United Nations Educational, Scientific and Cultural Organization

Intergovernmental Oceanographic Commission

Ocean Acidification: SDG indicator 14.3.1 methodology – revisited

Meeting Notes

12-13 April 2021, 3-6 pm CEST online

Contents

Rationale for the workshop

IOC-UNESCO promotes international cooperation, organizes and supports the coordination of programmes in research, services and capacity-building, in order to improve our knowledge about the nature and resources of the ocean and its coastal areas. The newly gained understanding can then be applied to improving the management, sustainable development, the protection of the marine environment, and the decision-making processes of IOC's Member States. IOC-UNESCO is the custodian agency for the SDG indicator 14.3.1. In this role, and with the support of GOA-ON, a methodology for the SDG indicator 14.3.1 was developed by 2018.

Two years after the initial adaptation of this methodology and the development of the SDG indicator 14.3.1 portal, the need to revise and further develop different parts and pieces of the methodology (metadata and data forms, portal, instructions) and related products was identified.

IOC-UNESCO invited a group of experts to join the IOC Secretariat in a two-day workshop to review the Methodology; to identify mistakes, mandatory changes and areas of improvement, as well as to develop an implementation plan for these changes. The IOC Secretariat based the agenda for the meeting on feedback received from the ocean acidification community throughout the last two years, questions raised during the data collection and data reporting process as well as related capacity development activities.

In preparation of the event all participants were invited to refamiliarize themselves with the Methodology and all of its parts: SDG 14.3.1 Indicator Methodology, SDG 14.3.1 data template, SDG 14.3.1 metadata template, Metadata instruction file, as well as the SDG 14.3.1 Data Portal.

1) Introduction and update: The SDG 14.3.1 Indicator and its components

Kirsten Isensee (IOC-UNESCO) introduced the SDG 14.3.1 Indicator, the text, the associated data and metadata templates, the SDG 14.3.1 Data Portal and the role of the IOC as the custodian agency for the Indicator.
The Methodology was developed in close collaboration with GOA-ON and other experts in the field of ocean acidification and finalised in May 2018. The Methodology was then presented at the 51st Session of the IOC Executive Council in July 2018, where it was adopted. It was recommended for presentation to the Inter-agency and Expert Group on SDG Indicators (IAEG-SDGs) in the second half of 2018 to apply for an upgrade to Tier II. The IOC was invited to present the Indicator for an upgrade in November 2018 and the Methodology is now in Tier II: *Indicator conceptually clear, established methodology and standards available but data are not regularly produced by countries.*
IOC is tasked with reporting on the SDG 14.3.1 Indicator to the United Nations on an annual basis. The Report must include an update on the progress of the Indicator as well as visualization products for the data collected towards the Indicator.

2) Objective of the Workshop

In the two years since the SDG 14.3.1 Indicator Methodology was approved by the IOC Executive Council and the IAEG, the IOC Secretariat has sent out two calls for data submissions towards the Indicator to the IOC Member States. Additionally, the IOC has called on its wider networks for data submissions towards the Indicator, including members of the Global Ocean Acidification Observing Network GOA-ON. Throughout the calls for data, technical trainings and workshops as well as conferences and presentations, the IOC Secretariat has received feedback on the text of the SDG

14.3.1 Indicator Methodology and its data and metadata templates. In response, the Secretariat has identified several parts of the Methodology that would benefit from an update or clarifications. Among these are:

- Update the text of the methodology as required: improve guidance on data quality assessments; clarify terminology and definitions;
- Update the metadata and data files as required;
- How to improve/automate the data collection process: SDG 14.3.1 Data Portal and other relevant databases;
- Visualization of data received: UN SDG Report and other data visualization products.

3) Review of the SDG 14.3.1 Indicator Methodology text

Following the introduction of the workshop objectives, and the suggestions of several details to be considered by the expert group, the discussion continued with the review of the SDG 14.3.1 Indicator Methodology text. In addition to the comments, suggestions and edits received prior to the workshop and incorporated into the Methodology text already, several issues and comments were raised during the discussion and read-through of the Methodology. All Participants were invited to continue to provide feedback on the following the workshop. The IOC Secretariat agreed to provide an updated version, including the comments received, for community review by the end of April 2021.

