Ocean Acidification Research for Sustainability - OARS

The UN Decade Programme of the Global Ocean Acidification Observing Network GOA-ON

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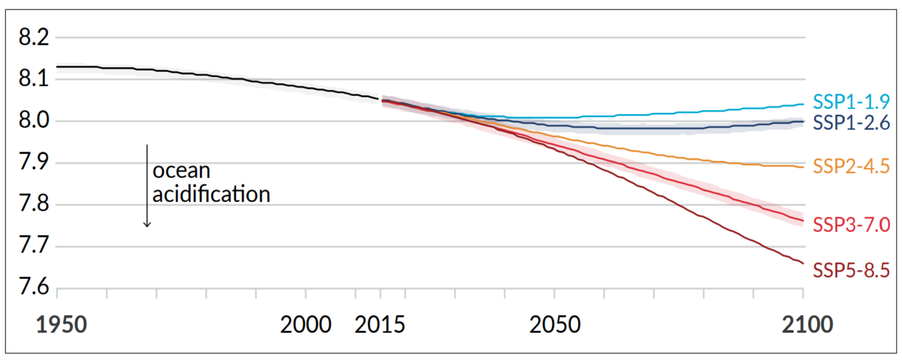
2021 2030 United Nations Decade of Ocean Science for Sustainable Development

Ocean Acidification

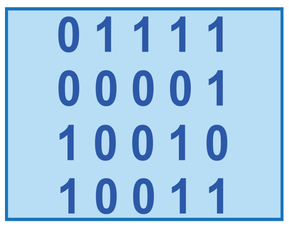


Global ocean surface pH (IPCC, 2022). The black curve represents a historical simulation of pH; colored curves indicate five possible future scenarios with high, intermediate, and low greenhouse gas emissions.

The ocean absorbs around one quarter of the annual emissions of anthropogenic CO_2 to the atmosphere (WMO, 2021), thereby helping to alleviate the impacts of climate change on the planet (Friedlingstein et al., 2020). The cost of this process to the ocean is high, as the CO_2 reacts with seawater to change the carbonate chemistry of the ocean; this process is referred to as 'ocean acidification' due to the observed decrease in pH. Ocean acidification threatens organisms and ecosystem services, including food security, by reducing biodiversity, degrading habitats, and endangering fisheries and aquaculture. Ocean acidification will continue to increase – open-ocean surface pH is projected to decrease by around 0.3 pH units by 2081–2100, relative to 2006–2015, under RCP8.5 (virtually certain), with consequences for the global climate (IPCC, 2019). As the acidity and temperature of the ocean increases, its capacity to absorb CO_2 from the atmosphere decreases, impeding the ocean's role in moderating climate change.

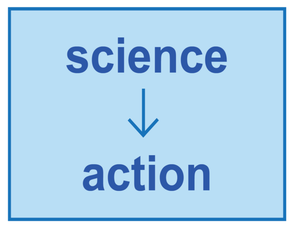
Seven Outcomes to Develop Ocean Acidification Science by 2030

Data



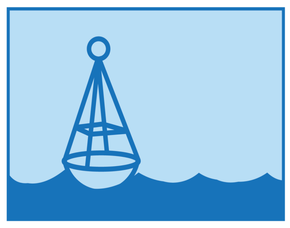
Enable the scientific community to provide ocean acidification data and evidence of known quality, via capacity development, mentoring of early career researchers, facilitating data sharing, and growing regional collaborations, and increased communication through meetings and workshops, allowing for a holistic analysis considering all stakeholder perspectives.

Adaptation



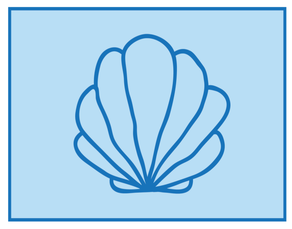
Identify data and evidence needs for mitigation and adaptation strategies, from local to global, by 2022. Communicate these needs to the scientific and science policy community to ensure that science is prioritized **to ensure efficient implementation of actions.**

Observations



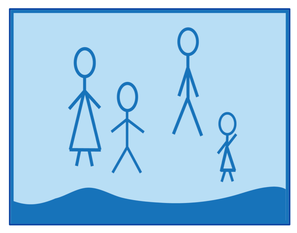
Co-design and implementation of observation strategies in collaboration with data producers and end-users by 2025. Identify factors limiting collection of data and implementation of solutions. Proactively design and implement strategies to ensure vulnerable areas are adequately monitored. Provide ocean acidification baseline data for newly developed carbon removal strategies.

