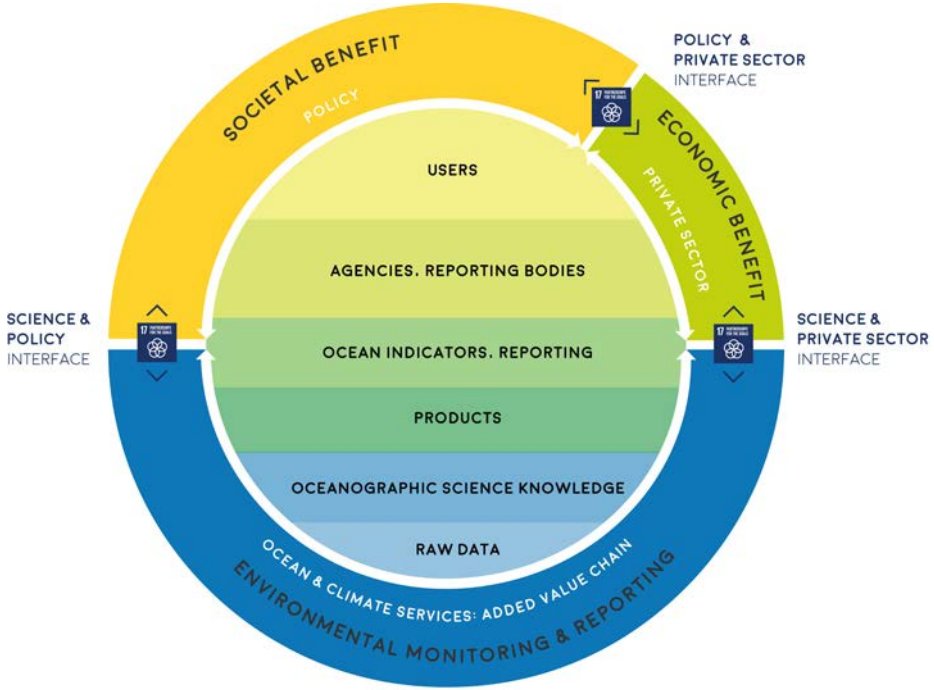
Towards a global ocean indicator framework

OOPC meeting, 01. Mars 2021 (remote)

Environmental indicators build the link between the lower and upper part of the added value chain



von Schuckmann et al., 2020 (Journal of Marine Policy)

- Indicators are a key element to interlink the three pillars of sustainable development: environment, society and economy
- They can play a central role for engagement between observing systems, services, science and stakeholders
- Indicators need to be backboned by state-of-the-art products and science knowledge, together with realiable uncertainty information

Policy, management and governance instruments require sustainable Ocean stewardship informed by best available Ocean science, data and services, and well targeted and framed ocean indicators across all ocean disciplines play a critical role.

The Global Climate Indicator framework: Example of use

WMO / GCOS Global Climate Indicators

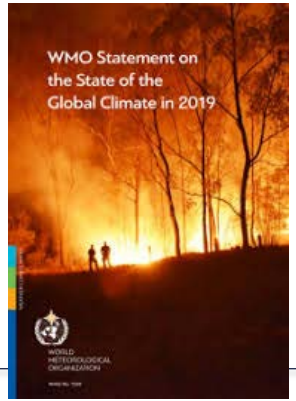
Temperature and Energy	Atmospheric Composition	Ocean and Water	Cryosphere
Surface Temperature	Atmospheric CO_2	Ocean Acidification	Glaciers
Ocean Heat		Sea Level	Arctic and Antarctic Sea Ice Extent

https://gcos.wmo.int/en/global-climate-indicators

5 criteria for indicator selection included:

(1) **relevance** for a range of audiences;
(2) **representativeness** to provide information of changes to the Earth system related to climate change;
(3) **traceability** of the data and method used for calculation;
(4) **timeliness and availability** of regular updates; and
(5) the **data adequacy** for a robust, reliable and valid indicator delivery

WMO Statements of the climate



The Global Climate Indicator framework: Example of use

Concerted international scientific collaborations on specific indicator topics

Earth Syst. Sci. Data, 10, 1551–1590, 2018
https://doi.org/10.5194/essd-10-1551-2018

Global sea-level budget 1993–present

WCRP Global Sea Level Budget Group

A full list of authors and their affiliations appears at the end of the paper.