<u>Specific issues raised during the workshop include:</u>

- An update of the definitions for ocean acidification and coastal ocean acidification to be included in the Definition section of the Methodology text was agreed, to be adapted from the IPCC and the NOAA OAP definitions, respectively.
- The question of the 'Average pH' stated in the title of the Indicator was raised. The details of what to submit towards this Indicator will be worded more precisely, including the fact that the calculation of the average pH is being done by the IOC, not the data submitters.
- It was highlighted that the tasks conducted by the custodian agency and those carried out by the data providers need to be more clearly distinguished throughout the text.
- Changes will be made to the units of the variables to be submitted and the auxiliary variables (temperature, salinity and depth) will be added.
- The calculation process for the average pH based on data submissions was discussed. Further expert consultations on specifying the language are required. .
- The section on sampling strategy is to be refined to include more details in Box 1
- Another box explaining the chemical impacts of ocean acidification will be inserted.
- The overview statements on best practices section, together with the links and references will be updated. This will include the Standard Operating Procedures (SOPs).
- The paragraphs focusing on the calculations of the carbonate system will be reworded, in particular with respect to constants.
- The updated version of the Methodology will include references to the SDG 14.3.1 Data Portal, which was established after the publication of the first version of the Methodology.

4) Metadata and data files review

The SDG 14.3.1 Indicator Methodology comprises, in addition to the text itself, a metadata template, a data template and a metadata instructions file, all of which are available in excel format. To facilitate the submission of these files IOC and International Oceanographic Data and Information Exchange (IODE) of IOC have developed the SDG 14.3.1 Data Portal. The allows for the data and metadata files to be uploaded and contains an online version of the metadata file which can be filled in online. The metadata file aims to collect additional information on the sampling and analysis processes for data quality assurance. The template was adapted from the NOAA NCEI metadata template and has since, with a few additional fields, been adopted by SOCAT.

In order to ensure the user friendliness of the metadata template, the accessibility and compatibility with other databases, especially in light of the establishment of a federated system for the automation of data harvesting from these other platforms, the discussion on potential changes to the metadata format for the SDG 14.3.1 Indicator Methodology has been repeatedly raised. The SDG 14.3.1 metadata template is more detailed than most of the other metadata templates. The discussion on the metadata and data template formats was postponed and reprised during the discussion on data collection.

5) Data visualization

Jan Newton (University of Washington, USA/ GOA-ON co-chair) led the discussion on data visualization. Dr Newton presented a range of data visualizations for ocean acidification data, including the visualizations submitted by the IOC to the United Nations Sustainable Development Goals Reports for the SDG 14.3.1 Indicator reporting, and the plots published in the WMO Statement on the State of the Global Climate. Additionally, Dr Newton introduced the GOA-ON Data Explorer, which provides access and visualization to ocean acidification data and data synthesis products. It was deemed necessary to establish what the visualisation products should show and who the intended audience for these products would be. Different visualization products for different audiences and in addition to the data visualization for the annual UN SDG Report were discussed. It was agreed that the increased numbers of countries measuring ocean acidification and reporting those data as well as the quality of the data reported should be shown.

Several questions and suggestions were raised during the discussion:

- Currently the data visualization products for the SDG 14.3.1 Indicator include data from open ocean and coastal zones. This potentially masks clear trends observed in the open ocean sites. It was discussed that producing two separate plots could show clearer data trends. Concerns were voiced on the issue of time of emergence of ocean acidification signals in coastal zones and the need to clarify the many confounding environmental factors at play in coastal areas potentially obscuring ocean acidification signals.
- The definition of coastal zones was discussed: where does 'coastal' end and 'open ocean' begin? Suggestions to base the coastal zone on countries' EEZs were discussed, as the development of ocean acidification within their countries' EEZs may be of particular interest to policy makers.

- It was decided that the plots showing data received towards the SDG 14.3.1 Indicator should include the number of stations or samples collected for each of the annual means to account for the fact that the increased scatter visible in the plots is also due to the higher number of coastal samples included.
- It was agreed that Maps showing where data were collected could be an impactful visualization and especially helpful to highlight both progress in data collection and the remaining gaps. For stations with long enough time series signs indicating trends in ocean acidification could be included in the map.
- Maps showing observations for each of the different data quality levels defined in the Methodology could be produced for those stations which have longer (>5 years) data series. Trends could be displayed on these maps in addition to or instead of the mean pH values of the observations.
- Global modelled maps for ocean acidification showing predicted/calculated rates of change as well as maps showing combinations of modelled values and observations were discussed.
- Maps showing the SDG 14.3.1 data on background layers, possibly similar to the SOCAT maps, were suggested.
- To highlight the effect of the community's continued efforts in ocean acidification capacity development countries that have recently begun observations should be highlighted, as should those that cannot yet produce data in accordance with the Methodology. Several countries which have not yet submitted data towards the Indicator are interested in contributing and working towards establishing the necessary infrastructure.
- A short annual outcome document from GOA-ON and IOC listing all of the stations, the PIs and countries which have submitted data towards the SDG 14.3.1 Indicator could be produced to highlight all observations.

6) Data collection

Benjamin Pfeil (UIB/Bjerknes Climate Data Center, Norway) together with Kevin O'Brien (NOAA/PMEL, USA) led the discussion on data collection following a presentation centred around the questions:

- What other data bases are collecting relevant data?
- What kind of metadata are requested by other databases?
- How to establish a federated data collection system?
- How to ensure the collection of data of known quality?

