Factsheet: Future Science Brief N° 12

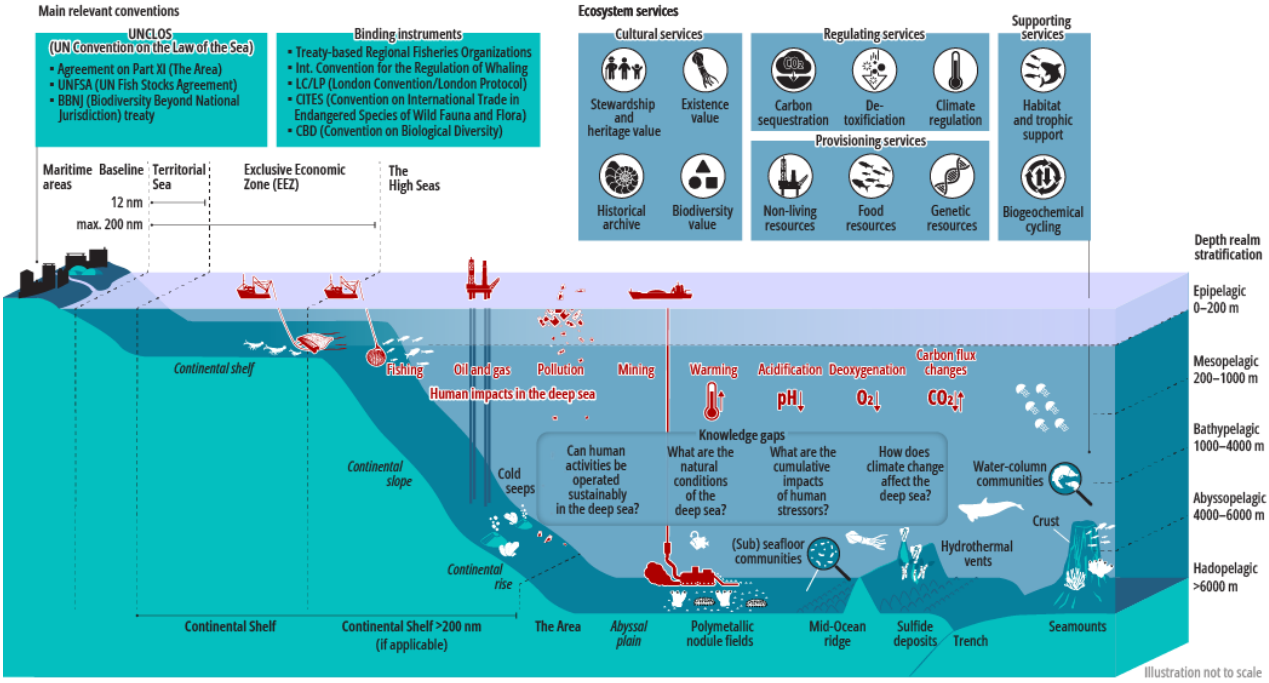
European MARINE BOARD
Advancing Seas & Ocean Science

Deep Sea Research and Management Needs

Background

The deep sea accounts for about 90% of the Ocean's volume. Its importance for ecosystems and biodiversity is therefore immense. However, pressure on these still relatively untouched areas of our planet is growing: human activities such as oil extraction, fishing, and potential seabed mining threaten deep-sea ecosystems, while climate change is already having a negative impact. In addition, it is estimated that around 90% of all Ocean species are still undescribed, with the majority of knowledge gaps being in the deep sea, and their roles within ecosystems remain largely unknown. There are also considerable gaps, e.g. in the modelling of deep currents, which are crucial for understanding the transport of nutrients and pollutants, or about how biogeochemical cycles in the deep sea are affected by human activities. Technical challenges also remain: many modern sensors and monitoring systems are not yet adequately developed for extreme depths, making it difficult to gather essential data. Closing these and other crucial knowledge gaps is urgently needed to support science-based decision-making for deep-sea governance. Despite its immense ecological importance, the deep sea remains underrepresented in policy considerations and global conservation efforts. There is an urgent need to translate European and international agendas into action, particularly concerning the deep sea.

