**Open Working Group on Sustainable Development Goals (OWG)**

**Statistical note for the issue brief on:**

# Oceans and seas

FIRST DRAFT AS OF 31 JANUARY 2014

## Main policy issues, potential goals and targets

1. Oceans and seas cover more than 70% of the earth's surface. They play critical roles in global systems, for example by regulating weather and climate, sustaining the water cycle, absorbing 30% of emitted CO2, recycling nutrients and providing food resources.

2. The main threats to oceans and seas include:

    - More than 50% of world's population within 60 km of a shoreline, the impact of this antropogenic pressure on marine environment is ever increasing, including both resource depletion and degradation of marine environmental health;
    - Key natural ecosystems are being lost or severely degraded, such as salt marshes, mangrove forest, coastal wetlands, coral reefs, marine prairies and river estuaries, whose survival is key to human wellbeing in the planet;
    - Unsustainable extraction of marine resources, with over half of current global fish stocks fully or over-exploited. The over-exploitation of fish stocks is a consequence of large-scale and intensive fishing industry practices that diminish available biomass of fish, negatively affecting local artisanal fishermen and their livelihoods;
    - Oceans are under tremendous anthropogenic pressure including both chemical and physical contamination. Increased marine pollution includes solid and plastic waste, heavy metals, persistent toxins, with 80% from land-based sources;
    - Alien invasive species that threaten complex ecosystem relationships;
    - Ocean acidification, coral bleaching and climate change impacts such as temperature changes, extreme events and marine ecosystems disruption;
    - Physical alteration and destruction of marine habitat (e.g. via dredging, trawling).
    - As a consequence, marine ecosystems disruption and loss of marine biodiversity.

3. A variety of data are collected about oceans and seas, particularly for national territorial seas, and not so much for international waters and oceans. However, while a range of information is collected, it is generally not done systematically, with sparse spatial coverage and little time series data.[1] In a statistical sense, the global ocean is under-sampled (insufficiently studied, particularly in regard to measuring its key attributes, dynamics and parameters) and poorly understood.[2]

4. In 2012, The UNESCO Task Team for an Integrated Framework for Sustained Ocean Observing (IFSOO) identified the need for improved co-ordination and integration of ocean observation data. The IFSOO recommended a governance framework model be implemented to improve communications and data sharing across the community.

## Conceptual and methodological tools

5. Data for oceans and seas are collected by an array of institutions, including governments, commercial operations and non-governmental organizations for a variety of purposes. The methods used to collect data include netting, tagging or other trapping (e.g. for fish species), a variety of instruments attached to ships, the seafloor and moorings (e.g. to sample water quality, water

[1] Intergovernmental Oceanographic Commission of UNESCO. 2013. *IOC Strategic Plan for Oceanographic data and Information Management (2013-2016)*. (IOC Manuals and Guides 66) 45 pp.

[2] A Framework for Ocean Observing. 2012 By the Task Team for an Integrated Framework for Sustained Ocean Observing, UNESCO.

temperature etc.) and from remote sensing (e.g. satellites).[3] The resulting data takes many different forms, from a reporting a single variable measured at a single point (e.g. a species name) to very large multivariate datasets.

6. There is currently no international framework that outlines methodologies, best practices or common frameworks or standards for management and exchange of data relating to oceans and seas. Although there have been many efforts to develop common standards and frameworks for different aspects of oceans and seas information, these have never been widely adopted.[4] To date, largely independent observing systems have evolved to meet the needs of particular disciplines and end users.[5]

7. Agencies such as the, Intergovernmental Oceanographic Commission (IOC) and The World Meteorological Organization (WMO) are working with the ocean and sea community to obtain broad agreement and commitment to common frameworks, standards and best measurement practices.

8. The System of Environmental-Economic Accounting (SEEA) Central Framework adopted as international statistical standard by the United Nations Statistical Commission in 2012[6] and the SEEA Experimental Ecosystem Accounting welcomed by the Statistical Commission as "an important first step in the development of a statistical framework for ecosystem accounting"[7], provide an important statistical framework to monitor the condition of the oceans as well as the ecosystem services provided and the impact of human activities.