The issue of data flow towards the SDG 14.3.1 Indicator, from data producers to national agencies such as National Oceanographic Data Centres (NODCs) though data portals was presented. The lack of data centres and/or expertise in some centres, which is reflected in the data submissions received, was emphasized. A close collaboration between the IOC and IODE and the other relevant national and international databases was agreed.

Discussion and decisions:

- The issue of data quality assurance and data quality control was raised, and examples of data QA Best Practices used by other data platforms were discussed. Richard Feely introduced the best practices for data QA prior to data submission in place at NOAA. While the Methodology includes some guidelines on data quality control, particularly for primary quality control, this section in the Methodology will be updated to reflect the community agreed best practices.
- The different data and metadata formats requested by the different databases collecting relevant data was identified as one of the most important issues. An agreement to align the metadata format across these efforts would significantly improve interoperability.
- In order to facilitate the establishment of a federated system to automatically exchange data with other relevant data bases closer cooperation between the IOC, IODE and other relevant data bases was agreed. The establishment of a Task Force to implement this collaborative effort and oversee the development of the federated system consisting of representatives from NOAA, EMODnet, IODE and Copernicus Marine as well as other interested parties was decided. IOC is looking at hiring a data platform developer to put into place the federated system, with the expert advice and support of the task force.

  Data collection task force:
  - Benjamin Pfeil (UIB/Bjerknes Climate Data Center)
  - Kevin O'Brien (NOAA/PMEL)
  - Eugene Burger (NOAA)
  - Toste Tanhua (GEOMAR)
  - Pieter Provoost (IODE)
  - Karina von Schuckmann (Mercator Ocean / Copernicus Marine)
  - EMODnet representative
  - NOAA representative
  - IOC Secretariat

- As many research cruises and sampling efforts have international crews and funding sources, the allocation of data to any one country has become an issue, especially with regard to the national data submissions towards the SDG 14.3.1 Indicator as required in the Methodology. Other agencies and databases have been using the country of the person handling the instrument and data as the owner of that data. It was determined that this approach should be used for data submitted towards the SDG 14.3.1 Indicator. The group agreed to establish a separate grouping for data from European research projects will be applied, in case scientists from multiple European Union Member States are involved in the data measurement and analysis.
- For data from private research vessels and other privately funded efforts a separate categorisation could be applied, ensuring the visibility of the sponsors and of the researchers.
- In general, the acknowledgement of the researchers submitting the data and their funding agencies should be assured and their visibility increased. This will be included in the updated SDG 14.3.1 Data Portal.

7) <u>Roadmap and next steps</u>

- Establish task teams for some of the topics discussed during the workshop, in particular for data visualization, data collection and data quality control (April, May 2021)
    - Objective Task Team Data collection: Establishment of federated system to allow the regular data exchange between relevant data bases (October 2021)
    - Objective Task Team Data visualization: Agree on 14.3.1 related products, including how to develop and disseminate these (October 2021)
    - Objective Task Team Data quality control in collaboration with existing efforts lead by GOA-ON and NOAA: Review and, if required, adapt existing data quality best practices for primary control of ocean acidification data (TBD)
- Publication of a Meeting Report, disseminated to all invited parties (including those invited but unable to attend), April 2021.
- Update of Methodology text
    - April 2021:
        - Incorporate comments, edits, additions
        - Update links and references
        - Send to Expert Group for review
    - May 2021:
        - Incorporation of Expert comments
    - June 2021
        - Publication
- Draft SDG 14.3.1 introduction leaflet for policy makers (September 2021)
- IOC will propose to the GOA-ON EC to produce a short annual 14.3.1, which could be broadened to GOA-ON capacity development activities. (See discussion under Data visualization).
- IOC/ IODE hosted SDG 14.3.1 Data Portal (September 2021)
    - Resolve how to credit both country and researcher for submissions (visibly)
    - Additional features:
        - Searching available datasets by parameters included, refine current search
        - Make online metadata form downloadable so that it can be reused for the next/similar submissions
        - Improve the data storage capacities for the portal
        - Add version names to the metadata and data templates to avoid incompatibility issues
- Establish regular communication with representative of other relevant ocean carbon data platforms
- Consult with Data QA and QC Expert Group on establishing a process for ocean acidification and SDG 14.3.1 data

Appendix

Attendees

Dorothee Bakker (University of East Anglia, UK)

Julian Barbière (IOC-UNESCO)

Richard Bellerby (NIVA, Norway)

Eugene Burger (NOAA OAP, USA)

Fei Chai (Second Institute of Oceanography, China & University of Maine, USA)

Kim Currie (NIWA, New Zealand,)