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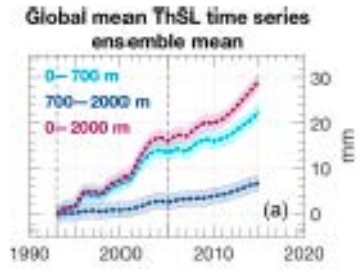
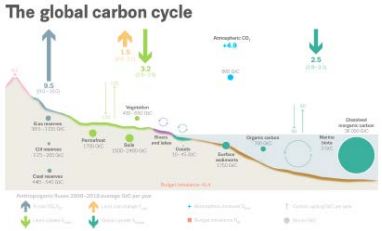
Received: 13 April 2018 – Discussion started: 15 May 2018
Revised: 31 July 2018 – Accepted: 1 August 2018 – Published: 28 August 2018



Earth Syst. Sci. Data, 11, 1783–1838, 2019
https://doi.org/10.5194/essd-11-1783-2019

Global Carbon Budget 2019

Pierre Friedlingstein[1,2], Matthew W. Jones[3], Michael O'Sullivan[1], Robbie M. Andrew[4], Judith Hauck[5], Glen P. Peters[4], Wouter Peters[6,7], Julia Pongratz[8,9], Stephen Sitch[10], Corinne Le Quéré[3], Dorothee C. E. Bakker[2], Josep G. Canadell[11], Philippe Ciais[12], Robert B. Jackson[13], Peter Anthoni[14], Leticia Barbero[15,16], Ana Bastos[8], Vladislav Bastrikov[12], Meike Becker[17,18], Laurent Bopp[19], Erik Buitenhuis[3], Naveen Chandra[19], Frédéric Chevallier[12], Louise P. Chini[20], Kim I. Currie[21], Richard A. Feely[22], Marion Gehlen[12], Dennis Gilfillan[23], Thanos Gkritzalis[24], Daniel S. Goll[25], Nicolas Gruber[26], Sören Gutekunst[27], Ian Harris[28], Vanessa Haverd[11], Richard A. Houghton[29], George Hurtt[20], Tatiana Ilyina[9], Atul K. Jain[30], Emilie Joetzjer[31], Jed O. Kaplan[32], Etsushi Kato[33], Kees Klein Goldewijk[34,35], Jan Ivar Korsbakken[4], Peter Landschützer[9], Siv K. Lauvset[36,18], Nathalie Lefèvre[37], Andrew Lenton[38,39], Sebastian Lienert[40], Danica Lombardozzi[41], Gregg Marland[23], Patrick C. McGuire[42], Joe R. Melton[43], Nicolas Metzl[37], David R. Munro[44], Julia E. M. S. Nabel[9], Shin-Ichiro Nakaoka[45], Craig Neill[38], Abdirahman M. Omar[18,18], Tsuneo Ono[46], Anna Peregon[12,47], Denis Pierrot[15,16], Benjamin Poulter[48], Gregor Rehder[49], Laure Resplandy[50], Eddy Robertson[51], Christian Rödenbeck[52], Roland Séférian[53], Jörg Schwinger[54,18], Naomi Smith[6,54], Pieter P. Tans[55], Hanqin Tian[56], Bronte Tilbrook[38,57], Francesco N. Tubiello[58], Guido R. van der Werf[59], Andrew J. Wiltshire[51], and Sönke Zaehle[52]

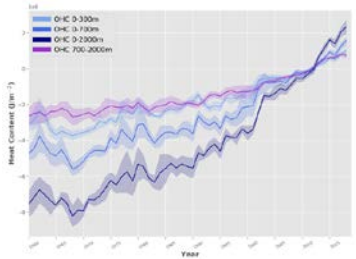


https://doi.org/10.5194/essd-2019-255
Preprint. Discussion started: 20 March 2020

Heat stored in the Earth system: Where does the energy go?