9. The Framework for the Development of Environment Statistics (FDES 2013) adopted by the Statistical Commission as a framework for strengthening anvironment statistics programmes in countries provides an organizing structure and a Basic and a Core Set od Environment Statistics including those relevant to the environmental, economic and social aspects of oceans[8].

**Existing and new indicators**

10. The relevant MDG is Goal 7 Ensure environment sustainability. The existing indicators for oceans and seas are:
    - 7.4 – Proportion of fish stocks within safe biological limits.
    - 7.6 – Proportion of terrestrial and marine areas protected.

11. Another MDG closely related to oceans and seas is:
    - 7.7 – Proportion of species threatened with extinction.

12. There are currently limited levels of detail available for MDG indicators 7.4 and 7.7.[9] Only the proportion of marine areas protected (7.6) is released by international regions within the MDG indicator website, which reports data from 168 countries with at least 2 observations (excluding modelling). [10]

13. A wide range of ocean and sea indicators have been developed for the specific needs of particular regions or organisations (see Appendix).

---

[3] Meaden, G.J. & Aguilar-Manjarrez, J., eds. 2013. Advances in geographic information systems and remote sensing for fisheries and aquaculture. http://www.fao.org/docrep/017/i3254e/i3254e.pdf

[4] Intergovernmental Oceanographic Commission of UNESCO. 2013.*Ocean Data Standards, Vol.3: Recommendation for a Quality Flag Scheme for the Exchange of Oceanographic and Marine Meteorological Data*. (IOC Manuals and Guides, 54, Vol. 3.).

[5] *A Framework for Ocean Observing. By the Task Team for an Integrated Framework for Sustained Ocean Observing, UNESCO 2012, IOC/INF-1284 rev., doi: 10.5270/OceanObs09-FOO*

[6] Statistical Commission – Report on the forty-third session (28 February-2 March 2012)

[7] Statistical Commission – Report on the forty-forth session (26 February-1 March 2013) http://unstats.un.org/unsd/statcom/doc13/2013-Report-E.pdf

[8] http://unstats.un.org/unsd/statcom/doc13/BG-FDES-Environment.pdf

[9] See http://mdgs.un.org/unsd/mdg/DataAvailability.aspx

[10] See http://mdgs.un.org/unsd/mdg/DataAvailability.aspx

**Data requirements, challenges and limitations**

14. Collecting data can be expensive and challenging due to the vast area of global oceans and seas and the complexity of interactions between different variables. Therefore, the systematic production of marine and ocean statistics and indicators is affected, particularly outside of territorial seas.

15. There is a major discrepancy between the scale at which data are typically gathered, and the scale at which the data and information are needed. With very few exceptions, data are collected on local scales, and over short time-spans. Threats to oceans and seas such as climate change, depletion of fish stocks, and pollution, have generated a need for data and information on a global scale; data sharing mechanisms and integration of relevant available local datasets is necessary to create a data and information base to support global decision-making.[11]

16. The following recommendations are drawn from the Intergovernmental Oceanographic Commission of UNESCO. 2013. *IOC Strategic Plan for Oceanographic data and Information Management.*

17. There are a number of shortfalls within the existing systems to deal with the broad range of applications, the operational requirements for data and information, the integration of satellite and in situ data, and an increased variety of physical, chemical, and biological parameters.

18. In order to strengthen existing data and information systems the following requirements must be met:

    - Improve ability to integrate regional and global data systems.
    - Improve the capability and functionality of systems in the centres managing oceanographic data and information. This includes the continuing capacity development of staff in these centres.
    - Exploit more sophisticated algorithms and software technologies to increase the amount of automation for data processing and quality control.
    - Address the needs of both the scientific users and society at large for the demand for access to quality data and information, including the needs identified by the Framework for Ocean Observing (FOO).