Kerri Dobson (NOAA OAP, USA)

Sam Dupont (University of Gothenburg, Sweden)

Richard Feely (NOAA/PMEL, USA)

Alessandra Giorgetti (EMODNet Chemistry, Italy)

Abed El Rahman Hassoun (National Council for Scientific Research in Lebanon, Lebanon)

Martin Hernandez Ayon (Universidad Autonoma de Baja California, Mexico)

Kirsten Isensee (IOC-UNESCO)

Libby Jewett (NOAA OAP, USA)

Somkiat Khokiattiwong (Phuket Marine Biological Centre, Thailand)

Elisabeth Kubin (National Institute of Oceanography and Experimental Geophysics, Italy)

Peter Landschützer (Max-Planck-Institute for Meteorology, Germany)

Siv K. Lauvset (NORCE, Norway)

Jan Newton (University of Washington, USA)

Kevin O'Brien (NOAA/PMEL, USA)

Benjamin Pfeil (UIB/ Bjerknes Climate Data Center, Norway)

Peter Pissierssens (IODE)

Pieter Provoost (IODE)

Karina von Schuckmann (Mercator Ocean / Copernicus Marine, France)

Katherina Schoo (IOC-UNESCO)

Lucy Scott (IODE)

Nayrah Shaltout (National Institute of Oceanography and Fisheries, Egypt)

Pauline Simpson (OBPS/IOC)

Adrienne Sutton (NOAA/PMEL, USA)

Peter Swarzenski (IAEA/OA-ICC)

Toste Tanhua (GEOMAR, Germany)

Bronte Tilbrook (CSIRO, Australia)

Steve Widdicombe (PML, UK)

Agenda

Monday 12 April 2021

15:00 **1. Welcome** – Julian Barbière, IOC

15:05 **2. Tour de table**

15:20 **3. The SDG 14.3.1 Indicator Methodology and all of its pieces–** facilitated by Kirsten Isensee

15:40 **4. Objective of the workshop** – Katherina Schoo & Kirsten Isensee

- Update the text of the methodology as required, how to improve guidance on data quality assessments (link to the documents can be found at the end of the document, please read the methodology in preparation for the workshop)
- Update the metadata and data files as required
- Plan on how to improve/automate the data collection process
- Visualization of data received
- Timeline for actions

16:00 **5. Review of SDG 14.3.1 Indicator Methodology text** – facilitated by Kirsten Isensee

16:30 *Health break*

16:45 **5. Cont'd**

17:15 **6. Metadata and data files review –** facilitated by Katherina Schoo

- Are changes to the format of the metadata necessary?
- Changes to the type and amount of metadata requested?
- Data file adaptations?

18:00 *Closing of day 1*

Tuesday 13 April 2021

15:00 **7. Data collection –** facilitated by Benjamin Pfeil

- What other data bases are collecting relevant data?
- What kind of metadata are requested by other databases?
- How to establish a federated data collection system?
- How to ensure the collection of data of known quality?

16:30 *Health break*

16:45 **8. Data visualization –** facilitated by Jan Newton

- What kind of 14.3.1 products do we want/need? (examples could include maps with three data quality categories, GOA-ON explorer app, regular reports outside of the UN SG report)
- What kind of OA data products exists?
- Plan to improve data visualization

17:30 **9. Roadmap**

18: 00 *Closing of workshop*

Additional information

- Sustainable Development Goal (SDG) 14.3.1 Indicator Methodology:
  - SDG 14.3.1 Indicator Methodology
  - SDG 14.3.1 data template
  - SDG 14.3.1 metadata template
  - Metadata instruction file

- The SDG 14.3.1 Data Portal
  Please note that you will need to register on OceanExpert to access all functions on the data portal. This link will take you to the registration page. After registering, it can take up to a few hours before your profile is created and access granted.

- GOA-ON Website and the Data Explorer

- GOA-ON Webinar: Measuring ocean acidification to support the 2030 Agenda for Sustainable Development - SDG target 14.3 and the related indicator 14.3.1 (presented by Kirsten Isensee and Katherina Schoo)
  This webinar introduces the audience to the Sustainable Development GOAL 14 and in particular the SDG target 14.3 and its indicator 14.3.1 focusing on ocean acidification. It introduces the related methodology, related meta-data and data requirements, what kind of data to submit and where.

- United Nations Sustainable Development Goal Report
  As the custodian agency for SDG 14.3.1 IOC is tasked with reporting annually on the Indicator to the United Nations for the SDG Report and the Secretary General's Report. IOC has contributed data on the SDG 14.3.1 Indicator for the 2019, 2020 and 2021 SDG Report. Data for the last two Reports was submitted by Member States towards the SDG 14.3.1 Indicator:
  - The Sustainable Development Goals Report 2019
  - The Sustainable Development Goals Report 2020