The GCOS Earth heat inventory team

Karina von Schuckmann[1], Lijing Cheng[2], Matthew D. Palmer[3], Caterina Tassone[4], Valentin Aich[4], Susheel Adusumilli[5], Hugo Beltrami[6], Tim Boyer[7], Francisco José Cuesta-Valero[8], Damien Desbruyères[9], Cana Domingues[9,10], Almudena García-García[9], Pierre Gentine[11], John Gilson[12], Maximilian Gorfer[13], Leopold Haimberger[14], Masayoshi Ishii[15], Gregory C. Johnson[16], Rachel Killick[3], Brian A. King[9], Gottfried Kirchengast[13], Nicolas Kolodziejczyk[17], John Lyman[12], Ben Marzeion[18], Michael Mayer[14], Maeva Monier[19], Didier Paolo Monselesan[20], Sarah Purkey[5], Dean Roemmich[5], Axel Schweiger[21], Sonia I. Seneviratne[22], Andrew Shepherd[23], Donald A. Slater[5], Andrea K. Steiner[13], Fiammetta Straneo[5], Mary-Louise Timmermans[24], Susan E. Wijffels[20,25]

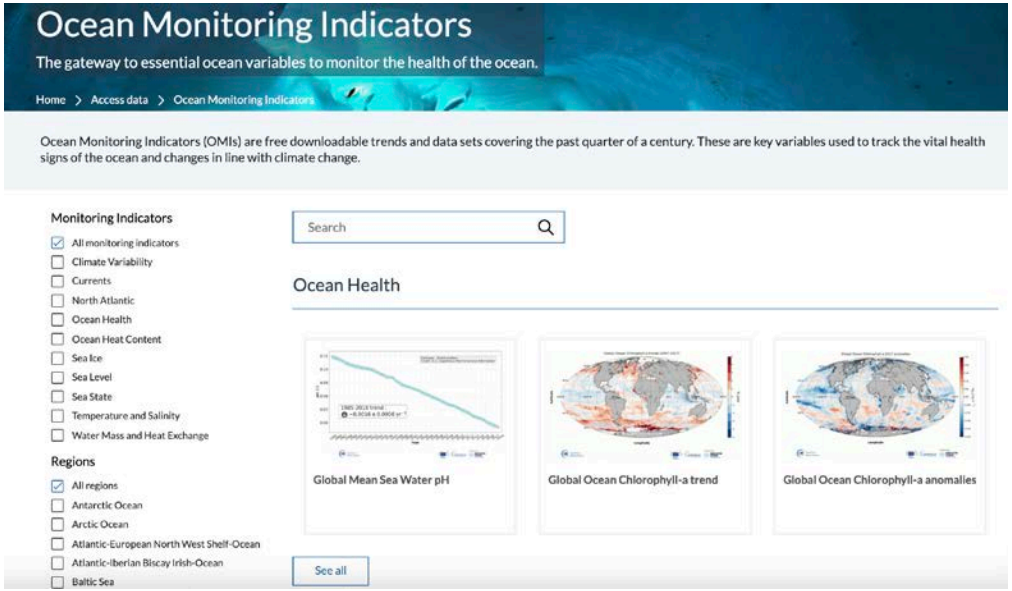


- Provides a framework for interdisciplinary science evaluations
- Provides a framework for high-level regular updates
- Provides a framework for continued and robust observing system recommendations

The Global Climate Indicator framework: Example of use

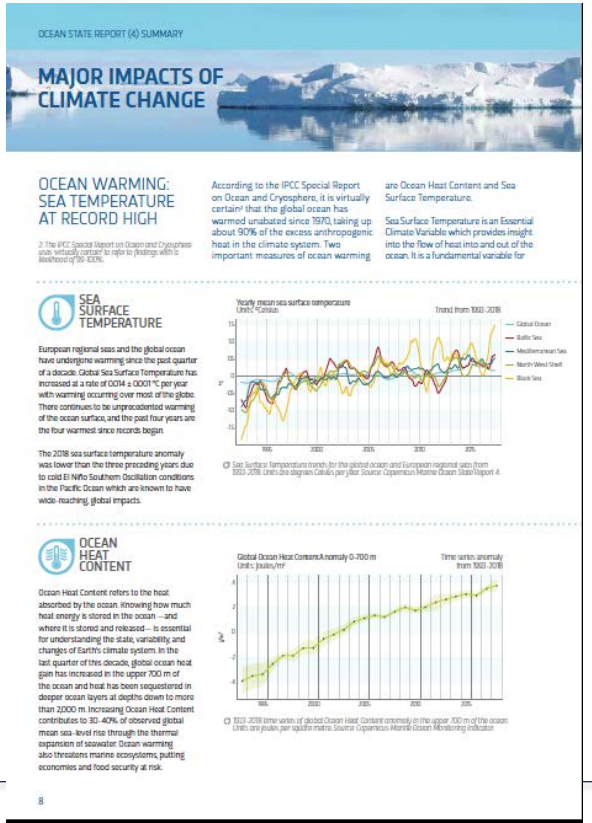
CMEMS OCEAN MONITORING INDICATORS:
Implementation into the Copernicus Marine web portal