19. Some of the issues which need to be addressed to strengthen existing data and information systems include:

    - Use of common standards for metadata, data formats, quality control procedures.
    - A common way to discover data of interest so that users can exploit the full extent of knowledge embodied in these data.
    - Data and information are duplicated when it is exchanged so that users may receive the same data from different sources.
    - A common way to assess or indicate the quality of existing data and to make information about quality assessment procedures available to allow users to better judge the quality of the data.
    - A common way to designate variables and attributes of data using common terminology so that exchanged data has consistent labels and users are not forced to reconcile these differences in order to use the data.

**Conclusions**

20. Statistics relating to oceans and seas are generally limited in scope and do not meet the information needs of global decision makers.

[11] See http://www.iode.org/index.php?option=com_content&view=article&id=3&Itemid=33

21. Data are predominantly produced using various independent methods, frameworks, standards, collected on regional or local scales and designed to meet the needs of particular users. This causes significant challenges and limitations in the production of aggregated, integrated coherent global indicators.

22. There is a need for improved coordination, integration and cooperation among data owners and the user communities. Further work is also required in obtaining an agreed framework that can align common standards and best practices; this will help improve statistical measurement, data analysis and interpretation.

23. In the short to medium terms there appears little scope to improve the current indicators, owing to the limitations in data availability. The UNESCO Task Team for an Integrated Framework for Sustained Ocean Observing should be encouraged to continue its work and the Friends of the Chair should consider asking this team to expand their work to include the development and population of both statistics and indicators.

24. The SEEA will provide the statistical standard for measuring the fish stocks and changes therein as well as the economic information related to fisheries including the contribution of the fisheries and associated industries (forward linkages) to GDP. It will also provide a measure of the contribution of fisheries to national wealth and measure of depletion of fishery resources. The SEEA Central Framework complemented with the SEEA Experimental Ecosystem Accounting, will provide the statistical framework to measure ecosystems in a comparable way across countries and over time.

**Preparation of note**

This note was prepared by the Australian Bureau of Statistics, Centre of Environment Statistics and edited by UNSD

**Appendix: Table comparing existing data and sources**

| Organisation | Indicator / Data | Description |
|---|---|---|
| Millennium Development Goals (MDG) | 7.4 - Proportion of fish stocks within safe biological limits<br>7.6: Proportion of terrestrial and marine areas protected<br>7.7: Proportion of species threatened with extinction | 7.4: Proportion of fish stocks within safe biological limits means the percentage of fish stocks of which abundance is at or above the level that produces the maximum sustainable yield.<br>7.6: The proportion of a country's terrestrial protected areas as well as marine protected areas in territorial waters (up to 12 nautical miles from the coast).<br>7.7: An index of the change in threat status of species in their natural habitat, based on population and range size and trends. The proportion of species expected to remain living in the near future in the absence of any conservation action. |
| Food and Agriculture Organisation of the United Nations (FAO) | Fisheries Catch and Production Data- main indicator derived is the degree of exploitation of fish stocks. | • Fish catch, production and aquaculture is split by production from inland and marine areas and by species and region.<br>• Coordinating Working Party on Fishery Statistics outline concepts and methods recommended by the FAO. |
| Ocean Health Index (OHI) | An index score based on the 10 Goals of:<br>• Food Provision<br>• Artisanal Fishing Opportunities<br>• Natural Products<br>• Carbon Storage<br>• Coastal Protection<br>• Coastal Livelihoods & Economics<br>• Tourism & Recreation<br>• Sense of Place<br>• Clean Waters<br>• Biodiversity | • The OHI evaluates the condition of marine ecosystems according to 10 anthropocentric goals, which are intended to represent the key ecological, social, and economic benefits that a healthy ocean provides to humans.<br>• The index score is the average of the 10 goal scores, which are in turn informed by 113 components.<br>• Available at country and global level. |
| Intergovernmental Oceanographic Commission of UNESCO (IOC) | Contributes to a number of data and information systems, including:<br>• International Oceanographic Data and Information Exchange (IODE)<br>• Joint Technical Commission for Oceanography and Marine Meteorology (JCOMM)<br>• Global Climate Observing System (GCOS)<br>• Harmful Algal Bloom Programme (IOC HAB) | • IODE includes a range of data collections, however spatial and temporal coverage is sparse for oceans and seas. Various databases have been compiled that bring together data from many different sources including the IODE Ocean Data Portal.<br>• IODE initiative- Global Ocean Surface Underway Data (GOSUD)- aims to develop and implement a data system for ocean surface data, acquire and manage these data and to provide a mechanism to integrate these data with other types of data collected in the world oceans.<br>• Works jointly on JCOMM which aims to improve and coordinate international oceanographic and marine meteorological observing, data management and services, combining the expertise, technologies and capacity development capabilities of the meteorological and oceanographic communities.<br>• Works jointly on GCOS is to provide comprehensive information on the total climate system, involving a multidisciplinary range of physical, chemical and biological properties, and atmospheric, oceanic, hydrological, cryospheric and terrestrial processes.<br>• IOC HAB has a number of data products including: Harmful Algal Event Database, IOC Taxonomic Reference List of Toxic Plankton Algae, International Directory of Experts in Harmful Algae and Their Effects on Fisheries and Public Health, and IOC Bibliographic HAB Database |