The EMB Future Science Brief No. 12 'Deep Sea Research and Management Needs' explores the complexity of the deep sea and its role in Ocean health today, highlights the critical ecosystem services and functions it provides, and underscores the risks to Ocean health in the face of climate change, direct human impacts, and future industries in the deep sea. This document provides policy, management, research and global capacity building recommendations to ensure a healthy Ocean and deep sea.



Summary of geological features, biological communities, ecosystem services, human impacts, institutions and conventions related to the deep sea, together with the main knowledge gaps. Credit: Andrés Alegría/ EMB

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Recommendations

Policy and management: The European Union (EU) and European nations should take an active role in leading international efforts to protect and sustainably manage the deep sea through:

1. **Effectively governing human activities in the deep sea** within EU jurisdiction and in areas beyond national jurisdiction (ABNJ), in alignment with the Agreement under the United Nations Convention on the Law of the Sea on the Conservation and Sustainable Use of Marine Biological Diversity of Areas beyond National Jurisdiction (BBNJ Agreement) and relevant EU and international laws.
2. **Establishing an international scientific committee for deep-sea sustainability and protection** to identify key areas to be monitored and protected, with the goal of reaching the Global Biodiversity Framework Target of 30% protection by 2030, and to be able to provide recommendations for funding essential scientific projects.
3. **Contributing to the development and implementation of standardised deep-sea Environmental Impact Assessment methodologies** in order to understand and manage human impacts and the associated risks in the deep sea.

Research funding and monitoring: National and European research funders should support research and monitoring to help close significant knowledge gaps in understanding Ocean processes in the deep sea and its connectedness over space and time through:

4. **Supporting transdisciplinary research programs to better understand the role of the deep sea in Ocean (and human) health.** This includes, but is not limited to, disciplines of natural sciences, social sciences and humanities, law, indigenous knowledge, engineering, and technology. These programs should aim for a holistic understanding of interactions between the deep sea, Ocean and planetary health.
5. **Investing in long-term monitoring of the deep sea.** Long-term, regional, and basin-scale multidisciplinary monitoring programs need to be established, and existing ones should remain operational, to describe baselines, capture shifting baselines under climate change and other anthropogenic impacts, and ensure effectiveness of protected areas.
6. **Launching large-scale and long-term multidisciplinary natural sciences projects to increase knowledge of global deep-sea processes.**
7. **Supporting research efforts in specific critical research fields**, such as, but not limited to, advancing genomic sequencing and taxonomy, and increasing our knowledge on: (i) the metabolic consequences of species adaptation to climate change through experimental studies; (ii) cumulative and synergistic impacts on deep-sea species; (iii) the (mid-water) biological carbon pump, (iv) the rate of change of deep-sea temperatures; (v) the Meridional Overturning Circulation (MOC) and its impact on upwelling and downwelling processes; and (vi) abiotic and biotic subseafloor processes and their connectedness to Ocean processes.

Global capacity building: International cooperation and multilateral action should ensure that all countries have sufficient capacity and appropriate technology to actively engage in scientific research and Ocean management, in order to implement the 2023 BBNJ Agreement effectively. This may be achieved by:

8. **Enhancing educational, training, and research opportunities for all current and future scientists addressing their unique regional challenges**, particularly those from underrepresented regions, as a way to implement science as a global fundamental human right.
9. **Fostering the transfer of marine technology and developing training programs**, to increase the number of deep-sea research initiatives by underrepresented nations.
10. **Continuing to promote the Findability, Accessibility, Interoperability, and Reusability (FAIR) Data principles.**

Find out more about the EMB Future Science Brief No. 12 “Deep Sea Research and Management Needs” at: https://www.marineboard.eu/publications/deep-sea-research-and-management-needs

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