frontiers | Frontiers in Marine Science

TYPE Editorial
PUBLISHED 01 October 2024
DOI 10.3389/fmars.2024.1484173

OPEN ACCESS

EDITED AND REVIEWED BY
Porter Hoagland,
Woods Hole Oceanographic Institution,
United States

*CORRESPONDENCE
Letian Ma
malt@sio.org.cn

RECEIVED 21 August 2024
ACCEPTED 18 September 2024
PUBLISHED 01 October 2024

CITATION
Ma L, Feng X, Wu S, Hao T, Lei Y and Yoshida K (2024) Editorial: Towards standards for marine environment impact assessment. *Front. Mar. Sci.* 11:1484173. doi: 10.3389/fmars.2024.1484173

Editorial: Towards standards for marine environment impact assessment

Letian Ma[1,2]*, Xuwen Feng[2], Sheng Wu[3], Tianyao Hao[4], Yanli Lei[5] and Koichi Yoshida[6]

[1]Key Laboratory of Submarine Geosciences, Ministry of Natural Resources, Hangzhou, China, [2]Second Institute of Oceanography, Ministry of Natural Resources, Hangzhou, China, [3]Yantai Graduate School, Harbin Engineering University, Yantai, China, [4]Institute of Geology and Geophysics, Chinese Academy of Sciences, Beijing, China, [5]Institute of Oceanology, Chinese Academy of Sciences, Qingdao, China, [6]Graduate School of Engineering, Yokohama National University, Yokohama, Japan

KEYWORDS

marine observation, marine exploration, marine environment impact assessment, International Standardization Organization, standard

Editorial on the Research Topic
Towards standards for marine environment impact assessment

Marine technology is not only an application of marine theoretical research but also a practical approach for deepening marine understanding, making it a promising frontier for global technological competition. The development of marine technology requires the realization of cross-industry and cross-technical disciplines. Recent studies on marine technology have focused on two aspects: the intelligent upgrade of traditional marine equipment and rapid application of emerging technologies. Consensus-based standards provide the necessary support for implementing new ideas and technologies. International standards for marine technology provide important means of expanding technological advantages in the global market.

International standards for marine technology focus on marine observation, marine exploration, and environmental protection. Marine observation and exploration offer means for the development of human society; however, they pose cumulative negative effects on the marine environment. Thus, addressing this undesirable relationship between these two aspects is challenging. The International Standardization Organization (ISO) has established a Marine Technology Subcommittee SC 13 of the ISO Technical Committee TC 8 (ISO/TC 8/SC 13) to provide a reliable international platform for negotiating and specifying requirements for eco-friendly and sustainable marine observation and exploration activities.

Six studies discussed in this Research Topic focused marine technology standardization to understand the coordination relationship between marine observation, marine exploration, marine engineering, and marine environment impact assessment (MEIA) providing a general framework for future focus on international marine technology standards under ISO/TC 8/SC 13.

Marine environment impact assessment

Coastal sea areas and areas beyond national jurisdiction (ABNJ) provide abundant marine ecosystem products and resources. However, they are affected by the cumulative effects of human activities. Thus, there is a need to assess the contribution of coastal marine ecosystems to the human society. Li et al. proposed a standardized system for evaluating the gross ecosystem product (GEP) of a sea area, which included principles for selecting evaluation indices and methods. They found that marine GEP can serve as a comprehensive indicator of the sustainability of marine ecosystems. Furthermore, Song et al. proposed a policy perspective for regulating exploration activities and protecting the marine biological diversity of ABNJ. They reported the fragmentation of existing strategic environmental assessment (SEA) rules and indicated the importance of developing SEA-related technical standards to improve marine environment assessment systems.

Marine observation

To assess marine environmental impacts, biological observations must be performed to measure species abundance and further conserve marine biodiversity. Artificial intelligence (AI) techniques have been employed in image-based underwater observations, such as automated image analysis. Zhou et al. proposed that standardizing AI-based tools could improve reproducibility across experiments and enhance comparability in the assessment of environmental impacts. Physical oceanographic observation also plays a key role in marine protection and sustainable resource management, and ocean profiling observation (OPO) systems contribute to real-time global oceanic observation. Jiang et al. proposed the design and implementation of an OPO system for a wave-powered vertical profiler in accordance with ISO standards. Compared to traditional ocean profiling methods, standardized data formats and transmission protocols can improve information-sharing efficiency, making such methods more modular and systematic.

Marine exploration and engineering

The exploration of submarine minerals (e.g. polymetallic nodules, sulfide deposits, ferromanganese crusts) and marine renewable energies (e.g. wave, wind and solar, hydrogen) requires not only investigations to map seabed structures and new resources but also marine engineering projects to utilize clean energy. Assessing the environmental impact of such activities is challenging because of the harsh nature of marine environments. Ma et al. employed a recently published ISO standard for active source exploration using ocean bottom seismometers (OBSs), which may enable obtaining higher-quality data, lower loss rate of an OBS, and more reliable data-processing results during seabed geophysical investigations relative to nonstandardized operation. Wu et al. studied the technological feasibility of extending the application scope of floating photovoltaic systems from land freshwater areas to the ocean and minimizing their potential effects on the marine environment during their life cycles (from manufacturing to disposal).

The studies reported herein provide a full perspective on marine technology standards, including the coordination among marine observation, exploration, and engineering, focusing on the assessment of marine environmental impacts. This topic is expected to serve as a useful reference for future research on establishing international standards for the practical assessment of the environmental impacts of marine investigation, exploration, and engineering and to provide technical support to international organizations during policymaking.

Author contributions

LM: Writing – original draft. XF: Writing – review & editing. SW: Writing – review & editing. TH: Writing – review & editing. YL: Writing – review & editing. KY: Writing – review & editing.

Funding

The author(s) declare that financial support was received for the research, authorship, and/or publication of this article. This work is supported by National Key Research and Development Program of China (2023YFF0803401), National Natural Science Foundation of China (Grant 42025601), and National Key Research and Development Program of China (2021YFF0601700).

Acknowledgments

We would like to thank all scientists contributing to this Research Topic. We would like to thank the reviewers for their insightful comments which substantially improved the manuscripts in this Research Topic. A special thanks to Porter Hoagland, Mario López Gallego and Kum Fai Yuen, who acted as additional manuscript handling editors.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note