theory be politically influenced.  
  
  
  
Methodology  
  
Computation Method:  
  
The indicator is based upon responses by States to a certain sections of the questionnaire for monitoring the implementation of the Code of Conduct for Responsible Fisheries and related instruments (CCRF). These are sections covering the implementation of different international instruments used to combat IUU fishing. The responses will be converted using an algorithm to obtain a score for the indicator. Each instrument will be covered within a given variable, as follows:  
  
  
  
Variable 1 (V1) - Adherence and implementation of the 1982 United Nations Convention on the Law of the Sea  
  
Variable 2 (V2) - Adherence and implementation of the 1995 United Nations Fish Stocks Agreement   
  
Variable 3 (V3) - Development and implementation of a national plan of action (NPOA) to combat IUU fishing in line with the IPOA-IUU   
  
Variable 4 (V4) - Adherence and implementation of the 2009 FAO Agreement on Port State Measures (PSMA)   
  
Variable 5 (V5) - Implementation of Flag State Responsibilities in the context of the 1993 FAO Compliance Agreement and FAO Voluntary Guidelines for Flag State Performance  
  
  
  
Depending on responses by FAO Members on the adherence and implementation of the above-mentioned instruments, States will score an indicator value between 0 and 1. Each variable is given a weighting, which takes into consideration the importance of the instrument in combating IUU fishing as well as the overlap between the instruments. The variable weightings are as follows:  
  
  
  
Variable  
  
Weighting\*  
  
V1  
  
10%  
  
V2  
  
10%  
  
V3  
  
30%  
  
V4  
  
30%  
  
V5  
  
20%  
  
(\*) item on “Applicability of instruments”  
  
  
  
For binding agreements, States will still be able to score points if they are not party to the agreement but are implementing its provisions. States will also score points if they have initiated the process to becoming party to an agreement.   
  
  
  
This indicator is automatically computed within the web-application on which the countries will be responding to the questionnaire. Once the questionnaire is completed the respondent will be presented with a report of the indicator, describing the methodology and the score attained. The user will then be able to give a final confirmation of the indicator. The final scores from all the respondents will automatically be collected onto a database. This web-application will also allow the user to access in any the following languages: English, French, Spanish, Chinese, Arabic and Russian.  
  
  
  
Choice of weighting per variable:  
  
The weightings for each variable have been carefully selected. These have been determined based upon their importance of their role in combatting IUU fishing as well as in consideration of the overlap present in between the different instruments. It is also for this consideration of overlap that the VG-FSP and the Compliance Agreement have been combined into Variable 5.  
  
  
  
Applicability of instruments:  
  
A set of questions will be present to determine certain characteristics of States (coastal, port, flag and land-locked). This will ensure that the indicator scoring for a country is not negatively affected if an instrument is not applicable to them. In such case, the weighing of the variable that is not applicable is redistributed into the remaining variables. In cases where none of the instruments is applicable, the country will get an indicator score of “N/A”.  
  
  
  
Variable  
  
Cases in which Instruments are not applicable  
  
V1  
  
The only case where this instrument becomes not applicable, is when the State is land-locked and they are not a flag state.   
  
V2  
  
Is not applicable if the country is land-locked and not a flag State or a coastal State but is not a flag State or Port State.  
  
V3  
  
Same as Variable 2.  
  
V4  
  
Same as Variable 2.  
  
V5  
  
Is not applicable if the country is not a flag State.  
  
  
  
  
  
  
  
For more details regarding the list of question, scoring and applicability, please refer to Appendix 1 and 2.  
  
  
  
Disaggregation:  
  
Due to nature of indicator, there will only be one score per country which could then be aggregated regionally or globally.  
  
Treatment of missing values:  
  
At country level  
  
Indicator will only be available for responding countries who approve of the use of their responses to the CCRF questionnaire for this indicator.  
  
At regional and global levels  
  
Data will only be aggregated from responding countries.  
  
  
  
Regional aggregates:  
  
Regional and global aggregates for this indicator will count the number of countries within a region or globally that fall under each of the five bands, as a proportion of the countries within a region or globally that have reported this indicator. This approach better illustrates the distribution of scores in each region and avoids determining a mean score for a region that assumes that non-reporting countries are equal to the mean, which would not be appropriate for a means-of-implementation type indicator like this.  
  
  
  
Sources of discrepancies:  
  
Data for this indicator is not internationally estimated.  
  
  
  
Methods and guidance available to countries for the compilation of the data at the national level:  
  
Once the countries receive the questionnaire, they will have access to a manual that will guide the user along the best process for completing the questionnaire. Due to the various themes that are covered within the questionnaire, it is essential that the focal point or user gather the responses using a well-coordinated process involving all the relevant staff that are in charge of the work within the various themes contained within the questionnaire, such as the focal point for the indicator. Additionally, the manual will also have a section describing the methodology of the indicator.  
  
  
  
Within the questionnaire application, the user will be able to find pop up guides embedded in the application describing technical aspects or terms encountered.  
  
  
  
URL to the authenticated CCRF questionnaire application: FAO Questionnaire for Monitoring the Implementation of the Code of Conduct for Responsible Fisheries and Related Instruments  
  
  
  
Quality assurance  
  
The questionnaire was created upon the request of the Members to the Committee on Fisheries. Within this process, FAO would not be in a position to question the responses of countries. Equally, this would require independent analysis of the status of implementation in the field of all responding countries for every edition of the questionnaire, a task that would require a substantial outlay of resources.   
  
  
  
FAO is however carrying out national and regional workshops on the implementation of international instruments to combat IUU fishing. During these workshops, the indicator is used a tool to understand the situation within the countries, all the while ensuring that there is a clear understanding of the questions or any other technical aspects relevant to this indicator.   
  
  
  
Furthermore, once the user has completed the questionnaire, the user is able to extract a report of the indicator detailing their responses to the relevant questions and the corresponding scoring. The questionnaire respondent will then be able to validate the indicator score, which will in turn be automatically stored onto FAO databases. This system has been put in place, not only to ensure that no mistakes were made during the completion of the questionnaire but also to ensure transparency of the indicator process.  
  
  
  
Data Sources  
  
Description:  
  
For the complete list of questions used for this indicator, please refer to appendix 1.   
  
  
  
The questionnaire is sent out to all FAO member States on a biennial basis. The questions used for this indicator will be included into the Committee on Fisheries Questionnaire for monitoring the implementation of the 1995 FAO Code of Conduct for Responsible Fisheries and related instruments.   
  
  
  
Collection process:  
  
This questionnaire is run on a web-application, which automatically records the submissions from the countries onto a database. The indicator will be extracted automatically from their responses, with a report of the indicator shown to the respondent prior to final submission. This will ensure transparency of the process and will allow for final confirmation of the results.  
  
  
  
In the previous edition of this questionnaire, 90 States and the EU responded to a relevant section that will be expanded to cover variable 1 of this indicator. The EU responded on behalf of its member States for this particular section. The sample size will differ from year to year depending on the number of respondents. The next questionnaire will be sent out towards the end of 2017 and remain open for 2-3 month period.  
  
  
  
Data Availability  
  
Description:  
  
The data required for this indicator is not currently available. It will become available in early 2018 after the closure of the 2017/18 edition of the Questionnaire for monitoring the implementation of the 1995 FAO Code of Conduct for Responsible Fisheries. Thereafter it will be collected regularly every two years through the Questionnaire for monitoring the implementation of the 1995 FAO Code of Conduct for Responsible Fisheries.  
  
  
  
Time series:  
  
2017 (When available will become baseline)  
  
  
  
Calendar  
  
Data collection:  
  
 Current data collection cycle: November 2017 – February 2018  
  
 Next data collection cycle: November 2019 – February 2020  
  
   
  
Data release:  
  
Current data collection cycle: April-June 2018  
  
Next data collection cycle: April-June 2020   
  
Data providers  
  
Data is typically provided by the National Fishery Ministries/departments.  
  
  
  
Data compilers  
  
FAO  
  
  
  
References  
  
URL:   
  
SDG 14.6.1: http://www.fao.org/sustainable-development-goals/indicators/14.6.1/en/  
  
  
  
Related indicators as of February 2020  
  
SDG 1, SDG 2, SDG 5, SDG 12, SDG 13, SDG 14.2/4/5/6/7/c  
  
  
  
Appendix 1: Questions and scoring   
  
Section not applicable if:  
  
Question not applicable if:  
  
Questions:  
  
Response Type  
  
Total Possible Indicator Score per Question:  
  
Indicator Score per Response Type:  
  
Variable Weighting Multiplier:  
  
  
  
  
  
(Note: when applicable “1-5” is a range representing extent of implementation starting from “1” being “Not at all” up to “5” being “Fully”)  
  
  
  
  
  
Yes  
  
No  
  
1  
  
2  
  
3  
  
4  
  
5  
  
  
  
   
  
   
  
General Questions to Determine a States Applicability to Instruments to Combat IUU Fishing  
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
-  
  
   
  
A.1) Is your country land-locked?  
  
Yes/No  
  
-  
  
-  
  
-  
  
-  
  
-  
  
-  
  
-  
  
-  
  
-  
  
  
  
  
  
A.2) Does your country flag vessels conducting fishing and fishing related activities to operate in:   
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
  
  
  
  
"Yes" to: A.1  
  
A.2.1) Areas within the national jurisdiction of your country including your Economic Exclusive Zone (e.g. internal waters, territorial sea and archipelagic waters of an archipelagic State)?  
  
Yes/No  
  
-  
  
-  
  
-  
  
-  
  
-  
  
-  
  
-  
  
-  
  
  
  
  
  
   
  
A.2.2) The High Seas?  
  
Yes/No  
  
-  
  
-  
  
-  
  
-  
  
-  
  
-  
  
-  
  
-  
  
  
  
  
  
  
  
A.2.3) Waters under the jurisdiction of other coastal States?  
  
Yes/No  
  
-  
  
-  
  
-  
  
-  
  
-  
  
-  
  
-  
  
-  
  
  
  
  
  
  
  
A.3) Are any of the vessels flying your flag conducting fishing and fishing related activities authorised by other States to operate in:  
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
  
  
  
  
  
  
A.3.1) Waters under the jurisdiction of the concerned State(s)?  
  
Yes/No  
  
   
  
-  
  
-  
  
-  
  
-  
  
-  
  
-  
  
-  
  
  
  
  
  
  
  
A.3.2) The High Seas?  
  
Yes/No  
  
   
  
-  
  
-  
  
-  
  
-  
  
-  
  
-  
  
-  
  
  
  
  
  
"Yes" to: A.1  
  
A.3) Does your country authorise vessels flying the flag of other States and which conduct fishing and fishing related activities, to:  
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
  
  
  
  
  
  
A.3.1) Enter and use the designated ports of your country?  
  
Yes/No  
  
-  
  
-  
  
-  
  
-  
  
-  
  
-  
  
-  
  
-  
  
  
  
  
  
  
  
A.3.2) Operate within waters under the jurisdiction of your country including your Economic Exclusive Zone (e.g. internal waters, territorial sea and archipelagic waters of an archipelagic State)?  
  
Yes/No  
  
-  
  
-  
  
-  
  
-  
  
-  
  
-  
  
-  
  
-  
  
  
  
   
  
   
  
Variable 1. the 1982 United Nations Convention on the Law of the Sea - Weighting 10%  
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
"Yes" to: A.1 and "No" to: A.2.2, A.2.3, A.3.1 and A.3.2  
  
   
  
1.1) Is your country a Party to the United Nations Convention on the Law of the Sea (UNCLOS)?  
  
Yes/No  
  
0.2  
  
0.2  
  
0  
  
-  
  
-  
  
-  
  
-  
  
   
  
x10 if Variable Applicable  
  
  
  
"Yes" to: 1.1  
  
1.2) If no to 1.1, has your country initiated the process to becoming Party to UNCLOS?  
  
Yes/No  
  
0.1  
  
0.1  
  
0  
  
-  
  
-  
  
-  
  
-  
  
   
  
  
  
  
  
   
  
1.3) To what extent is your country implementing the provisions of the UNCLOS in relation to coastal States and flag State responsibilities for the management of fisheries, with regard to:  
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
  
  
  
  
  
  
 1.3.1) Policy  
  
1-5  
  
0.2  
  
-  
  
-  
  
0  
  
0.05  
  
0.1  
  
0.15  
  
0.2  
  
  
  
  
  
  
  
 1.3.2) Legislation  
  
1-5  
  
0.2  
  
-  
  
-  
  
0  
  
0.05  
  
0.1  
  
0.15  
  
0.2  
  
  
  
  
  
  
  
 1.3.3) Institutional framework  
  
1-5  
  
0.2  
  
-  
  
-  
  
0  
  
0.05  
  
0.1  
  
0.15  
  
0.2  
  
  
  
  
  
  
  
 1.3.4) Operations and procedures  
  
1-5  
  
0.2  
  
-  
  
-  
  
0  
  
0.05  
  
0.1  
  
0.15  
  
0.2  
  
  
  
   
  
   
  
Variable 2. the 1995 United Nations Fish Stocks Agreement - Weighting 10%  
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
"Yes" to: A.1 and "No" to: A.2.2, A.2.3, A.3.1 and A.3.2 or "No" to: A.2-A.4  
  
   
  
2.1) Is your country a Party to the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (UN Fish Stocks Agreement)?  
  
