Health of Ocean under Multiple Ecosystem Stressors

(HOMES: Sustainability of the Maritime Continent)

Background

The Maritime Continent faces a multitude of complex threats due to climate change and anthropogenic impacts. The region's marine biodiversity, shaped by geological and climatic processes, is in decline. The HOMES project is a response to this urgent situation, aiming to understand and preserve the rich marine ecosystems of the area.

Goals

Improve the observation systems and modeling capabilities in the Maritime Continent under climate change through the implementation of joint cruises, long-term observations, interdisciplinary research, and coupling of multi-disciplinary models.
Improve understandings on formation mechanism, status quo, and trend of evolution of the biodiversity center in the Maritime Continent and their socio-economic impacts with changing climate.

Provide the best and most up-to-date research and data support for decision makers to protect the marine ecosystems and sustainable development in the Maritime Continent area through constructing a comprehensive data and sample sharing platform and a sustainable management of a healthy coupled social-ecological system.

Key Expected Outcomes

- Improve the observation systems and modeling capabilities in the Maritime Continent under climate change through the implementation of joint cruises, long-term observations, interdisciplinary research, and coupling of multi-disciplinary models.
- Improve understandings on formation mechanism, status quo, and trend of evolution of the biodiversity center in the Maritime Continent and their socio-economic impacts with changing climate.
- Provide the best and most up-to-date research and data support for decision makers to protect the marine ecosystems and sustainable development in the Maritime Continent area through constructing a comprehensive data and sample sharing platform and a sustainable management of a healthy coupled social-ecological system.

Research Content and Targets during 2024-2026

- Identify priority topics for cooperative studies through international symposiums and meetings to filter the key environmental factors driving the formation and evolution of marine biodiversity in the Maritime Continent.
- Co-design and implement scientific expedition and observation in collaboration with relevant regional countries;
- Establish standardized protocols and technology for marine biodiversity observation and monitoring, and organize training courses for promoting the application of new observation methods and technology;
- Build high-resolution physical-ecosystem coupled numerical models in the Maritime Continent to explore the roles of different environmental factors and the future of

marine biodiversity.

- Develop a data management system to promote data storage, assimilation and sharing. Identify and provide data and evidence for the development of strategies and policies for marine biodiversity protection and marine pollution remediation;
- Increase public awareness of ocean eutrophication, pollution, acidification and deoxygenation, and their impacts on marine organism, ecosystem or even human being, achieved via ocean literacy and public outreach, such as brochures, videos, and online class.

Implementation Plan

- **International Collaboration:** Foster partnerships for joint research and observations.
- **Capacity Building:** Provide training and knowledge sharing for new monitoring technologies.
- **Data Management:** Create a platform for data storage, assimilation, and sharing.
- **Public Outreach:** Engage communities through literacy programs and outreach materials.

Significance

HOMES will fill knowledge gaps in the Outstanding Universal Value of marine World Heritage sites in the Maritime Continent. The project's outcomes are critical for effective management and are aligned with the Decade of Ocean Science for Sustainable Development.

Distinctive Features

- Multi-Sphere Approach: Comprehensive study of interactions between various spheres.
- Granularity of Study: Detailed insights into the mechanisms of biodiversity evolution.
- Focus on Interactions: Dynamic view of marine life through interaction analysis.
- Adaptive Strategies: Responsive strategies based on real-time ecosystem changes.
- Environmental Impact Analysis: Comprehensive analysis of environmental factors affecting biodiversity.

Contribution to UN-Decade Outcomes

- Outcome1: A clean ocean with reduced pollution.
- Outcome2: A healthy and resilient ocean with well-managed ecosystems.
- Outcome4: A predicted ocean with society's ability to respond to changing conditions.

Addressing UN-Decade Challenges

- Challenge 2: Understanding and addressing multiple stressors on ocean ecosystems.
- Challenge 5: Enhancing knowledge of the ocean-climate nexus and developing resilience strategies.