| | | |
|---|---|---|
| Biodiversity Indicators Partnership (BIP) | Aichi Biodiversity Target 6: By 2020 all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approached, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe biological limits. | Marine Trophic Index (MTI)- Measure the impacts of fisheries on the world's marine ecosystems by reporting a measure of species replacement indices by fisheries. The MTI is calculated from catch composition data from the FAO after being spatially allocated to the Exclusive Economic Zones of countries (EEZs) or other relevant spatial ecosystem components. |
| Global Ocean Observing System (GOOS) | Collection of ocean observing and information delivery systems providing near real time measurements of the state of the oceans including salinity, temperature and Global Mean Sea Level (GMSL) | • Aims to establish high quality global and regional sea level networks for application to climate, oceanographic and coastal sea level research.<br>• Uses 290 sea level stations around the world, gauges in straits and polar areas and island based altimeter calibration stations.<br>• Uses satellites, moored instruments, free floating buoys and profilers to collect temperature and salinity data.<br>• Permanent system for observations, modelling and analysis of marine and ocean variables to support operational ocean services worldwide. |
| World Climate Research Programme (WCRP) | Coordinates a number of research projects looking at oceans and how they relate to climate topics such as global atmosphere, oceans, sea- and land-ice, the biosphere and land surface. | • International Ocean Carbon Coordination Project (IOCCP) promotes the development of a global network of ocean carbon observations for research through technical coordination and communication services, international agreements on standards and methods, advocacy, and links to the global observing systems.<br>• Argo buoys are an international project collecting information on temperature and salinity of the upper part of the world's oceans. Uses a global array of 3,000 robotic floats to measure temperature and salinity and to provide a quantitative description on the evolving state of the ocean and patterns of ocean climate variability.<br>• Surface Ocean Lower Atmosphere Study (SOLAS) an international research initiative aiming to understand the key biogeochemical-physical interactions and feedbacks between the ocean and atmosphere. |
| International Council for the Exploration of the Sea (ICES) | Collection of datasets relating to the North Atlantic marine environment including:<br>• Biological community<br>• Contaminants and biological affects<br>• Fish eggs and larvae<br>• Fish predation<br>• Fish trawl survey<br>• ICES historical plankton<br>• Oceanographic | • Coordinates research on oceanography, the marine environment, the marine ecosystem, and on living marine resources in the North Atlantic.<br>• The ICES Data Centre manages large dataset collections a wide variety of oceanographic data and meta-data types into its databases from regional and country organisations.<br>• Has decade long time series on certain datasets and station level ocean observation data. |