Yes/No  
  
0.2  
  
0.2  
  
0  
  
-  
  
-  
  
-  
  
-  
  
   
  
x10 if Variable Applicable  
  
  
  
"Yes" to: 2.1  
  
2.2) If no to 2.1, has your country initiated the process to becoming Party to the UN Fish Stocks Agreement?  
  
Yes/No  
  
0.1  
  
0.1  
  
0  
  
-  
  
-  
  
-  
  
-  
  
   
  
  
  
  
  
   
  
2.3) To what extent is your country implementing the provisions of the UN Fish Stocks Agreement in relation to coastal State and flag State responsibilities for the management of fisheries, with regard to:  
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
  
  
  
  
  
  
 2.3.1) Policy  
  
1-5  
  
0.1  
  
-  
  
-  
  
0  
  
0.025  
  
0.05  
  
0.075  
  
0.1  
  
  
  
  
  
  
  
 2.3.2) Legislation  
  
1-5  
  
0.1  
  
-  
  
-  
  
0  
  
0.025  
  
0.05  
  
0.075  
  
0.1  
  
  
  
  
  
  
  
 2.3.3) Institutional framework  
  
1-5  
  
0.1  
  
-  
  
-  
  
0  
  
0.025  
  
0.05  
  
0.075  
  
0.1  
  
  
  
  
  
  
  
 2.3.4) Operations and procedures  
  
1-5  
  
0.1  
  
-  
  
-  
  
0  
  
0.025  
  
0.05  
  
0.075  
  
0.1  
  
  
  
  
  
  
  
2.4) To what extent is your country engaged in sub-regional, regional and international cooperation in enforcement, as required by the UN Fish Stocks Agreement?  
  
1-5  
  
0.4  
  
-  
  
-  
  
0  
  
0.025  
  
0.05  
  
0.075  
  
0.1  
  
  
  
   
  
   
  
Variable 3. National Plan of Action to Combat IUU Fishing in Line with IPOA-IUU - Weighting 30%  
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
"Yes" to: A.1 and "No" to: A.2.2, A.2.3, A.3.1 and A.3.2 or "No" to: A.2-A.4  
  
   
  
3.1) Has your country developed a national plan of action to combat IUU fishing (NPOA-IUU)?  
  
Yes/No  
  
0.2  
  
0.2  
  
0  
  
-  
  
-  
  
-  
  
-  
  
-  
  
x30 if Variable Applicable  
  
  
  
"Yes" to: 3.1  
  
3.2) If no to 3.1, is there an intention to develop a national plan of action?  
  
Yes/No  
  
0.1  
  
0.1  
  
0  
  
-  
  
-  
  
-  
  
-  
  
-  
  
  
  
  
  
"No" to: 3.1  
  
3.3) If yes to 3.1, to what extent has your country implemented its NPOA-IUU, with regard to:  
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
  
  
  
  
  
  
 3.3.1) Policy  
  
1-5  
  
0.2  
  
-  
  
-  
  
0  
  
0.05  
  
0.1  
  
0.15  
  
0.2  
  
  
  
  
  
  
  
 3.3.2) Legislation  
  
1-5  
  
0.2  
  
-  
  
-  
  
0  
  
0.05  
  
0.1  
  
0.15  
  
0.2  
  
  
  
  
  
  
  
 3.3.3) Institutional framework  
  
1-5  
  
0.2  
  
-  
  
-  
  
0  
  
0.05  
  
0.1  
  
0.15  
  
0.2  
  
  
  
  
  
  
  
 3.3.4) Operations and procedures  
  
1-5  
  
0.2  
  
-  
  
-  
  
0  
  
0.05  
  
0.1  
  
0.15  
  
0.2  
  
  
  
   
  
   
  
Variable 4. the 2009 FAO Agreement on Port State Measures - Weighting 30%  
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
"Yes" to: A.1 and "No" to: A.2.2, A.2.3, A.3.1 and A.3.2 or "No" to: A.2-A.4  
  
   
  
4.1) Is your country Party to The FAO Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (PSMA)?  
  
Yes/No  
  
0.2  
  
0.2  
  
0  
  
-  
  
-  
  
-  
  
-  
  
   
  
x30 if Variable Applicable  
  
  
  
"Yes" to: 4.1  
  
4.2) If no to 4.1, has your country initiated the process to become a Party to the PSMA?  
  
Yes/No  
  
0.1  
  
0.1  
  
0  
  
-  
  
-  
  
-  
  
-  
  
   
  
  
  
  
  
   
  
4.3) To what extent has your country implemented the provisions of the PSMA, with regard to: (even through relevant regional mechanisms)  
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
  
  
  
  
  
  
 4.3.1) Policy  
  
1-5  
  
0.15  
  
-  
  
-  
  
0  
  
0.0375  
  
0.075  
  
0.1125  
  
0.15  
  
  
  
  
  
  
  
 4.3.2) Legislation  
  
1-5  
  
0.15  
  
-  
  
-  
  
0  
  
0.0375  
  
0.075  
  
0.1125  
  
0.15  
  
  
  
  
  
  
  
 4.3.3) Institutional framework  
  
1-5  
  
0.15  
  
-  
  
-  
  
0  
  
0.0375  
  
0.075  
  
0.1125  
  
0.15  
  
  
  
  
  
  
  
 4.3.4) Operations and procedures  
  
1-5  
  
0.15  
  
-  
  
-  
  
0  
  
0.0375  
  
0.075  
  
0.1125  
  
0.15  
  
  
  
  
  
  
  
4.4) Has your country designated ports to receive vessels flying the flag of other States that are conducting fishing and fishing related activities, as required under the PSMA?  
  
Yes/No  
  
0.1  
  
0.1  
  
-  
  
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4.5) Has your country designated an authority that shall act as a contact point for the exchange of information, as required by the PSMA?  
  
Yes/No  
  
0.1  
  
0.1  
  
-  
  
-  
  
-  
  
-  
  
-  
  
   
  
  
  
   
  
   
  
Variable 5. Flag State Responsibilities - Weighting 20%  
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
"No" to: A.3 and A.4  
  
   
  
5.1) Has your country become a Party to The FAO Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas (the Compliance Agreement)?  
  
Yes/No  
  
0.15  
  
0.15  
  
0  
  
-  
  
-  
  
-  
  
-  
  
-  
  
x20 if Variable Applicable  
  
  
  
"Yes" to: 5.1  
  
5.2) If no to 5.1, has your country initiated the process to become a Party to the Compliance Agreement?  
  
Yes/No  
  
0.05  
  
0.05  
  
0  
  
-  
  
-  
  
-  
  
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-  
  
  
  
  
  
   
  
5.3) To what extent has the Compliance Agreement and/or other flag state responsibilities been implemented with regard to:  
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
  
  
  
  
  
  
 5.3.1) Policy  
  
1-5  
  
0.1  
  
-  
  
-  
  
0  
  
0.025  
  
0.05  
  
0.075  
  
0.1  
  
  
  
  
  
  
  
 5.3.2) Legislation  
  
1-5  
  
0.1  
  
-  
  
-  
  
0  
  
0.025  
  
0.05  
  
0.075  
  
0.1  
  
  
  
  
  
  
  
 5.3.3) Institutional framework  
  
1-5  
  
0.1  
  
-  
  
-  
  
0  
  
0.025  
  
0.05  
  
0.075  
  
0.1  
  
  
  
  
  
  
  
 5.3.4) Operations and procedures  
  
1-5  
  
0.1  
  
-  
  
-  
  
0  
  
0.025  
  
0.05  
  
0.075  
  
0.1  
  
  
  
  
  
  
  
5.4) Does your country maintain a record of vessels authorized by your country to operate on the high seas conducting fishing and fishing related activities and suply the record to the FAO or interested States at their request?  
  
Yes/No  
  
0.075  
  
0.08  
  
0  
  
-  
  
-  
  
-  
  
-  
  
-  
  
  
  
  
  
  
  
5.5) Does your country ensure that vessels flying your flag, that are conducting fishing and fishing related activities, have not engaged in previous activities that has undermined the effectiveness of international conservation and management measures, unless it has satisfied certain requirements in line with the provisions of the FAO Compliance Agreement or the UN Fish Stocks Agreement?  
  
Yes/No  
  
0.075  
  
0.08  
  
0  
  
-  
  
-  
  
-  
  
-  
  
-  
  
  
  
  
  
  
  
5.6) Does your country ensure that vessels flying your flag, that are conducting fishing and fishing related activities, provide your country with information on its operations as may be necessary to enable your country to fulfil its obligations as a flag State?  
  
Yes/No  
  
0.075  
  
0.08  
  
0  
  
-  
  
-  
  
-  
  
-  
  
-  
  
  
  
  
  
  
  
5.7) Does your country ensure vessels flying your flag do not conduct unauthorised fishing or fishing related activities within areas under jurisdiction of other States?  
  
Yes/No  
  
0.075  
  
0.08  
  
0  
  
-  
  
-  
  
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-  
  
  
  
  
  
  
  
5.8) Has your country undertaken an assessment of your country’s performance as a flag State in accordance with The FAO Voluntary Guidelines for Flag State Performance?  
  
Yes/No  
  
0.15  
  
0.15  
  
0  
  
-  
  
-  
  
-  
  
-  
  
-  
  
  
  
  
  
"Yes" to: 5.8  
  
5.9) If no to 5.8, does your country intend to do so in the future?  
  
Yes/No  
  
0.05  
  
0.05  
  
0  
  
-  
  
-  
  
-  
  
-  
  
-  
  
  
  
   
  
   
  
   
  
   
  
Final Indicator Score = Total of Variables / Total Multiplier of Applicable Variables  
  
  
  
  
  
Appendix 2: Example indicator scoring  
  
The general question ascertain the applicability of the instruments to a State.  
  
  
  
- Country A is a coastal State, port State and flag State with high levels of implementation of instruments to combat IUU fishing.  
  
  
  
- Country B is a coastal State, port State and flag State with very low levels of implementation of instruments to combat IUU fishing, however it still scores some points for initiating the processes of becoming a party to certain agreements and base implementation of UNCLOS.  
  
  
  
- Country C is a coastal State and port State but does not flag any vessels conducting fishing or fishing related activities. It is not a party to any of the agreements but has a high level of implementation of instruments to combat IUU fishing to which it is applicable.  
  
  
  
  
  
The table on the next page shows hypothetical responses for this three countries, the scores that they achieve with these responses and finally the bands that these scores translate into.  
  
