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)).

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.

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”.

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.

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[1]. In February 2019, FAO convened an expert consultation workshop[2] 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.

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1 Full report accessible here: http://www.fao.org/documents/card/en/c/I8714EN/ ↑

2 Full report accessible here: http://www.fao.org/3/ca4355en/ca4355en.pdf ↑

Treatment of missing values:

- ***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.

- ***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.

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:

NA

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).

Disaggregation:

By FAO major marine fishing areas for statistical purposes[3].

Taxonomically, FAO publishes the indicator separately for straddling stocks (mostly tuna and tuna like).

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3 http://www.fao.org/cwp-on-fishery-statistics/handbook/general-concepts/fishing-areas-for-statistical-purposes/en/ ↑

Calendar

Data collection:

Global/regional: every 2 years (i.e., 2013, 2015, 2017, 2019, etc.)

National: Reporting every 2 years (i.e., 2019, 2021, 2023, 2025, etc.)

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.

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:

1. 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.
2. 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.
3. 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	Last year of input data used in the assessment (i.e. year of Current Biomass)

	year	
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:

Related indicators

Indicator 14.7.1: Sustainable fisheries as a percentage of GDP in small island developing States, least developed countries and all countries