http://marine.copernicus.eu/science-learning/ocean-monitoring-indicators/



CMEMS OCEAN STATE REPORT:
Summary for policy makers

https://marine.copernicus.eu/access-data/ocean-state-report



Proposal under OOPC

The OceanObs19 conference statement includes

'Indicators based on ocean observations help nations meet national goals and targets of the United Nations 2030 Agenda on Sustainable Development, the Paris Climate Agreement, the Sendai Framework for Disaster Risk Reduction, the Convention on Biological Diversity, and the Small Island Developing States Accelerated Modalities of Action Pathway. Ocean observations are fundamental to increase the scientific and information content of indicators, contribute to the United Nations Decade of Ocean Science for Sustainable Development (2021–2030) and are coordinated by Global Ocean Observing System (GOOS) and Group on Earth Observations (GEO).'

➔ **proposal on the development of an international global ocean indicator framework submitted (September 2020) to GOOS as part of OOPC** (Karina von Schuckmann, Marjolaine Krug, Sabrina Speich, Weidong Yu, Maria Hood)

Proposal under OOPC

- fostering international collaborations across multiple disciplines
- fostering the identification of key research priority areas
- supporting the quantification and identification of limitations in observing system capabilities, models and predictions, and assessments (product & information, e.g. International Panel of Climate Change (IPCC), the assessment report of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), weather forecasts, model validation, …)
- providing a useful tool for international product assessments, quality control, validation and verification
- providing an effective communication tool particularly beyond the scientific community to increase awareness of ocean issues with a wider public scope
- guiding planners and policy makers on the most effective way to use ocean information and scientific state-of-the-art knowledge to support decision making, with information and data products that are ready for application and most relevant for their needs (e.g. SDGs)
- providing a backbone to establish cross-linkage between the three pillars of sustainable development, i.e., environment, society and economy
- Powerful tool for the identification of research gaps.

G7 Future of the Seas and Oceans Initiative

G7 FSOI Action Area 2:

Proposed activity: Catalyse and facilitate the development of an internationally-agreed Global Ocean Monitoring Indicator Framework to provide authoritative scientific underpinning for global ocean assessments, for State of the Ocean Reports, and for assessing the capacity of observing systems to provide the data and information required for societal benefit areas.

Funded by the European Union

EU4OceanObs
INTERNATIONAL OCEAN GOVERNANCE
EU COMPONENT TO GLOBAL OCEAN OBSERVATIONS

1 scoping meeting, 29 January 2021

- EU Office G7/GOOS Coordination Centre
- IOC-UNESCO
- European Commission
- High-level Panel for a Sustainable Ocean Economy

Strong initial support from G7 members / pending final approval (April 2021)

Next steps: 1) prepare a perspective paper to be published in a high-profile journal to establish a science-based rationale; 2) begin community-wide discussions about appropriate scope required for global assessments (refer to proposed IOC State of the Ocean Report; 3) Determine if there is interest to develop a UN Decade programme.

Courtesy: Maria Hood

An ocean indicator can be defined as:

A simple easy to understand tool to describe, measure and monitor a complex Ocean phenomenon. The Ocean indicator may change globally to locally, at different time scales, and can be utilized for Ocean literacy, and to build a sustainable Ocean observing system for holistic scientific assessment and stewardship.'

von Schuckmann, K., E. Holland, P. Haugan, P. Thompson, 2020, Journal of Marine Policy

NEXT STEPS…

THE OCEAN's ROLE IN THE EARTH SYSTEM

Ocean & Human	Ocean & Climate	Ocean & Biosphere	Ocean & Cryosphere	Ocean & Atmosphere	Ocean & Land
Ecosystem services	Ocean & energy cycle & Sea Level	Ecosystem health	Sea Ice	Climate modes	Coastal dynamics
Sustainable development	Ocean & water cycle & MOC	Ecosystem functioning	Deep circulation & ocean-driven melting	Extreme variability	Coastal ecosystems
Integrated ocean governance	Ocean & carbon cycle	Ocean conservation	Ice sheet, glacier and ice-shelf stability	Ocean currents	Marine spatial planning

➔ this first structuration could support the establishment of an international team dedicated to an international ocean indicator framework