Questions:  
  
Country A  
  
Country B  
  
Country C  
  
  
  
Responses  
  
 Variable Score  
  
Responses  
  
Variable Score  
  
Responses  
  
Variable Score  
  
General Questions  
  
A.1  
  
No  
  
  
  
-  
  
No  
  
  
  
-  
  
No  
  
  
  
-  
  
A.2.1  
  
Yes  
  
  
  
Yes  
  
  
  
No  
  
  
  
A.2.2  
  
Yes  
  
  
  
Yes  
  
  
  
No  
  
  
  
A.2.3  
  
Yes  
  
  
  
Yes  
  
  
  
No  
  
  
  
A.3.1  
  
Yes  
  
  
  
Yes  
  
  
  
No  
  
  
  
A.3.2  
  
Yes  
  
  
  
Yes  
  
  
  
No  
  
  
  
A.4.1  
  
Yes  
  
  
  
Yes  
  
  
  
Yes  
  
  
  
A.4.2  
  
Yes  
  
  
  
Yes  
  
  
  
Yes  
  
  
  
Variable 1. UNCLOS – 10%  
  
1.1  
  
Yes  
  
  
  
0.9  
  
Yes  
  
  
  
0.5  
  
No  
  
  
  
0.7  
  
1.2  
  
n/a  
  
  
  
n/a  
  
  
  
No  
  
  
  
1.3.1  
  
4  
  
  
  
3  
  
  
  
5  
  
  
  
1.3.2  
  
5  
  
  
  
3  
  
  
  
5  
  
  
  
1.3.3  
  
5  
  
  
  
2  
  
  
  
4  
  
  
  
1.3.4  
  
4  
  
  
  
2  
  
  
  
4  
  
  
  
Variable 2. Fish Stocks Agreement – 10%  
  
2.1  
  
Yes  
  
  
  
0.85  
  
No  
  
  
  
0.1  
  
No  
  
  
  
0.75  
  
2.2  
  
n/a  
  
  
  
Yes  
  
  
  
No  
  
  
  
2.3.1  
  
4  
  
  
  
1  
  
  
  
4  
  
  
  
2.3.2  
  
5  
  
  
  
1  
  
  
  
5  
  
  
  
2.3.3  
  
5  
  
  
  
1  
  
  
  
5  
  
  
  
2.3.4  
  
4  
  
  
  
1  
  
  
  
4  
  
  
  
2.4  
  
4  
  
  
  
1  
  
  
  
5  
  
  
  
Variable 3. IPOA-IUU – 30%  
  
3.1  
  
Yes  
  
  
  
0.9  
  
No  
  
  
  
0.1  
  
Yes  
  
  
  
0.95  
  
3.2  
  
n/a  
  
  
  
Yes  
  
  
  
n/a  
  
  
  
3.3.1  
  
4  
  
  
  
n/a  
  
  
  
5  
  
  
  
3.3.2  
  
5  
  
  
  
n/a  
  
  
  
5  
  
  
  
3.3.3  
  
5  
  
  
  
n/a  
  
  
  
4  
  
  
  
3.3.4  
  
4  
  
  
  
n/a  
  
  
  
5  
  
  
  
Variable 4. PSMA – 30%  
  
4.1  
  
Yes  
  
  
  
0.725  
  
No  
  
  
  
0  
  
No  
  
  
  
0.725  
  
4.2  
  
n/a  
  
  
  
No  
  
  
  
No  
  
  
  
4.3.1  
  
5  
  
  
  
1  
  
  
  
5  
  
  
  
4.3.2  
  
5  
  
  
  
1  
  
  
  
5  
  
  
  
4.3.3  
  
5  
  
  
  
1  
  
  
  
4  
  
  
  
4.3.4  
  
3  
  
  
  
1  
  
  
  
4  
  
  
  
4.4  
  
No  
  
  
  
No  
  
  
  
No  
  
  
  
4.5  
  
No  
  
  
  
No  
  
  
  
No  
  
  
  
Variable 5. Flag State Responsibilities – 20%  
  
5.1  
  
Yes  
  
  
  
  
  
0.975  
  
No  
  
  
  
  
  
0.175  
  
  
  
n/a  
  
  
  
  
  
n/a\*  
  
5.2  
  
n/a  
  
  
  
Yes  
  
  
  
n/a  
  
  
  
5.3.1  
  
5  
  
  
  
1  
  
  
  
n/a  
  
  
  
5.3.2  
  
5  
  
  
  
1  
  
  
  
n/a  
  
  
  
5.3.3  
  
5  
  
  
  
1  
  
  
  
n/a  
  
  
  
5.3.4  
  
4  
  
  
  
1  
  
  
  
n/a  
  
  
  
5.4  
  
Yes  
  
  
  
Yes  
  
  
  
n/a  
  
  
  
5.5  
  
Yes  
  
  
  
No  
  
  
  
n/a  
  
  
  
5.6  
  
Yes  
  
  
  
No  
  
  
  
n/a  
  
  
  
5.7  
  
Yes  
  
  
  
No  
  
  
  
n/a  
  
  
  
5.8  
  
Yes  
  
  
  
No  
  
  
  
n/a  
  
  
  
5.9  
  
n/a  
  
  
  
Yes  
  
  
  
n/a  
  
  
  
Indicator Score:   
  
(Weighted average)  
  
  
  
  
  
0.86  
  
0.13  
  
0.73  
  
Band  
  
5  
  
1  
  
4

Last updated: 29 May 2018  
  
  
  
Goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development  
  
Target 14.b: Provide access for small-scale artisanal fishers to marine resources and markets  
  
Indicator 14.b.1: Progress by countries in the degree of application of a legal/regulatory/policy/institutional framework which recognizes and protects access rights for small-scale fisheries  
  
  
  
Institutional information  
  
  
  
Organization(s):   
  
Food and Agriculture Organisation of the United Nations  
  
  
  
Concepts and definitions  
  
  
  
Definition:  
  
Progress by number of countries in the degree of application of a legal/regulatory/policy/institutional framework which recognizes and protects access rights for small-scale fisheries.  
  
  
  
Rationale:  
  
Target 14.b focuses on access to resources and markets for small-scale fisheries, in line with the Rio+20 outcome document para, 175. In order to guarantee secure access, an enabling environment is necessary which recognizes and protects small-scale fisheries rights. Such an enabling environment has three key features:  
  
Appropriate legal, regulatory and policy frameworks;   
  
Specific initiatives to support small-scale fisheries; and  
  
Related institutional mechanisms which allow for the participation of small-scale fisheries organisations in relevant processes.   
  
  
  
The 32nd Session of the FAO Committee on Fisheries agreed that the data submitted through the Code of Conduct for Responsible Fisheries (CCRF) questionnaire could be used by Members for reporting on Sustainable Development Goals (SDGs) indicators.  
  
  
  
The indicator variables are therefore chosen from three of the five questions on small-scale fisheries of the CCRF questionnaire to reflect these three aspects:  
  
Are there any laws, regulations, policies, plans or strategies that specifically target or address the small-scale fisheries sector?  
  
Are there any ongoing specific initiatives to implement the SSF Guidelines?  
  
Does your country have an advisory/consultative body to the Ministry/Department of Fisheries in which fishers/fish workers can participate and contribute to decision-making processes?  
  
  
  
The national indicator is calculated based on these questions specifically focusing on actual efforts of promoting and facilitating access rights to small scale fisheries.  
  
  
  
Although the exact score will be important from one reporting year to the next for determining the progress made by a country, to aid the interpretation of this indicator, the score will then be converted into one of 5 bands as following:  
  
Score  
  
Bands  
  
>0 –< 0.2  
  
Band 1: Very low implementation of instruments for access to resources and markets for small-scale fisheries  
  
0.2 –< 0.4  
  
Band 2: Low implementation of instruments for access to resources and markets for small-scale fisheries  
  
0.4 –< 0.6  
  
Band 3: Medium implementation of instruments for access to resources and markets for small-scale fisheries  
  
0.6 –< 0.8  
  
Band 4: High implementation of instruments for access to resources and markets for small-scale fisheries  
  
0.8 – 1.0  
  
Band 5: Very high implementation of instruments for access to resources and markets for small-scale fisheries  
  
  
  
  
  
Concepts:  
  
National Statistical Systems already collect fisheries-relevant data, with a focus on production, employment, and trade. Relevant concepts can be found at CWP Handbook of Fishery Statistical Standards of the Coordinating Working Party on Fisheries Statistics (CWP).   
  
  
  
Comments and limitations:  
  
It should be noted that while target 14.b refers to access for small-scale artisanal fishers to marine resources and markets some landlocked countries with inland fisheries have taken the opportunity to report on this indicator.  
  
  
  
Methodology  
  
  
  
Computation Method:  
  
The indicator is calculated using three variables, which are given respective weightings for the final calculation. There has not been a change in the calculation, nor the use of mixed sources.   
  
  
  
Variable 1: Existence of laws, regulations, policies, plans or strategies that specifically target or address the small-scale fisheries sector  
  
Variable 2: Ongoing specific initiatives to implement the SSF Guidelines  
  
Variable 3: Existence of mechanisms enabling small-scale fishers and fish workers to contribute to decision-making processes   
  
  
  
Performance is scored based on the country responses to the relevant portions of three questions included in the Code of Conduct for Responsible Fisheries Questionnaire (CCRF). These questions have been transformed into weighted variables for the purpose of calculating the country scores. The target has been set at a positive (‘yes’) response to all the sub-variables, resulting in a score of 1.   
  
  
  
   
  
Sub-variables  
  
Weight  
  
   
  
   
  
Sub-variables  
  
Weight  
  
Variable 1  
  
1.1  
  
0.1  
  
   
  
Variable 2  
  
2.1  
  
0.03  
  
  
  
1.2  
  
0.1  
  
   
  
  
  
2.2  
  
0.03  
  
  
  
1.3  
  
0.1  
  
   
  
  
  
2.3  
  
0.03  
  
  
  
1.4  
  
0.1  
  
   
  
  
  
2.4  
  
0.03  
  
  
  
1.5  
  
1  
  
   
  
  
  
2.5  
  
0.03  
  
   
  
Variable weight  
  
0.4  
  
   
  
  
  
2.6  
  
0.03  
  
1 Sub-variable 1.5 is only weighted when a response of 'yes' is provided along with supporting details in the text form.   
  
   
  
  
  
2.7  
  
0.03  
  
  
  
   
  
  
  
2.8  
  
0.03  
  
  
  
   
  
  
  
2.9  
  
0.03  
  
   
  
   
  
   
  
   
  
  
  
2.10  
  
0.03  
  
   
  
   
  
   
  
   
  
  
  
Indicator weight  
  
0.3  
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
   
  
Sub-variables  
  
Weight  
  
   
  
   
  
   
  
   
  
Variable 3  
  
3.1  
  
0.3  
  
   
  
   
  
   
  
   
  
  
  
Indicator weight  
  
0.3  
  
  
  
  
  
The higher weighting assigned to Variable 1 reflects the slightly greater importance of that indicator for assessing the degree of application of a legal/regulatory/policy/institutional framework which recognizes and protects access rights for small-scale fishers.   
  
  
  
Each sub-variable is scored on the basis of a ‘yes’ or ‘no’ response and any ‘blank’ or ‘unknown’ responses are scored as a ‘no’, or zero. A response of yes results in a score that corresponds with the full weighting value for that variable category. For example, a ‘yes’ response for variables 1.3, 2.1 and 3.1 are scored as 0.1, 0.03 and 0.3 respectively.  
  
  
  
One exception is made in the case of sub-variable 1.5. This question allows a response of ‘other’ with an associated text field. A positive response in this field is only scored as a ‘yes’ in the case where the text field is also completed AND at least one of the other prior sub-variable were scored as ‘no’. This allows the indicator weighting to remain consistent in all cases.  
  
  
  
Once the specific score has been determined for each country, countries will be classified into a number of bands, ranging from a low to a high degree of implementation, and thus effectively translate a synthetic score into a tangible and intuitive metric for countries.   
  
  
  
Disaggregation:  
  
The disaggregation level is the national level. No demographic features are included in the indicators and are thus excluded from the consideration of level of disaggregation.   
  
  
  
Treatment of missing values:  
  
At country level  
  
The most appropriate methodology for producing estimates for the indicator when the country data are not available would be the use of expert consultation and judgement rather than the use of mathematical formula for data imputation. The use of expert judgement is a critical factor as the indicator asses the state of management/ policy implementation at a national level, not values that could be readily inputted.   
  
At regional and global levels  
  
Not applicable  
  
  
  
Regional aggregates:  
  
The categorization into the respective bands will also apply in the case of regional and global aggregates for this indicator. Once the mean score for an SDG region has been calculated, the region will be classified into a particular band reflecting the degree of implementation of relevant instruments.  
  
Data is combined for the respective nations within a region, as a count of the number of countries by Band, and this can be further aggregated to the global level without the need for any weighting of national or regional scores.   
  
  
  
Sources of discrepancies:  
  
There might be differences between a national estimated based on an expert judgment, in case of country data is not available, and the answer a country would give via the self-assessment questionnaire. This can happen not only because the expert judgement represents the best approximation to the reality, but not the reality itself, and/or due to the well-known self-report bias verifiable in this type of surveys that means countries will by tendency report a better reality that the one indeed in place.  
  
  
  
Methods and guidance available to countries for the compilation of the data at the national level:  
  
Data is collected through an electronic questionnaire submitted by FAO to the country focal points for the CCRF questionnaire, usually in the national fisheries administration. Data are validated upon intake of the questionnaires. No adjustments are required for the data for definitions nor for classification or demographic harmonization.  
  
  
  
Quality assurance  
  
Data are checked for their correctness; completeness; consistency along the process of data entry, and/or through a specific statistical analysis as the yearly data set is closed.   
  
  
  
The indicator relies on data generated through the CCRF questionnaire which is filled in by countries on a biannual basis. To facilitate reporting of the CCRF-based SDG indicators, a tailor-made data processing tool has been developed within the framework of the existing CCRF questionnaire online platform. Upon submission of the questionnaire by the user, an indicator report will automatically be generated for final validation by the country.  
  