Biology



Increase understanding of ocean acidification impacts to protect marine life by 2030. Implementation of the newly established framework for biological observation within the ocean acidification monitoring framework (Dupont et al., in review) providing the possibility to improve predictions of vulnerability and resilience to ocean acidification at all temporal and spatial scales.

Forecasts

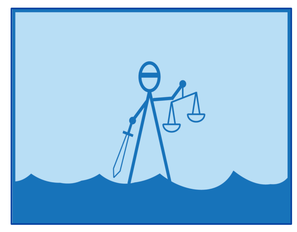


Develop societally relevant predictions and projections of OA and impacts, to understand implications and facilitate effective adaptation and mitigation strategies. Provide appropriate data and information necessary to development of predictions and projections, employing new technologies such as digital twins, for all ocean 'users' of the impacts of ocean acidification to implement adaptation and mitigation by 2030.

Communication

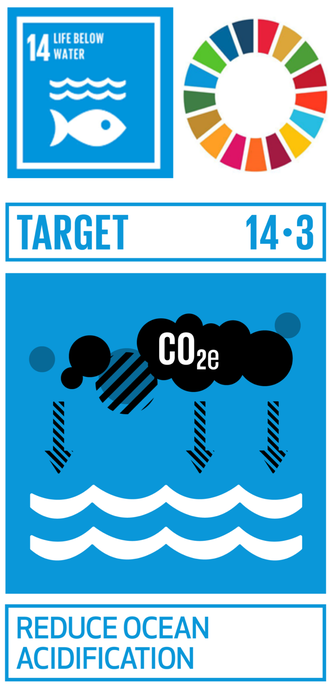
Increase public awareness of ocean acidification, its sources and impacts, achieved via ocean literacy and public outreach.

Policy



Develop strategies and solutions to enable countries and regions to include measures to reduce ocean acidification in their respective legislation. This outcome is based on achieving the outcomes 1-6.

What is OARS?



The OARS programme will build on the work of GOA-ON and its regionally-based hubs to foster the development of the science of ocean acidification, including the impacts on marine life and sustainability of marine ecosystems in estuarine, coastal, and open ocean environments. The programme will address the SDG Target 14.3 "Minimize and address the impacts of Ocean Acidification (OA), including through enhanced scientific cooperation at all levels" and is endorsed as an Ocean Decade Action for the UN Decade of Ocean Sciences for Sustainable Development (2021-2030).

Goals and Impacts

The OARS programme provides a roadmap for ocean acidification research for the next Decade. Each of the seven OARS outcomes is led by co-champions, experts within their fields, who have assembled working groups tasked with finding the path towards achieving the seven outcomes by identifying the key actions, drivers, and enablers.

Together, the co-champions and working group members will put OARS on the path to achieving the overarching vision of this program by providing societies with the observational and scientific evidence needed to sustainably identify, monitor, mitigate, and adapt to ocean acidification from local to global scales. Countries can then better manage, mitigate, and reduce the impacts of ocean acidification on marine ecosystems, the goods and services they provide, and the human communities that rely on them.

By delivering the seven outcomes, OARS will create a number of benefits: providing a clean, diverse, productive ocean capable of supporting the health, well-being, and livelihoods of human societies dependent on marine resources.

OARS Video

OARS Webpage

References

1. Allan, Richard P., et al. "IPCC, 2021: Summary for Policymakers." (2021). 2. WMO. State of the Global Climate 2020. World Meteorological Organization (WMO), 2021. 3. Friedlingstein, Pierre, et al. "Global carbon budget 2020." Earth System Science Data 12.4 (2020): 3269-3340. 4. Pörtner, Hans-Otto, et al. "The ocean and cryosphere in a changing climate." IPCC Special Report on the Ocean and Cryosphere in a Changing Climate (2019).