

# 國際海洋資訊

International  
Ocean Information

22

February 2023

雙月刊 | Bimonthly

海洋委員會「《聯合國海洋法公約》  
40週年與海洋政策國際研討會」紀要

Ocean Affairs Council "International Conference on the  
40th Anniversary of the United Nations Convention on the  
Law of the Sea and Ocean Policy": Memorandum of Conference

印度海洋資訊

India Ocean Information



海洋委員會  
Ocean Affairs Council

發行



## 目錄 Contents

<b>發行人語</b>	海洋治理展新頁 共創永續、安全、繁榮的海洋 .....	01
<b>專題報導</b>	海洋委員會「《聯合國海洋法公約》40週年與海洋政策國際研討會」 紀要 .....	02
<b>國際議題</b>	2022年海洋狀態先期報告：聚焦海洋科學十年挑戰 .....	07
<b>產業動態</b>	借鏡印度藍色經濟願景——給世界一個更好的臺灣 .....	12
<b>組織焦點</b>	印度地球科學部（MoES）及其主要海洋倡議行動 .....	17
<b>資訊新知</b>	印度國立海洋資訊服務中心（ESSO-INCOIS）簡介 .....	22
<b>法規制度</b>	西印度洋區域海洋治理之現況 .....	27
<b>Letter of Publisher</b>	New Pages of Marine Governance - Join Forces to Build Sustainable, Safe and Prosperous Oceans .....	31
<b>Special Report</b>	Ocean Affairs Council "International Conference on the 40th Anniversary of the United Nations Convention on the Law of the Sea and Ocean Policy": Memorandum of Conference .....	32
<b>International Issues</b>	State of the Ocean Report 2022: Pilot Edition With a Focus on Ocean Decade Challenges .....	37
<b>Industry Dynamics</b>	Through Blue Economy Vision in India: Giving the World a Better Taiwan .....	42
<b>Organization Focus</b>	India's Ministry of Earth Sciences (MoES) and Major Ocean Initiatives .....	47
<b>Latest News</b>	Earth System Science Organization - Indian National Centre for Ocean Information Services (ESSO-INCOIS) .....	52
<b>Regulatory Systems</b>	The State of Ocean Governance in the Western Indian Ocean Region .....	57





## New Pages of Marine Governance Join Forces to Build Sustainable, Safe and Prosperous Oceans

Minister of the Ocean Affairs Council: Bi-Ling Kuan  
Translated by Linguitronics

The United Nations Convention on the Law of the Sea (UNCLOS) has been adopted for 40 years now. For this edition of *International Ocean Information*, the "Special Report" shares details of the conference on the 40th Anniversary of the United Nations Convention on the Law of the Sea and Ocean Policy, hosted by the Ocean Affairs Council (OAC) from November 2-3rd, 2022. The event invited scholars from various countries to discuss methods for maintaining fundamental international order based on regulations.

Taiwan shares universal values such as democracy, freedom, human rights, and rule of law with other Indo-Pacific countries. We are also happy to join like-minded nations and work together towards building sustainable, safe, and prosperous oceans. As such, this issue focuses on India's critical geographic location in the Indo-Pacific Region. India's Ministry of Earth Sciences (MoES) was founded in 2006 with a scope of research from the atmosphere to the oceans. It actively includes the polar circle into its research objectives. MoES primarily advocates ocean sustainability by implementing the National Policy on Blue Economy. Task forces are planned for 7 major sectors and the National Policy on Blue Economy was drafted in 2021 to increase the Blue Economy's contribution to India's GDP. Secondly, marine spatial planning (MSP) is utilized to manage and coordinate marine spaces for various uses and maintain maritime environments. A partnership was formed with Norway to build a replicable MSP framework.

India established a National Decade Coordination Committee (NDCC) under the UN's framework of the United Nations Decade of Ocean Science for Sustainable Development (Ocean Decade). This issue's "Latest News" describes how India's Earth System Science Organization- Indian National Centre for Ocean Information Services (ESSO-INCOIS) utilizes marine data management, plan formulation, and strengthening of marine infrastructure to achieve planned objectives for Ocean Decade. In addition, "Regulatory Systems" introduces matters such as the current governance mechanisms of the West Indian Ocean and the marine environments, fishery resources, and maritime boundaries of the region, which are under ongoing cooperation and planning. Assistance from the United Nations and other nations, as well as the establishment of governance resources will prove essential for progress in the future.

This issue's "International Issues" discusses the *State of the Ocean Report 2022: Pilot edition*, which focuses on challenges, such as "Understand and beat marine pollution" and "Protect and restore ecosystems and biodiversity". When dealing with deteriorating oceans, the world must continue to work hard to learn about and use the oceans sustainably! OAC will join such effort by striving to expedite the debate and enactment of the Marine Conservation Act and other two major ocean-related legislations, as well as ensure effective implementation of the National Oceans Policy Guidelines and the Ocean Basic Act. We will thus fulfill the expectations of all Taiwanese citizens by protecting our territorial waters.



## Ocean Affairs Council "International Conference on the 40th Anniversary of the United Nations Convention on the Law of the Sea and Ocean Policy": Memorandum of Conference

Jia-He Song (Doctoral student, International Doctoral Program in Asia-Pacific Studies, National Chengchi University)

Keywords: UNCLOS, Marine Policy

On November 2-3, 2022, "the International Conference on 40th Anniversary of the United Nations Convention on the Law of the Sea (UNCLOS) and Ocean Policy" was held online under the guidance of Ocean Affairs Council (OAC) and in cooperation with the organizers. In order to review the development of UNCLOS, 1982, over the past 40 years, the conference discussed five major issues related; including institutional development of the law of the sea, protection of the marine environment and the law of the sea, conservation of marine resources and the law of the sea, maritime security and law enforcement, also maritime disputes and their resolution. In his opening speech, OAC former Deputy minister, Mei-Wu Chou addressed that UNCLOS, which came into force in 1994, has codified the original customary international law and has been recognized as the "World Charter for the Oceans". Scholars from Singapore, Republic of Korea, the United States, Italy, Japan, the United Kingdom, Poland, Republic of the Philippines, and Taiwan R.O.C. were invited to present, share and exchange views on relevant topics, discuss and uphold a rule-based international order to safeguard the freedom and prosperity of the Indo-Pacific region.