  
  
Data Sources  
  
  
  
Description:  
  
Data is based on the replies to three questions of the CCRF questionnaire. It is usually provided from administrative sources, as best identified by the national fisheries administration responsible for replying to the CCRF questionnaire. The data is based on the presence of relevant laws, regulations, policies, plans or strategies and how these have been implemented so both legislative, management, and other documentation must be consulted to respond to the queries.  
  
  
  
Collection process:  
  
The CCRF questionnaire is a web-based system, with related data processing tools and usability features. Data is collected from FAO member countries every two years to be reported at aggregated level on the occasion of the sessions of the FAO Committee on Fisheries (COFI), usually in the period November to March preceding the session of COFI. In 2016, for the 32nd Session of COFI, 92 countries and the European Union (EU) responded to the section on small-scale fisheries of the CCRF questionnaire, which includes the three questions providing the variables for indicator 14.b.1.  
  
  
  
Data Availability  
  
  
  
Description:  
  
In 2016, 92 countries and the European Union replied to the questionnaire section on the three indicators to measure target performance for 14.b.1   
  
  
  
Breakdown of the number of countries covered by region is as follows:  
  
  
  
Number of countries  
  
Nature of data  
  
World  
  
120  
  
G  
  
Africa  
  
26  
  
G  
  
Northern Africa  
  
1  
  
G  
  
Sub-Saharan Africa  
  
25  
  
G  
  
Eastern Africa  
  
9  
  
G  
  
Middle Africa  
  
6  
  
G  
  
Southern Africa  
  
4  
  
G  
  
Western Africa  
  
6  
  
G  
  
Americas  
  
27  
  
G  
  
Latin America and the Caribbean  
  
25  
  
G  
  
Caribbean  
  
9  
  
G  
  
Latin America  
  
14  
  
G  
  
Northern America  
  
2  
  
G  
  
Asia  
  
25  
  
G  
  
Central Asia  
  
2  
  
G  
  
Eastern Asia  
  
2  
  
G  
  
Southern Asia  
  
6  
  
G  
  
South-Eastern Asia  
  
8  
  
G  
  
Western Asia  
  
8  
  
G  
  
Europe  
  
35  
  
G  
  
Eastern Europe  
  
8  
  
G  
  
Northern Europe  
  
9  
  
G  
  
Southern Europe  
  
9  
  
G  
  
Western Europe  
  
9  
  
G  
  
Oceania  
  
7  
  
G  
  
Australia and New Zealand  
  
2  
  
G  
  
Melanesia  
  
2  
  
G  
  
Micronesia  
  
2  
  
G  
  
Polynesia  
  
1  
  
G  
  
  
  
  
  
Time series:  
  
2016 (baseline)  
  
  
  
Calendar  
  
  
  
Data collection:  
  
 The next data collection cycle will be conducted and completed by May 2018.  
  
   
  
Data release:  
  
The data will be processed and released by July 2018.  
  
  
  
Data providers  
  
Data is typically provided by the National Fishery Ministries/departments.  
  
  
  
Data compilers  
  
FAO  
  
  
  
References  
  
URL:   
  
SDG 14.b http://www.fao.org/sustainable-development-goals/indicators/14.b.1/en/  
  
e-learning course on SDG indicator 14.b.1: http://www.fao.org/elearning/#/elc/en/course/SDG14B1  
  
  
  
References:  
  
32nd Session of the FAO Committee on Fisheries – relevant documents:  
  
http://www.fao.org/3/a-mq663e.pdf  
  
http://www.fao.org/3/a-mq873e.pdf  
  
http://www.fao.org/3/a-bo076e.pdf  
  
Related indicators as of February 2020  
  
Linkages with any other Goals and Targets: SDG 1, SDG 2 (in particular 2.3), SDG 5, SDG 12, SDG 13, SDG 14.2/4/5/6/7

Last updated: October 2019  
  
Goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development  
  
Target 14.1: By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution  
  
Indicator 14.2.1: Number of countries using ecosystem-based approaches to managing marine areas  
  
  
  
Institutional information  
  
  
  
Organization(s):  
  
UN Environment (United Nations Environment Programme/UNEP)  
  
  
  
Concepts and definitions  
  
  
  
Definition:   
  
Regional Seas Coordinated Indicator 22 ‘Integrated Coastal Zone Management (ICZM) is proposed as the primary indicator. For countries with Marine/Maritime Spatial Planning (MSP) in place, these plans can be helpful to assess ICZM. For other countries, it is important to identify ways to measure existing plans and to build capacity for integrated planning. All data for this indicator will be based on country submissions to the Regional Seas Programme.   
  
  
  
In order to promote the use of the Regional Seas as part of the follow-up and review mechanism for the Regional Seas, UNEP drafted report on how Regional Seas data could be directly used for the SDGs (see https://wedocs.unep.org/bitstream/handle/20.500.11822/27295/ocean\_SDG.pdf?sequence=1&isAllowed=y).  
  
  
  
A full methodology for this indicator is available in the document entitled, “Global Manual on Ocean Statistics for Measuring SDG 14.1.1, 14.2.1 and 14.5.1”.  
  
  
  
Rationale:  
  
From an ecological perspective, ecosystem approaches consider the connections between the living organisms, habitats, physical and chemical conditions within an ecosystem, focusing on the importance of ecological integrity, biodiversity and overall ecosystem health. From a management perspective, ecosystem-based approaches refer to integrated management strategies for socio-ecological systems that consider ecological, social and economic factors and apply principles of sustainable development.   
  
  
  
A marine or coastal area-based (or spatial) management promotes better management of EEZs. Many countries use Marine Spatial Planning (MSP) and Integrated Coastal Zone Management (ICZM) as their approach for ensuring appropriate ecosystem-based management, including issues that are cross-sectoral and wider scale in nature.   
  
  
  
Concepts:  
  
ICZM – An Integrated Coastal Zone Management (ICZM) plan covers the entire coastal zone. Marine and terrestrial areas are managed together. Plans are developed through coordination across different marine and terrestrial institutions and agencies.  
  
Marine Spatial Planning (MSP) – Marine Spatial Planning is focused on the EEZ. It the integrates the needs and policies of multiple marine sectors in one coherent planning framework.  
  
EEZ - national Exclusive Economic Zone (EEZ) (200 nautical miles from the coast) as outlined by the United Nations Convention on the Law of the Sea.   
  
  
  
Comments and limitations:   
  
The Indicator only measures the policy formulation and not policy implementation.   
  
  
  
  
  
Methodology  
  
Computation Method   
  
A full methodology for this indicator is available in the document entitled, “Global Manual on Ocean Statistics for Measuring SDG 14.1.1, 14.2.1 and 14.5.1”.  
  
  
  
Regional Seas Coordinated Indicator 22 ‘Integrated Coastal Zone Management (ICZM) is proposed as the primary indicator. For countries with Marine/Maritime Spatial Planning (MSP) in place, these plans can be helpful to assess ICZM. For other countries, it is important to identify ways to measure existing plans and to build capacity for integrated planning. All data for this indicator will be based on country submissions to the Regional Seas Programme.   
  
  
  
This indicator will measure the number of countries using ecosystem-based approaches to manage marine areas (measured through ICZM (Integrated Coastal Zone Management), marine spatial plan or other area-based, integrated planning and management in place.  
  
  
  
Step one   
  
Identify national authorities/agencies/organisations responsible for coastal and marine/maritime planning and management.  
  
  
  
Step two   
  
Identify and spatially map the boundaries of ICZM plans or other plans at national, sub-national and local level. Coordinate with the national authorities/agencies/organisations responsible for coastal and marine/maritime planning and management to complete a questionnaire on the ICZM plans (Shipman and Petit 2014)).  
  
  
  
Step three  
  
Determine the status of implementation of each plan, and categorise the spatial map according to implementation stages:  
  
1) Initial plan preparation  
  
2) Plan development  
  
3) Plan adoption/designation  
  
4) Implementation and adaptive management  
  
Collect the questionnaire responses and document the answers is recommended. The spatial map showing the boundaries of relevant plans (produced in step two) could also be used to calculate the proportion of national waters, or national exclusive economic zone, covered by relevant plans. This can be done by overlaying the spatial layer of relevant plans with a spatial layer of national waters, or of the exclusive economic zone, to identify where the two layers coincide.   
  
  
  
All countries should report on if a plan is in place.   
  
  
  
Disaggregation:  
  
A geospatial map of areas covered by a plan is recommended for national level decision making.  
  
  
  
Treatment of missing values:  
  
Missing values are not imputed.   
  
   
  
Regional aggregates:  
  
The data will be aggregated at the sub-regional, regional and global levels by counting the number of countries with a plan for each group.  
  
Sources of discrepancies: NA  
  
  
  
Data Sources  
  
Description:  
  
Data provided by national governments   
  
  
  
Collection process:  
  
The custodian agencies propose to collect national data through the Regional Seas Programmes in order to reduce the reporting burden on countries. For countries that are not included in a Regional Seas Programme then UNEP will reach out directly.   
  
  
  
  
  
Data Availability  
  
Description:  
  
Data will be made available for all member states.  
  
  
  
Time series:  
  
National data collection through the Regional Seas already exists for many Regional Seas, this data will compiled for SDG reporting in 2020. Reporting will be every 5 years – as policy development takes time.  
  
  
  
Calendar  
  
Data collection:  
  
First data collection: Data is already being collected by the Regional Seas  
  
   
  
Data release:  
  
First reporting cycle: 2020  
  
  
  
  
  
Data providers  
  
National Statistical Systems, through the Regional Seas. The Regional Seas Programmes include the CPPS: Permanent Commission for the South Pacific (Southeast Pacific); EU MSFD: European Union Marine Strategy Framework Directive; EU WFD: European Union Water Framework Directive; GEF-TWAP: Global Environment Facility Transboundary Waters Assessment Programme; HELCOM: Helsinki Commission (Baltic Sea); Nairobi Convention (Western Indian Ocean); NOAA: National Oceanic and Atmospheric Administration; NOWPAP: Northwest Pacific Action Plan (Northwest Pacific); OSPAR: Oslo-Paris Convention (Northeast Atlantic); ROMPE: Regional organization for the Protection of the Marine Environment (ROMPE sea area); UNEP-MAP: UN Environment Mediterranean Action Plan (Mediterranean Sea)). For more information on the Regional Seas see: https://www.unenvironment.org/explore-topics/oceans-seas/what-we-do/working-regional-seas.   
  
  
  
Data compilers  
  
UN Environment (United Nations Environment Programme), in collaboration with partners mentioned in the other sections of this metadata  
  
  
  
References  
  
  
  
References:   
  
Regional Seas website: https://www.unenvironment.org/explore-topics/oceans-seas/what-we-do/working-regional-seas.   
  
  
  
UNEP Global Manual on Ocean Statistics for Measuring SDG 14.1.1, 14.2.1 and 14.5.1 (forthcoming)  
  
  
  
ICZM (and Marine Spatial Planning (MSP)) for monitoring SDG 14.1.1: https://wedocs.unep.org/bitstream/handle/20.500.11822/26440/MSP\_ICZM\_Guidelines.pdf?sequence=1&isAllowed=y  
  
  
  
Related indicators as of February 2020  
  
  
  
N/A

Last updated: October 2019  
  
  
  
  
  
  
Goal: 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development  
  
Target 14.1: By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution  
  
Indicator 14.1.1: (a) Index of coastal eutrophication; and (b) floating plastic debris density  
  
  
  
The metadata covers both part (a) Index of coastal eutrophication (ICEP) and (b) Plastic debris density.   
  
  
  
Institutional information  
  
  
  
Organization(s):  
  
UN Environment (United Nations Environment Programme/UNEP)  
  
  
  
Concepts and definitions  
  
  
  
Definition:   
  
The indicator includes 14.1.1a Index of coastal eutrophication (ICEP) and 14.1.1b Plastic debris density. SDG 14.1.1a and SDG 14.1.1b will described as two indicators. Across the 14.1.1a and 14.1.1b, two levels are proposed:   
  
Level 1: Globally available data from earth observations and modelling   
  
Level 2: National data which will be collected from countries (through the relevant Regional Seas Programme, where applicable (i.e. for countries that are a member of a Regional Seas Programme)  
  
Level 3: Additional indicators which are suggested that countries might consider collecting (these are not discussed in this document)   
  
  
  
The below tables demonstrate the proposed parameters for SDG Target 14.1.1a and 14.1.1b.  
  
  
  
Table 1: Monitoring parameters for eutrophication to track progress against SDG Indicator 14.1.1a.  
  
