

**2020-2022 GEO Work Programme**  
**Development of Implementation Plans for GEO Community Activities**  
**Global Marine Ecosystem Monitoring (GMEM)**

**1. Executive Summary**

Title: Global Marine Ecosystem Monitoring (GMEM)

Category: Community Activity

Overview: The GEO Strategic Plan (2016-2025) advocates the value of Earth observations, engages communities and delivers data and information in support of ecosystem sustainability. Global marine ecosystem is an integral part of the earth's biogeochemical cycles, which is coupled to and influence the climate through a myriad of physical, chemical, biological and ecological processes. Establishing a comprehensive system to understand the complex processes and quantify global marine ecosystem would be a wise investment for the coming decade along with climate change. Global Marine Ecosystem Monitoring (GMEM) expects to realize a Technique-Service-Community-Application framework for monitoring and understanding global marine ecosystem. The actual and planned outputs focus on the advanced data collection technique, comprehensive data service platform, active scientific community, several important science questions and social problems. Engineers, scientists, young scholars, students, society and government can all benefit from the main outputs of GMEM.

Planned activities: 1) development of cutting-edge monitoring technologies, 2) data collection and sharing service, 3) cooperation and exchange activities, 4) application demonstration and social benefits

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**2. Purpose**

**Rationale:** The GEO Strategic Plan (2016-2025) advocates the value of Earth observations, engages communities and delivers data and information in support of ecosystem sustainability. Global marine ecosystem is an integral part of the earth's biogeochemical cycles, which is coupled to and influence the climate through a myriad of physical, chemical, biological and ecological processes. Establishing a comprehensive system to understand the complex processes and quantify global marine ecosystem would be a wise investment for the coming decade along with climate change. With the advent of satellite ocean color technology, accomplishment that routinely survey and monitor the ocean leads to the improved understanding of marine ecosystem dynamics. Recently, expanding technique plans of satellite oceanic lidar start to be implemented in China and US to supplement the traditional satellite ocean color measurement. With the technical opportunity, Global Marine Ecosystem Monitoring (GMEM) expects to realize a Technique-Service-Community-Application framework for monitoring and understanding global marine ecosystem. Service and Community serve as the media to connect Technique and Application, which transfers the technical strength to the scientific and social values efficiently.

**Actual and planned outputs of the Community Activity and their geographical scope**

- Provide a comprehensive theoretical and practical framework of the oceanic lidar.
- Provide the preliminary data service on global marine ecosystem, e.g. marine data

around China.

- Build an active community to facilitate the cooperation and exchanges in the ocean science and engineering.
- Sign international cooperative agreements between several institutes.
- Establish joint laboratories with top research institutes solving oceanographic science questions and equipment practical problems.
- Organizing several international workshops and conferences, e.g. the 6<sup>th</sup> International Symposium on Atmospheric Light Scattering and Remote Sensing.
- Provide several key science questions and the corresponding answers.
- Finish annual program reports on the field of global marine ecosystem.

**Actual and intended users of the outputs and the expected types of decisions these outputs are expected to inform**

- Engineers on optics, machinery, electronics, computer etc. use the comprehensive theoretical and practical framework on oceanic lidar as a reference of research and use the science questions to guide themselves to the right direction through continuous communication.
- Scientists on oceanography, biology, chemistry and earth science etc. use the data service to answer the key science questions and propose the technical demand for engineers through continuous communication.
- Young scholars and students use the wide cooperation to study the comprehensive knowledge about the marine ecosystem and promote their multidisciplinary knowledge.
- Society and government use the application research to maximum economic benefit and develop realistic strategies for the marine ecosystem.

**3. Background and Previous Achievements**

GMEM that was listed as one of the GEO Work Programmes in 2018 expects to realize a Technique-Service-Community-Application framework for monitoring and understanding global marine ecosystem. Status of implementation of planned activities and outputs are as follows:

- Developed preliminary theoretical and practical framework of the oceanic lidar in the period of 2017-2019.
- Held the International Workshop on Ocean Optical Remote Sensing in 2018.
- Preparing the 6th International Symposium on Atmospheric Light Scattering and Remote Sensing that will be host in 2019.

**4. Key Activities**

To achieve the above objectives and based on the previous achievements, GMEM will continue to work on four types of activities: 1) development of cutting-edge monitoring technologies, 2) data collection and sharing service, 3) cooperation and exchange activities, 4) application demonstration and social benefits:

- GMEM will focus on the development of cutting-edge technologies for global observations, including oceanic high-spectral-resolution lidar. GMEM will make efforts in the pre-research and data processing of the world's first space-borne oceanic lidar and develop the active-passive ocean optical remote sensing fusion technology.

- GMEM plans to integrate the multi-source ocean optical remote sensing data about ecosystem and build a real-time online big data sharing platform to provide effective information of the marine environment and ecosystem for non-profit research in the departments of meteorology and environmental protection, universities and other research institutions.
- GMEM will also organize multiple activities, such as international workshops and conferences, for the global experts and officials to sharing the latest research in marine environment and ecosystem. Furthermore, it plans to establish long-term and stable cooperation between universities and research institutions on a global scale.
- GMEM will develop an application demonstration about marine ecosystem research, marine environment protection or marine resource exploration. What's more, GMEM will try to create social benefits fisheries and tourism.

#### **5. Relationship to GEO Engagement Priorities and to other Work Programme Activities**

- Development of cutting-edge monitoring technologies and application demonstration are expected to inform the achievement of SDG target (*Goal 14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development*).
- GMEM is relevant to Flagship *GEO BON*, Initiatives *AmeriGEOSS*, *GEO ECO*, *Oceans and Society: Blue Planet*, and Community Activity *GEOARC* in the 2017-2019 GEO Work Programme. GMEM has cross task partially with those projects and can promotes mutual complementarity.

#### **6. Governance**

- Leadship is in charge of carrying out routine work of GMEM. The academic committee of the work unit is responsible for the regulation and supervision.

#### **7. Data Policy**

- All the participants and contributions adherence to the GEOSS Data Sharing Principles and GEOSS Data Management Principle. Data collected in the project is open to all non-profit research with the permission of data provider.
- An online big data sharing platform will be built in the near future to display the data and outputs.