Monitoring parameters  
  
Level 1  
  
Level 2  
  
Level 3  
  
Reporting Frequency  
  
Indicator for Coastal Eutrophication Potential (N and P loading)  
  
X  
  
  
  
  
  
Five years  
  
Chlorophyll-a deviations (remote sensing)  
  
X  
  
  
  
  
  
Annual   
  
Chlorophyll-a concentration (remote sensing and in situ)  
  
  
  
X  
  
  
  
4 years (aligned with Regional Seas)  
  
National modelling of indicator for Coastal Eutrophication Potential (ICEP)   
  
  
  
X  
  
  
  
  
  
Total Nitrogen of DIN (dissolved inorganic nitrogen)   
  
  
  
X  
  
  
  
  
  
Total Phosphorus or DIP (dissolved inorganic phosphorus)   
  
  
  
X  
  
  
  
  
  
Total silica   
  
  
  
X  
  
  
  
  
  
Dissolved oxygen   
  
  
  
  
  
X  
  
NA  
  
Biological/chemical oxygen demand (BOD/COD)  
  
  
  
  
  
X  
  
NA  
  
Total organic carbon (TOC)  
  
  
  
  
  
X  
  
NA  
  
Turbidity (remote sensing)  
  
  
  
  
  
X  
  
NA  
  
River parameters from SDG 6.3.2  
  
  
  
  
  
X  
  
NA  
  
Other water parameters (O2 % saturation, Secchi depth, river discharge, salinity, temperature, pH, alkalinity, organic carbon, toxic metals, persistent organic pollutants)  
  
  
  
  
  
X  
  
NA  
  
Microalgal growth, harmful algal blooms, submerged aquatic vegetation coverage, biodiversity and hypoxia  
  
  
  
  
  
X  
  
NA  
  
  
  
Table 2: Monitoring parameters for marine plastic litter to track progress against SDG Indicator 14.1.1b.  
  
Monitoring parameters (and methods)  
  
 Level 1  
  
Level 2  
  
Level 3  
  
Reporting Frequency  
  
Plastic patches greater than 10 meters\*  
  
X  
  
  
  
  
  
Annual  
  
Beach litter originating from national land-based sources  
  
X  
  
  
  
  
  
Two years  
  
Beach litter (beach surveys)  
  
  
  
X  
  
  
  
4 years (aligned with Regional Seas)  
  
Floating plastics (visual observation, manta trawls)  
  
  
  
X  
  
  
  
  
  
Water column plastics (demersal trawls)  
  
  
  
X  
  
  
  
  
  
Seafloor litter (benthic trawls (e.g. fish survey trawls), divers, video/camera tows, submersibles, remotely operated vehicles)  
  
  
  
X  
  
  
  
  
  
Beach litter microplastics (beach samples)  
  
  
  
  
  
X  
  
  
  
Floating microplastics (manta trawls, e.g. Continuous Plankton Recorder)  
  
  
  
  
  
X  
  
  
  
Water column microplastics (demersal plankton trawls)  
  
  
  
  
  
X   
  
  
  
Seafloor litter microplastics (sediment samples)  
  
  
  
  
  
X  
  
  
  
Plastic ingestion by biota (e.g. birds, turtles, fish)  
  
  
  
  
  
X  
  
  
  
Plastic litter in nests  
  
  
  
  
  
X  
  
  
  
Entanglement (e.g. marine mammals, birds)  
  
  
  
  
  
X  
  
  
  
Plastic pollution potential (based on the use and landfilling of plastics)  
  
  
  
  
  
X  
  
  
  
River litter  
  
  
  
  
  
X  
  
  
  
Other parameters related to plastic consumption and recycling  
  
  
  
  
  
X  
  
  
  
Health indicators (human health and ecosystem health)  
  
  
  
  
  
X  
  
  
  
  
  
  
  
A full methodology for this indicator is available in the document entitled, “Global Manual on Ocean Statistics for Measuring SDG 14.1.1, 14.2.1 and 14.5.1”.  
  
  
  
Rationale:  
  
Coastal areas are areas of high productivity where inputs from land, sea, air and people converge. With over 40 percent of the human population residing in coastal areas, ecosystem degradation in these areas can have disproportionate effects on society (IGOS, 2006). One of the largest pressures on coastal environments is eutrophication, resulting primarily from land-based nutrient input from agricultural runoff and domestic wastewater discharge. Coastal eutrophication can lead to serious damage to marine ecosystems, vital sea habitats, and can cause the spread of harmful algal blooms.   
  
  
  
Target 14.1 aims to reduce the impacts of pollution through prevention and reduction of marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution.   
  
  
  
Concepts:  
  
Eutrophication – excess nutrient loading into coastal environments from anthropogenic sources, resulting in excessive growth of plants, algae and phytoplankton.  
  
Coastal Zone – national Exclusive Economic Zone (EEZ) (200 nautical miles from the coast) as outlined by the United Nations Convention on the Law of the Sea.   
  
Marine litter - any persistent, manufactured or processed solid material which is lost or discarded and ends up in the marine and coastal environment.  
  
  
  
Comments and limitations:   
  
This methodology mobilizes the collection of widely available earth observation data and other data sources which will be validated by countries. The methodologies used to generate this data are technical in nature. The methodology employs internationally recognized methods, from expert communities such as the Group on Earth Observation (GEO) and international space agencies and technical experts. There is a need to provide training on these indicators over time.  
  
   
  
The Indicator is designed in a way to generate data to allow informed decision making towards identifying the state of pollution and pollution flows in oceans. It is assumed that countries would use the data to actively make decisions, but as oceans are transboundary, it makes this decision-making complex. Additionally, there is a need to consider data on pollution generation and waste in conjunction with these indicators.  
  
  
  
  
  
Methodology  
  
Computation Method   
  
A full methodology for this indicator is available in the document entitled, “Global Manual on Ocean Statistics for Measuring SDG 14.1.1, 14.2.1 and 14.5.1”.  
  
  
  
For 14.1.1a:  
  
Level 1: Indicator for coastal eutrophication potential   
  
The indicator for coastal eutrophication potential (ICEP), is based on loads and ratios of nitrogen, phosphorus and silica delivered by rivers to coastal waters. This indicator assumes that excess nitrogen or phosphorus relative to silica will result in increased growth of potentially harmful algae (ICEP>0). This indicator is based on loads and ratios of nitrogen, phosphorous and silica delivered by rivers to coastal waters (Garnier et al. 2010) which contribute to the ICEP. The basis for these loads is collected from land-based assessments of land use including fertilizer use, population density, socioeconomic factors and other contributors to nutrient pollution runoff. Given the land-based nature of the indicator, it provides a modelled number indicating the risk of coastal eutrophication at a specific river mouthn. The indicator can be further developed by incorporating in situ monitoring to evaluate the dispersion of concentrations of nitrogen, phosphorous and silica to ground-truth the index. The indicator assumes that excess concentrations of nitrogen or phosphorus relative to silica will result in increased growth of potentially harmful algae (ICEP>0). ICEP is expressed in kilograms of carbon (from algae biomass) per square kilometre of river basin area per day (kg C km-2 day-1).   
  
The ICEP model is calculated using one of two equations depending on whether nitrogen or phosphorus is limiting. The equations (Billen and Garnier 2007) are  
  
ICEP (N limiting) = [NFlx/(14\*16)-SiFlx/(28\*20)]\*106\*12  
  
ICEP (P limiting) = [PFlx/31 – SiFlx/(28\*20)]\*106\*12   
  
Where PFlx, NFlx and SiFlx are respectively the mean specific values of total nitrogen, total phosphorus and dissolved silica delivered at the mouth of the river basin, expressed in kg P km-2 day-1, in kg N km-2 day-1 and in kg Si km-2 day-1.   
  
  
  
Level 1: Chlorophyll-A deviation modelling  
  
Satellite-based assessments of ocean colour began in 1978 with the launch of the Coastal Zone Color Scanner (CZCS) aboard the NASA Nimbus 7 satellite. Following a decade long break in observations, there has been continuous satellite ocean colour since 1997 with SeaWiFS, followed by MERIS, MODIS (Terra, Aqua), VIIRS (NPP, N20) and now OLCI (S3-A, S3-B). Data gaps from individual sensors are common due to revisit cycles, cloud cover, and spurious retrievals resulting from a host of confounding atmospheric and aquatic conditions. This issue has been addressed by combining data from multiple sensors and creating a consistent, merged ocean colour product (e.g., chlorophyll-a). The ESA Ocean Colour CCI (OC\_CCI) project, led by the Plymouth Marine Laboratory (PML), has produced a consistent, merged chlorophyll-a product from SeaWiFS, MODIS, MERIS and VIIRS, spanning 1997 to 2018 (Sathyendranath et al., 2018). A merged multi-sensor product will be updated in both time and with data from additional sensors (e.g., OLCI) under a forthcoming EUMETSAT initiative that will continue the time series on an operational basis.  
  
   
  
For SDG 14.1.1a, Chlorophyll-a (4 km resolution, monthly products) will be derived from the OC-CCI project is generated for each individual pixel within a country’s Coastal Zone. For generation of a climatological baseline, results are averaged by month over the time period of 2000 – 2004. The deviation will be calculated by pixel and deamed a high deviation if the magnitude is more than 50% and as an extreme deviation at more than 100%. UN Environment and GEO BluePlanet are working to produce both a high deviation and extreme deviation map. For the purpose of the SDG 14.1.1, the 50% threshold in the high deviation will be used to calculate the percentage of the national EEZ with a deviation by month. The annual average of these monthly figures will also be provided. Data on the daily anomaly rate will also be made available.  
  
  
  
Level 2: In situ monitoring of nutrients  
  
Where national capacity to do so exists, national level measurements of Chlorophyll-a and other parameters (including nitrogen, phosphate and silica) (in situ or from remote sensing), should be used to complement and ground truth global remote sensing and modelled data and enable a more detailed assessment of eutrophication. In particular, monitoring of supplementary eutrophication parameters is advisable to determine whether an increase in Chlorophyll-a concentration is directly linked to an anthropogenic increase in nutrients. Please refer to Table 2 for parameters for monitoring eutrophication at the national level (Level 2).   
  
  
  
Level 2: National ICEP modelling  
  
Existing ICEP modelling at the national level is limited, but could be further developed following the model of a current study analysing basin level data in Chinese rivers (Strokal et al 2016). The study utilises Global NEWS – 2 (Nutrient Export from WaterSheds) and NUtrient flows in Food chains, Environment and Resources use (NUFER) as models. The Global NEWS-2 model is basin-scale and quantifies river export of various nutrients (nitrogen, phorsphorus, carbon and silca) in multiple forms (dissolved inorganic, dissolved organic and particulate) as functions of human activities on land and basin characteristics (Strokal et al 2016). Furthermore, the model shows past and future trends.  
  
  
  
For 14.1.1b:  
  
Level 1: Plastic patches greater than 10 meters  
  
Satellite-based global data products make up the statistics for this indicator. NASA and ESA both contribute satellite images to construct information on the plastic patches greater than 10 meters throughout the world’s oceans. Multi-spectral satellite remote sensing of plastic in the water column is currently only possible for larger elements (more than 10m) and under good atmospheric conditions (no clouds). This data is being produced in collaboration with ESA and NASA.  
  
  
  
Level 1: Beach litter originating from national land-based sources  
  
Modelling of litter movement through the oceans occurs through numerical models using inputs including ocean flow and marine plastic litter characteristics. UN Environment has produced a global model of marine litter using OceanParcels v2.0, a state-of-the-art Lagrangian Ocean analysis framework to create customizable particle tracking simulation using outputs from ocean circulation models.  
  
This model was used to estimate where plastics that would be found on the coast likely originated from. As a simple example, for Kenya, based on this model, of the plastic which ends up on Kenya’s beaches, 11% likely originated from Kenya, 60% likely came from countries in Africa and 29% likely came from outside the region. This model can be produced annually and updated as better waste emissions data becomes available for countries.   
  
  
  
Level 2: Beach litter, plastic in the sea column and floating plastic and plastic on the sea floor (average count of plastic items per km2)  
  
The details for collecting data for beach litter, plastic in the sea column and floating plastic and plastic on the sea floor are in the global manual and in the GESAMP Guidelines (GESAMP 2019). Beach litter is the most available type of data at the national level. National efforts to collect data on beach litter can be supported by campaigns to engage members of the public as volunteers in beach clean-ups (see for example the Ocean Conservancy’s International Coastal Clean-up (ICC) initiative ) or citizen science programmes (see for example NOAA’s Marine Debris Monitoring and Assessment Citizen Science Project). Specific instructions on how to conduct citizen science beach surveys are included in the GESAMP Guidelines (GESAMP 2019). Beyond the tools used to conduct beach litter monitoring, it is important to consider the timing of surveys in order to properly plan effective surveys. The GESAMP Guidelines explain two main types of surveying beaches including rapid assessment surveys and routine shoreline monitoring. Rapid assessment surveys are best conducted in response to natural disasters, to build a baseline for future surveys and/or to identify beach litter hotspots. (see: https://environmentlive.unep.org/media/docs/marine\_plastics/une\_science\_dvision\_gesamp\_reports.pdf).  
  
The average count of plastic items can be computed for each area sampled. A geospatial model is recommended in order to estimate the density across the coastline and to establish a national average.  
  
  
  
Disaggregation:  
  
A geospatial disaggregation of the state of pollution is proposed. For the ICEP loading indicators, this disaggregation should be at the sub-basin level.  
  
  
  
Treatment of missing values:  
  
At country level due to the use of globally derived data for some sub-indicators, it is not expected to have missing data for these sub-indicators. For all other sub-indicators, missing values are not imputed.   
  
   
  
Regional aggregates:  
  
The data will be aggregated at the sub-regional, regional and global levels. For the aggregation methods, please see: http://uneplive.unep.org/media/docs/graphs/aggregation\_methods.pdf.   
  
  
  
Sources of discrepancies:   
  
There are a number of experiences in terms of collecting data on marine plastics and some do not follow a consistent methodology. Similarly, the underlying national nutrient data which feeds into national or global ICEP modelling may include discrepancies (for example, in some cases different national ministries maintain data on fertilizer, wastewater, etc.). It is recommended that national statistical systems review and work to eliminate discrepancies in the underlying data for these indictors.   
  
  
  
Data Sources  
  
Description:  
  
Satellite data  
  
Global models: which are based on official data from national governments as collected from UN organizations   
  
Data provided by national governments   
  
  
  
Collection process:  
  
The custodian agencies propose to collect national data through the Regional Seas Programmes in order to reduce the reporting burden on countries. For countries that are not included in a Regional Seas Programme then UNEP will reach out directly.   
  
  
  
For globally derived data, UNEP has established a partnership with NOAA and GEOBluePlanet, with the Global Nutrient Management System (GNMS) and with the Scientific Advisory Committee of the Ad hoc and Open Ended Expert Group on Marine Litter. This will facilitate the production of global data products.  
  
  
  
Data Availability  
  
Description:  
  
Data will be made available for all member states.  
  
  
  
Time series:  
  
The reporting on this indicator is described in the table for each sub-indicator. Reporting will initiate in 2020 for the global indicator on chl-a and plastic modelling. For the other globally derived indicators, reporting will initiate in 2021. National data collection through the Regional Seas already exists for many Regional Seas, this data will compiled for SDG reporting in 2020.  
  
  
  
Calendar  
  
Data collection:  
  
First data collection: Data is already being collected by the Regional Seas  
  
   
  
Data release:  
  
First reporting cycle: 2020  
  
  
  
  
  
Data providers  
  
National Statistical Systems, through the Regional Seas. The Regional Seas Programmes include the CPPS: Permanent Commission for the South Pacific (Southeast Pacific); EU MSFD: European Union Marine Strategy Framework Directive; EU WFD: European Union Water Framework Directive; GEF-TWAP: Global Environment Facility Transboundary Waters Assessment Programme; HELCOM: Helsinki Commission (Baltic Sea); Nairobi Convention (Western Indian Ocean); NOAA: National Oceanic and Atmospheric Administration; NOWPAP: Northwest Pacific Action Plan (Northwest Pacific); OSPAR: Oslo-Paris Convention (Northeast Atlantic); ROMPE: Regional organization for the Protection of the Marine Environment (ROMPE sea area); UNEP-MAP: UN Environment Mediterranean Action Plan (Mediterranean Sea)). For more information on the Regional Seas see: https://www.unenvironment.org/explore-topics/oceans-seas/what-we-do/working-regional-seas.   
  
  
  
Data compilers  
  
UN Environment (United Nations Environment Programme), in collaboration with partners mentioned in the other sections of this metadata  
  
  
  
References  
  
  
  
References:   
  
Regional Seas website: https://www.unenvironment.org/explore-topics/oceans-seas/what-we-do/working-regional-seas.   
  
  
  
UNEP Global Manual on Ocean Statistics for Measuring SDG 14.1.1, 14.2.1 and 14.5.1 (forthcoming)  
  
  
  
Guidelines for the Monitoring and Assessment of Plastic Litter in the Ocean (see: https://environmentlive.unep.org/media/docs/marine\_plastics/une\_science\_dvision\_gesamp\_reports.pdf)  
  
  
  
  
  
Related indicators as of February 2020  
  
  
  
N/A

**Ocean**



An **ocean** (from [Ancient Greek](https://en.wikipedia.org/wiki/Ancient_Greek_language) [Ὠκεανός,](https://en.wiktionary.org/wiki/Ὠκεανός) [transc.](https://en.wikipedia.org/wiki/Romanization_of_Greek) [*Okeanós*](https://en.wikipedia.org/wiki/Oceanus)[[1]](#page12)) is a body of [water](https://en.wikipedia.org/wiki/Water)



that composes much of a [planet's](https://en.wikipedia.org/wiki/Planet) [hydrosphere.](https://en.wikipedia.org/wiki/Hydrosphere)[[2]](#page12) On [Earth,](https://en.wikipedia.org/wiki/Earth) an ocean is one of the major conventional divisions of the [World Ocean.](https://en.wikipedia.org/wiki/World_Ocean) These are, in descending order by area, the [Pacific,](https://en.wikipedia.org/wiki/Pacific_Ocean) [Atlantic,](https://en.wikipedia.org/wiki/Atlantic_Ocean) [Indian,](https://en.wikipedia.org/wiki/Indian_Ocean) [Southern](https://en.wikipedia.org/wiki/Southern_Ocean) (Antarctic), and [Arctic](https://en.wikipedia.org/wiki/Arctic_Ocean)



Oceans.[[3][4]](#page12) The word "ocean" is often used interchangeably with "**sea**" in

[American English.](https://en.wikipedia.org/wiki/American_English) Strictly speaking, a [*sea*](https://en.wikipedia.org/wiki/Sea) is a body of water (generally a



division of the world ocean) partly or fully enclosed by land,[[5]](#page12) though "**the sea**" refers also to the oceans.

Surface view of the [Atlantic Ocean](https://en.wikipedia.org/wiki/Atlantic_Ocean)

[Saline water](https://en.wikipedia.org/wiki/Saline_water) covers approximately 361,000,000 km2 (139,000,000 sq mi) and is customarily divided into several principal oceans and smaller seas, with the



ocean covering approximately 71% of Earth's surface and 90% of the Earth's [biosphere.](https://en.wikipedia.org/wiki/Biosphere)[[6]](#page12) The ocean contains 97% of Earth's water, and [oceanographers](https://en.wikipedia.org/wiki/Oceanography) have stated that less than 5% of the World Ocean has been explored.[[6]](#page12) The total volume is approximately 1.35 billion cubic kilometers (320 million cu mi) with an average depth of nearly 3,700 meters (12,100 ft).[[7][8][9]](#page12)



As the world ocean is the principal component of Earth's hydrosphere, it is integral to [life,](https://en.wikipedia.org/wiki/Life) forms part of the [carbon cycle,](https://en.wikipedia.org/wiki/Carbon_cycle) and influences [climate](https://en.wikipedia.org/wiki/Climate) and [weather](https://en.wikipedia.org/wiki/Weather) patterns. The World Ocean is the [habitat](https://en.wikipedia.org/wiki/Habitat) of 230,000 known [species,](https://en.wikipedia.org/wiki/Species) but because much of it is



[unexplored, the number of species that exist in the ocean is much larger, possibly over two million.](https://en.wikipedia.org/wiki/Origin_of_water_on_Earth)[[10]](#page12) [The origin of Earth's](https://en.wikipedia.org/wiki/Origin_of_water_on_Earth) [oceans is unknown; oceans are thought to have formed in the](https://en.wikipedia.org/wiki/Origin_of_water_on_Earth) [Hadean](https://en.wikipedia.org/wiki/Hadean) [eon and may have been the cause for the](https://en.wikipedia.org/wiki/Origin_of_water_on_Earth) [emergence of life.](https://en.wikipedia.org/wiki/Abiogenesis)



[Extraterrestrial oceans](https://en.wikipedia.org/wiki/Extraterrestrial_oceans) may be composed of water or other [elements](https://en.wikipedia.org/wiki/Chemical_element) and [compounds.](https://en.wikipedia.org/wiki/Chemical_compound) The only confirmed large stable bodies of [extraterrestrial surface liquids are the lakes of Titan, although there is evidence for the existence of oceans elsewhere in the Solar](https://en.wikipedia.org/wiki/Solar_System) [System. Early in their geologic histories, Mars and Venus are theorized to have had large water oceans. The Mars ocean](https://en.wikipedia.org/wiki/Mars_ocean_hypothesis) [hypothesis suggests that nearly a third of the surface of Mars was once covered by water, and a](https://en.wikipedia.org/wiki/Mars_ocean_hypothesis) [runaway greenhouse effect](https://en.wikipedia.org/wiki/Runaway_greenhouse_effect) [may](https://en.wikipedia.org/wiki/Mars_ocean_hypothesis) have boiled away the global ocean of Venus. Compounds such as [salts](https://en.wikipedia.org/wiki/Salt_(chemistry)) and [ammonia](https://en.wikipedia.org/wiki/Ammonia) dissolved in water lower its freezing point so that water might exist in large quantities in extraterrestrial environments as brine or convecting [ice.](https://en.wikipedia.org/wiki/Ice) Unconfirmed oceans are speculated beneath the surface of many [dwarf planets](https://en.wikipedia.org/wiki/Dwarf_planets) and natural satellites; notably, the ocean of the moon [Europa](https://en.wikipedia.org/wiki/Europa_(moon)) is estimated to have over twice the water volume of Earth. The Solar System's [giant planets](https://en.wikipedia.org/wiki/Giant_planet) are also thought to have liquid [atmospheric](https://en.wikipedia.org/wiki/Atmosphere) layers of yet to be confirmed compositions. Oceans may also exist on [exoplanets](https://en.wikipedia.org/wiki/Exoplanet) and [exomoons,](https://en.wikipedia.org/wiki/Exomoon) including surface oceans of liquid water within a [circumstellar habitable zone.](https://en.wikipedia.org/wiki/Circumstellar_habitable_zone) [Ocean planets](https://en.wikipedia.org/wiki/Ocean_planet) are a hypothetical type of planet with a surface completely covered with



[liquid.[11][12]](#page12)

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**Etymology**



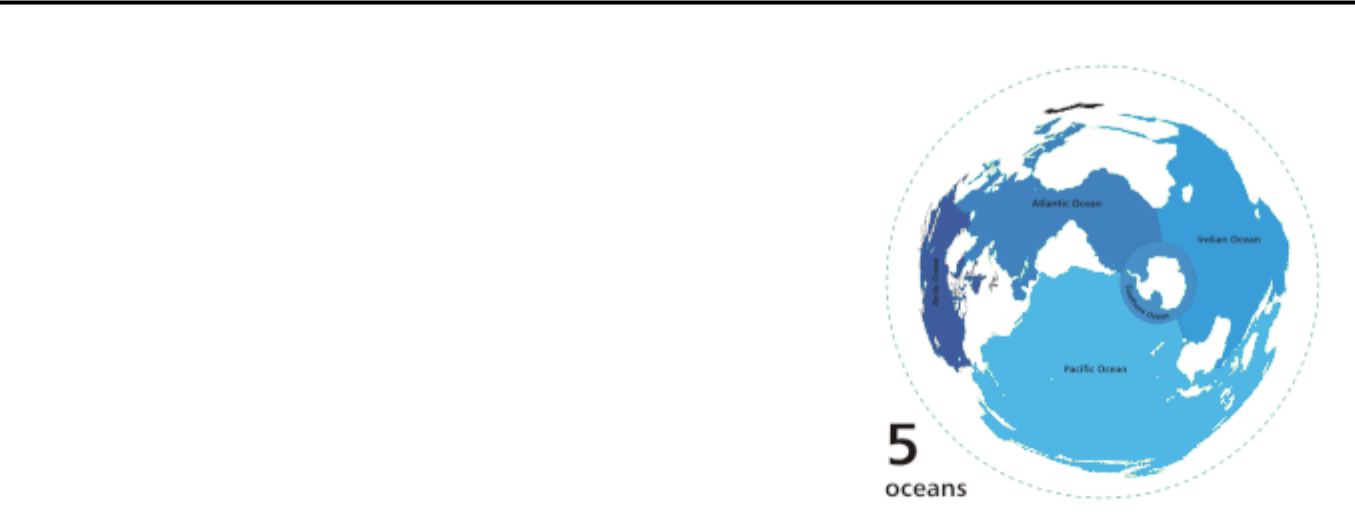
The word *ocean* comes from the figure in [classical antiquity,](https://en.wikipedia.org/wiki/Classical_antiquity) [Oceanus](https://en.wikipedia.org/wiki/Oceanus) [(/oʊˈsiːənəs/;](https://en.wikipedia.org/wiki/Help:IPA/English) [Greek:](https://en.wikipedia.org/wiki/Greek_language) [Ὠκεανός](https://en.wiktionary.org/wiki/Ὠκεανός) *Ōkeanós*,[[13]](#page12) pronounced [[ɔːkeanós]),](https://en.wikipedia.org/wiki/Help:IPA/Greek) the elder of the [Titans](https://en.wikipedia.org/wiki/Titan_(mythology)) in classical [Greek mythology,](https://en.wikipedia.org/wiki/Greek_mythology) believed by the [ancient Greeks](https://en.wikipedia.org/wiki/Ancient_Greece) and [Romans](https://en.wikipedia.org/wiki/Ancient_Rome) to be the divine personification of the [sea,](https://en.wikipedia.org/wiki/Sea) an enormous [river](https://en.wikipedia.org/wiki/River) encircling the world.



The concept of Ōkeanós has an [Indo-European](https://en.wikipedia.org/wiki/Indo-European_religion) connection. Greek Ōkeanós has been compared to the [Vedic](https://en.wikipedia.org/wiki/Vedic) epithet ā-śáyāna-, predicated of the dragon Vṛtra-, who captured the cows/rivers. Related to this notion, the Okeanos is represented with a dragon-tail on some early Greek vases.[[14]](#page12)



**Earth's global ocean**



**Oceanic divisions**

Though generally described as several separate oceans, the global, [interconnected body of salt water is sometimes referred to as the World](https://en.wikipedia.org/wiki/World_Ocean)



[Ocean or global ocean.](https://en.wikipedia.org/wiki/World_Ocean)[[15][16]](#page12) [The concept of a continuous body of water](https://en.wikipedia.org/wiki/World_Ocean) with relatively free interchange among its parts is of fundamental importance to [oceanography.](https://en.wikipedia.org/wiki/Oceanography)[[17]](#page12)



The major oceanic divisions – listed below in descending order of area and volume – are defined in part by the [continents,](https://en.wikipedia.org/wiki/Continent) various [archipelagos,](https://en.wikipedia.org/wiki/Archipelago) and other criteria.[[9][12][18]](#page12)



Various ways to divide the World Ocean

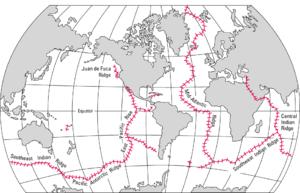


Oceans are fringed by smaller, adjoining bodies of water such as [seas,](https://en.wikipedia.org/wiki/List_of_seas) [gulfs,](https://en.wikipedia.org/wiki/List_of_gulfs) [bays,](https://en.wikipedia.org/wiki/Bay) [bights,](https://en.wikipedia.org/wiki/Bight_(geography)) and [straits.](https://en.wikipedia.org/wiki/Strait)



**Global system**

The [mid-ocean ridges](https://en.wikipedia.org/wiki/Mid-ocean_ridge) of the world are connected and form a single global mid-oceanic ridge system that is part of every ocean and the [longest](https://en.wikipedia.org/wiki/List_of_mountain_ranges" \l "By_length) [mountain range](https://en.wikipedia.org/wiki/Mountain_range) in the world. The continuous mountain range is 65,000 km (40,000 mi) long (several times longer than the [Andes,](https://en.wikipedia.org/wiki/Andes) the longest continental mountain range).[[28]](#page13)

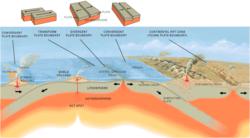


**Physical properties**

|  |  |  |
| --- | --- | --- |
| The total mass of the [hydrosphere](https://en.wikipedia.org/wiki/Hydrosphere) is about 1.4 quintillion tonnes | World Distribution of [Mid-Oceanic Ridges;](https://en.wikipedia.org/wiki/Mid-oceanic_ridge) [USGS](https://en.wikipedia.org/wiki/USGS) |  |
| (1.4 × 1018 long tons or 1.5 × 1018 short tons), which is about |  |



|  |  |
| --- | --- |
| 0.023% of Earth's total mass. Less than 3% is [freshwater;](https://en.wikipedia.org/wiki/Freshwater) the rest |  |
| is [saltwater,](https://en.wikipedia.org/wiki/Seawater) almost all of which is in the ocean. The area of the |  |
| World Ocean is about 361.9 million square kilometers (139.7 million |  |
| square miles),[[9]](#page12) which covers about 70.9% of Earth's surface, and its |  |
| volume is approximately 1.335 billion cubic kilometers (320.3 million |  |
| cubic miles).[[9]](#page12) This can be thought of as a cube of water with an edge |  |
| length of 1,101 kilometers (684 mi). Its average depth is about 3,688 |  |
| meters (12,100 ft),[[9]](#page12) and its maximum depth is 10,994 meters (6.831 mi) |  |
| at the [Mariana Trench.](https://en.wikipedia.org/wiki/Mariana_Trench)[[29]](#page13) Nearly half of the world's marine waters are | Three main types of [plate](https://en.wikipedia.org/wiki/Plate_tectonics) boundaries. |



over 3,000 meters (9,800 ft) deep.[[16]](#page12) The vast expanses of deep ocean (anything below 200 meters or 660 feet) cover about 66% of Earth's

surface.[[30]](#page13) This does not include seas not connected to the World Ocean, such as the [Caspian Sea.](https://en.wikipedia.org/wiki/Caspian_Sea)



The bluish [ocean color](https://en.wikipedia.org/wiki/Ocean_color) is a composite of several contributing agents. Prominent contributors include dissolved organic matter and



[chlorophyll.](https://en.wikipedia.org/wiki/Chlorophyll)[[31]](#page13) Mariners and other seafarers have reported that the ocean [often emits a visible glow](https://en.wikipedia.org/wiki/Milky_seas_effect) which extends for miles at night. In 2005, scientists announced that for the first time, they had obtained photographic evidence of this glow.[[32]](#page13) It is most likely caused by [bioluminescence.](https://en.wikipedia.org/wiki/Bioluminescence)[[33][34][35]](#page13)



**Oceanic zones**

Oceanographers divide the ocean into different vertical [zones](https://en.wikipedia.org/wiki/Oceanic_zone) defined by physical and biological conditions. The [pelagic zone](https://en.wikipedia.org/wiki/Pelagic_zone) [includes all open ocean regions, and can be divided into further regions categorized by depth and light abundance. The photic](https://en.wikipedia.org/wiki/Photic_zone) [zone includes the oceans from the surface to a depth of 200 m; it is the region where photosynthesis can occur and is, therefore,](https://en.wikipedia.org/wiki/Photic_zone) the most [biodiverse.](https://en.wikipedia.org/wiki/Biodiverse) Because plants require [photosynthesis,](https://en.wikipedia.org/wiki/Photosynthesis) life found deeper than the photic zone must either rely on material sinking from above (see [marine snow)](https://en.wikipedia.org/wiki/Marine_snow) or find another energy source. [Hydrothermal vents](https://en.wikipedia.org/wiki/Hydrothermal_vents) are the primary source of energy in what is known as the [aphotic zone](https://en.wikipedia.org/wiki/Aphotic_zone) (depths exceeding 200 m). The pelagic part of the [photic zone](https://en.wikipedia.org/wiki/Photic_zone) is known as the [epipelagic.](https://en.wikipedia.org/wiki/Epipelagic)



The pelagic part of the aphotic zone can be further divided into vertical regions according to temperature. The [mesopelagic](https://en.wikipedia.org/wiki/Mesopelagic) is the uppermost region. Its lowermost boundary is at a [thermocline](https://en.wikipedia.org/wiki/Thermocline) of 12 °C (54 °F), which, in the [tropics](https://en.wikipedia.org/wiki/Tropics) generally lies at 700–1,000 meters (2,300–3,300 ft). Next is the [bathypelagic](https://en.wikipedia.org/wiki/Bathypelagic) lying between 10 and 4 °C (50 and 39 °F), typically between 700–1,000 meters (2,300–3,300 ft) and 2,000–4,000 meters (6,600–13,100 ft), lying along the top of the [abyssal plain](https://en.wikipedia.org/wiki/Abyssal_plain) is the [abyssopelagic,](https://en.wikipedia.org/wiki/Abyssal_zone) whose lower boundary lies at about 6,000 meters (20,000 ft). The last zone includes the deep [oceanic trench,](https://en.wikipedia.org/wiki/Oceanic_trench) and is known as the [hadalpelagic.](https://en.wikipedia.org/wiki/Hadal_zone) This lies between 6,000–11,000 meters (20,000–36,000 ft) and is the deepest oceanic zone.



The [benthic](https://en.wikipedia.org/wiki/Benthic) zones are aphotic and correspond to the three deepest zones of the [deep-sea.](https://en.wikipedia.org/wiki/Deep-sea) The [bathyal zone](https://en.wikipedia.org/wiki/Bathyal_zone) covers the continental slope down to about 4,000 meters (13,000 ft). The abyssal zone covers the abyssal plains between 4,000 and 6,000 m. Lastly, the [hadal](https://en.wikipedia.org/wiki/Hadal) zone corresponds to the hadalpelagic zone, which is found in oceanic trenches.



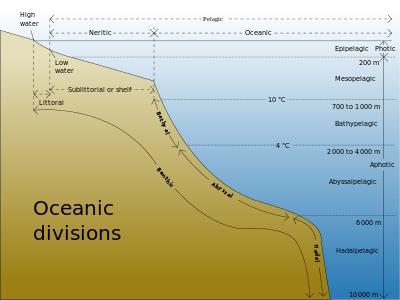
The pelagic zone can be further subdivided into two subregions: the [neritic zone](https://en.wikipedia.org/wiki/Neritic_zone) and the [oceanic zone.](https://en.wikipedia.org/wiki/Oceanic_zone) The neritic zone encompasses [the water mass directly above the continental](https://en.wikipedia.org/wiki/Continental_shelves) [shelves whereas the oceanic zone includes all](https://en.wikipedia.org/wiki/Continental_shelves) the completely open water.



In contrast, the [littoral zone](https://en.wikipedia.org/wiki/Littoral_zone) covers the region between low and high tide and represents the transitional area between marine and



The major oceanic zones, based on depth and biophysical conditions



terrestrial conditions. It is also known as the [intertidal](https://en.wikipedia.org/wiki/Intertidal) zone because it is the area where tide level affects the conditions of the region.



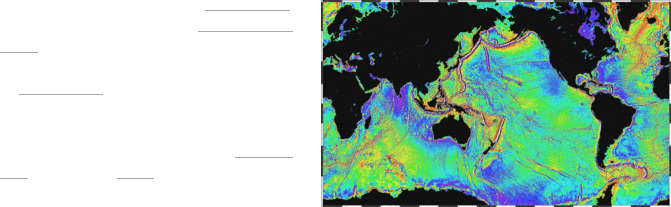
If a zone undergoes dramatic changes in temperature with depth, it contains a [thermocline.](https://en.wikipedia.org/wiki/Thermocline) The tropical thermocline is typically deeper than the thermocline at higher latitudes. Polar waters, which receive relatively little solar energy, are not stratified by temperature and generally lack a thermocline because surface water at polar latitudes are nearly as cold as water at greater depths. Below the thermocline, water is very cold, ranging from −1 °C to 3 °C. Because this deep and cold layer contains the bulk of ocean water, the average temperature of the world ocean is 3.9 °C. If a zone undergoes dramatic changes in salinity with depth, it contains a [halocline.](https://en.wikipedia.org/wiki/Halocline) If a zone undergoes a strong, vertical chemistry gradient with depth, it contains a [chemocline.](https://en.wikipedia.org/wiki/Chemocline)



The halocline often coincides with the thermocline, and the combination produces a pronounced pycnocline.

**Exploration**

The deepest point in the ocean is the [Mariana Trench,](https://en.wikipedia.org/wiki/Mariana_Trench) [located in the Pacific Ocean near the Northern Mariana](https://en.wikipedia.org/wiki/Northern_Mariana_Islands) [Islands. Its maximum depth has been estimated to be](https://en.wikipedia.org/wiki/Northern_Mariana_Islands) 10,971 meters (35,994 ft) (plus or minus 11 meters; see the [Mariana Trench](https://en.wikipedia.org/wiki/Mariana_Trench) article for discussion of the various estimates of the maximum depth.) The British naval vessel *Challenger II* surveyed the trench in 1951 and [named the deepest part of the trench the "Challenger](https://en.wikipedia.org/wiki/Challenger_Deep) [Deep". In 1960, the](https://en.wikipedia.org/wiki/Challenger_Deep) [Trieste](https://en.wikipedia.org/wiki/Bathyscaphe_Trieste) [successfully reached the](https://en.wikipedia.org/wiki/Challenger_Deep) bottom of the trench, manned by a crew of two men.



Map of large underwater features (1995, [NOAA)](https://en.wikipedia.org/wiki/NOAA)

**Oceanic maritime currents**

Oceanic maritime currents have different origins. Tidal currents are in phase with the [tide,](https://en.wikipedia.org/wiki/Tide) hence are [quasiperiodic;](https://en.wikipedia.org/wiki/Quasiperiodicity) they may form various knots in certain places, most notably around [headlands.](https://en.wikipedia.org/wiki/Cape_(geography)) Non-periodic currents have for origin the waves, wind and different densities.



The [wind](https://en.wikipedia.org/wiki/Wind) and [waves](https://en.wikipedia.org/wiki/Wave) create surface currents (designated as “drift currents”). These currents can decompose in one quasi-permanent current (which varies within the hourly scale) and one movement of [Stokes drift](https://en.wikipedia.org/wiki/Stokes_drift) under the effect of rapid waves movement (at the echelon of a couple of seconds).).[[36]](#page13) The quasi-permanent current is accelerated by the breaking of waves, and in a lesser governing effect, by the friction of the wind on the surface.[[37]](#page13)



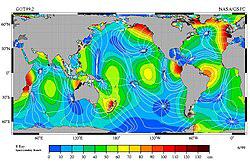
This acceleration of the current takes place in the direction of waves and dominant wind. Accordingly, when the sea depth increases, the [rotation](https://en.wikipedia.org/wiki/Earth's_rotation) of the [earth](https://en.wikipedia.org/wiki/Earth) changes the direction of currents in proportion with the increase of depth, while friction lowers their speed. At a certain sea depth, the current changes direction and is seen inverted in the opposite direction with current speed becoming null: known as the [Ekman spiral.](https://en.wikipedia.org/wiki/Ekman_spiral) The influence of these currents is mainly experienced at the mixed layer of the ocean surface, often from 400 to 800 meters of maximum depth. These currents can considerably alter, change and are dependent on the various yearly seasons. If the mixed layer is less thick (10 to 20 meters), the quasi-permanent current at the surface adopts an extreme oblique direction in relation to the direction of the wind, becoming virtually homogeneous, until the [Thermocline.](https://en.wikipedia.org/wiki/Thermocline)[[38]](#page13)



In the [deep](https://en.wikipedia.org/wiki/Deep_sea) however, maritime currents are caused by the temperature gradients and the [salinity](https://en.wikipedia.org/wiki/Salinity) between water density masses.



Oceanic surface currents (U.S. Army, 1943).



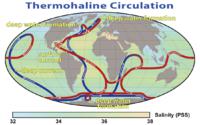
Amphidromic points showing the direction of [tides](https://en.wikipedia.org/wiki/Tides) per incrementation periods along with resonating directions of wavelength movements.

In [littoral zones,](https://en.wikipedia.org/wiki/Littoral_zone) [breaking waves](https://en.wikipedia.org/wiki/Breaking_wave) are so intense and the depth measurement so low, that maritime currents reach often 1 to 2 knots.



**Climate**

A map of the global thermohaline circulation; blue represent deep-water currents, whereas red represent surface currents



[Ocean currents](https://en.wikipedia.org/wiki/Ocean_current) greatly affect Earth's [climate](https://en.wikipedia.org/wiki/Climate) by transferring heat from the tropics to the [polar regions.](https://en.wikipedia.org/wiki/Polar_regions) Transferring warm or cold air and [precipitation](https://en.wikipedia.org/wiki/Precipitation) to coastal regions, winds may carry them inland. Surface heat and freshwater [fluxes](https://en.wikipedia.org/wiki/Flux) create global [density gradients](https://en.wikipedia.org/wiki/Density_gradient) that drive the [thermohaline circulation](https://en.wikipedia.org/wiki/Thermohaline_circulation) part of large-scale ocean circulation. It plays an important role in supplying heat to the polar regions, and thus in sea ice regulation. Changes in the thermohaline circulation are thought to have significant impacts on [Earth's energy budget.](https://en.wikipedia.org/wiki/Earth's_energy_budget) In so far as the thermohaline circulation governs the rate at which deep waters reach the surface, it may also significantly influence atmospheric [carbon dioxide](https://en.wikipedia.org/wiki/Carbon_dioxide) concentrations.



For a discussion of the possibilities of changes to the thermohaline circulation under [global warming,](https://en.wikipedia.org/wiki/Global_warming) see [shutdown of thermohaline circulation.](https://en.wikipedia.org/wiki/Shutdown_of_thermohaline_circulation)



The [Antarctic Circumpolar Current](https://en.wikipedia.org/wiki/Antarctic_Circumpolar_Current) encircles that continent, influencing the area's climate and connecting currents in several oceans.



One of the most dramatic forms of [weather](https://en.wikipedia.org/wiki/Weather) occurs over the oceans: [tropical cyclones](https://en.wikipedia.org/wiki/Tropical_cyclone) (also called "typhoons" and "hurricanes" depending upon where the system forms).



**Biology**

The ocean has a significant effect on the [biosphere.](https://en.wikipedia.org/wiki/Biosphere) Oceanic [evaporation,](https://en.wikipedia.org/wiki/Evaporation) as a phase of the [water cycle,](https://en.wikipedia.org/wiki/Water_cycle) is the source of most



rainfall, and ocean temperatures determine [climate](https://en.wikipedia.org/wiki/Climate) and [wind](https://en.wikipedia.org/wiki/Wind) patterns that affect life on land. Life within the ocean [evolved](https://en.wikipedia.org/wiki/Evolution) 3



billion years prior to life on land. Both the depth and the distance from shore strongly influence the [biodiversity](https://en.wikipedia.org/wiki/Biodiversity) of the plants and animals present in each region.[[39]](#page13)



As it is thought that life evolved in the ocean, the diversity of life is immense, including:

[Bacteria](https://en.wikipedia.org/wiki/Bacteria) : ubiquitous single-celled [prokaryotes](https://en.wikipedia.org/wiki/Prokaryotes) found throughout the world



[Archaea](https://en.wikipedia.org/wiki/Archaea) : [prokaryotes](https://en.wikipedia.org/wiki/Prokaryotes) distinct from bacteria, that inhabit many environments of the ocean, as well as many [extreme environments](https://en.wikipedia.org/wiki/Extremophile)



[Algae](https://en.wikipedia.org/wiki/Algae) : algae is a "catch-all" term to include many [photosynthetic,](https://en.wikipedia.org/wiki/Photosynthesis) [single-celled](https://en.wikipedia.org/wiki/Protist) [eukaryotes,](https://en.wikipedia.org/wiki/Eukaryote) such as [green algae,](https://en.wikipedia.org/wiki/Green_algae) [diatoms,](https://en.wikipedia.org/wiki/Diatom) and [dinoflagellates,](https://en.wikipedia.org/wiki/Dinoflagellates) but also multicellular algae, such as some [red algae](https://en.wikipedia.org/wiki/Red_algae) (including organisms like [Pyropia,](https://en.wikipedia.org/wiki/Pyropia) which is the source of the edible [nori](https://en.wikipedia.org/wiki/Nori) seaweed), and [brown algae](https://en.wikipedia.org/wiki/Brown_algae) (including organisms like [kelp)](https://en.wikipedia.org/wiki/Kelp).



[Plants](https://en.wikipedia.org/wiki/Plants) : including [sea grasses,](https://en.wikipedia.org/wiki/Seagrass) or [mangroves](https://en.wikipedia.org/wiki/Mangroves)



[Fungi](https://en.wikipedia.org/wiki/Fungi) : many [marine fungi](https://en.wikipedia.org/wiki/Marine_fungi) with diverse roles are found in oceanic environments



[Animals](https://en.wikipedia.org/wiki/Animals) : most animal [phyla](https://en.wikipedia.org/wiki/Phylum) have species that inhabit the ocean, including many that are only found in marine environments such as [sponges,](https://en.wikipedia.org/wiki/Porifera) [Cnidaria](https://en.wikipedia.org/wiki/Cnidaria) (such as [corals](https://en.wikipedia.org/wiki/Coral) and [jellyfish),](https://en.wikipedia.org/wiki/Jellyfish) [comb jellies,](https://en.wikipedia.org/wiki/Ctenophora) [Brachiopods,](https://en.wikipedia.org/wiki/Brachiopod) and [Echinoderms](https://en.wikipedia.org/wiki/Echinoderm) (such as [sea urchins](https://en.wikipedia.org/wiki/Sea_urchin) and [sea stars)](https://en.wikipedia.org/wiki/Sea_star). Many other familiar animal groups primarily live in the ocean, including [cephalopods](https://en.wikipedia.org/wiki/Cephalopod) (includes [octopus](https://en.wikipedia.org/wiki/Octopus) and [squid),](https://en.wikipedia.org/wiki/Squid) [crustaceans](https://en.wikipedia.org/wiki/Crustacean) (includes [lobsters,](https://en.wikipedia.org/wiki/Lobster) [crabs,](https://en.wikipedia.org/wiki/Crab) and [shrimp),](https://en.wikipedia.org/wiki/Shrimp) [fish,](https://en.wikipedia.org/wiki/Fish) [sharks,](https://en.wikipedia.org/wiki/Sharks) [cetaceans](https://en.wikipedia.org/wiki/Cetacean) (includes [whales,](https://en.wikipedia.org/wiki/Whale) [dolphins,](https://en.wikipedia.org/wiki/Dolphin) and [porpoises)](https://en.wikipedia.org/wiki/Porpoise).



In addition, many land animals have adapted to living a major part of their life on the oceans. For instance, [seabirds](https://en.wikipedia.org/wiki/Seabirds) are a diverse group of birds that have adapted to a life mainly on the oceans. They feed on marine animals and spend most of their lifetime on water, many only going on land for breeding. Other birds that have adapted to oceans as their living space are [penguins,](https://en.wikipedia.org/wiki/Penguin) [seagulls](https://en.wikipedia.org/wiki/Gull) and [pelicans.](https://en.wikipedia.org/wiki/Pelecaniformes) Seven species of turtles, the [sea turtles,](https://en.wikipedia.org/wiki/Sea_turtle) also spend most of their time in the oceans.



**Salinity**

A zone of rapid salinity increase with depth is called a [halocline.](https://en.wikipedia.org/wiki/Halocline) The temperature of maximum density of [seawater](https://en.wikipedia.org/wiki/Salinity" \l "Seawater) decreases as its salt content increases. Freezing temperature of water decreases with salinity, and boiling temperature of water increases with [salinity.](https://en.wikipedia.org/wiki/Salinity) Typical seawater freezes at around −2 °C at [atmospheric pressure.](https://en.wikipedia.org/wiki/Atmospheric_pressure)[[53]](#page14) If precipitation exceeds evaporation, as is the case in polar and temperate regions, salinity will be lower. If evaporation exceeds precipitation, as is the case in tropical regions, salinity will be higher. Thus, oceanic waters in polar regions have lower salinity content than oceanic waters in temperate and tropical regions.[[54]](#page14)



Salinity can be calculated using the chlorinity, which is a measure of the total mass of halogen ions (includes fluorine, chlorine, bromine, and iodine) in seawater. By international agreement, the following formula is used to determine salinity:

**Salinity (in ‰) = 1.80655 × Chlorinity (in ‰)**

The average chlorinity is about 19.2‰, and, thus, the average salinity is around 34.7‰ [[54]](#page14)

**Economic value**

Many of the world's goods are moved by [ship](https://en.wikipedia.org/wiki/Ship) between the world's [seaports.](https://en.wikipedia.org/wiki/Seaport)[[55]](#page14) Oceans are also the major supply source for the [fishing industry.](https://en.wikipedia.org/wiki/Fishing_industry) Some of the major harvests are [shrimp,](https://en.wikipedia.org/wiki/Shrimp) [fish,](https://en.wikipedia.org/wiki/Fish) [crabs,](https://en.wikipedia.org/wiki/Crabs) and [lobster.](https://en.wikipedia.org/wiki/Lobster)[[6]](#page12)



**Waves and swell**

The motions of the ocean surface, known as undulations or [*waves*](https://en.wikipedia.org/wiki/Wind_wave), are the partial and alternate rising and falling of the ocean surface. The series of [mechanical waves](https://en.wikipedia.org/wiki/Mechanical_waves) that propagate along the interface between water and air is called [swell.](https://en.wikipedia.org/wiki/Swell_(ocean))