After the opening, Research Fellow Yann-Huei Song from Academia Sinica gave a lecture on "The United Nations Convention on the Law of the Sea and Maritime Claims: The Taiwan Strait as an Example". In particular, he pointed out that after the recent 4th Taiwan Strait Crisis (August, 2022), Taiwan has encountered challenges. For example, Taiwan has long encountered difficulties in participating in meetings of the United Nations and UNCLOS-related intergovernmental organizations. The international law of the sea issues arising from this factor are worthy of continued exploration. However, this crisis has also caused the United States and Japan to pay even more attention to Taiwan Strait's security, possibly increasing operations such as U.S. Department of Defense Freedom of Navigation Program and Innocent Passage (FONOP) related to this area. In response to the rising situation, there is an urgent need to promote dialogue between the two sides of the Taiwan Strait and relevant countries, especially the United States and China, in order to maintain peace in the Taiwan Strait.

### First Day Highlights: Developments in the United Nations Convention on the Law of the Sea and Conservation in Marine and Resource

The first session of "Development of the 1982 UNCLOS" invited Emeritus Professor Robert Beckman of the National University of Singapore to present on the topic of "NAVAL OPERATIONS IN THE EEZ AND THE 'DUE REGARD' OBLIGATION IN 1982 UNCLOS", focusing on the provisions of UNCLOS regarding



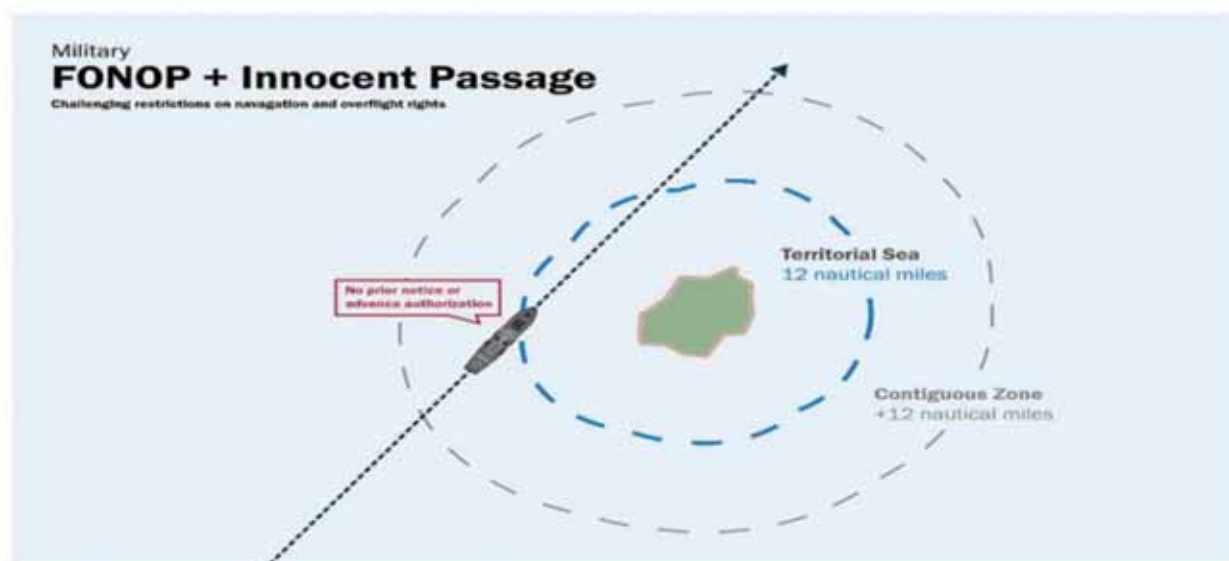


Figure 1/ U.S. Department of Defense Freedom of Navigation Program and Innocent Passage  
Source/ Belfer Center for Science and International Affairs, Harvard Kennedy School

naval operations in the Exclusive Economic Zone (EEZ) of coastal states, the history of the negotiations, and the sovereign rights, jurisdiction and obligations of coastal states and other states in the EEZ including an analysis of the right to engage in other lawful uses of the sea in connection with freedom of navigation and flight. "Due regard for obligations" emphasizes the need for consultation with sovereign states and looks to the United States to take the lead on prior consultation in the South China Sea to alleviate the concerns of Asian coastal states.

Professor Seokwoo LEE of the College of Law, Inha University, Korea, presented on the topic of "OBLIGATIONS ASSUMED BY THE STATE UNDER THE UNCLOS AND RELEVANT CONVENTIONS AND AGREEMENTS, EMBODIED AND REFLECTED IN DOMESTIC LEGISLATION POLICIES", which illustrated that Southeast Asian countries have assumed, implemented, and reflected in their domestic legislative policies laws and policies related to the obligations of protecting the marine environment under the conventions and agreements. In terms of the current legislation and measures for marine protected areas, Southeast Asia has achieved limited results. Finally, Distinguished Professor Nien-Tsu Alfred Hu of National Sun Yat-sen University presented on the topic of "A Fisheries Management Gap for Transboundary Stocks in the Eastern Waters of Taiwan: Biological requirements vs. geopolitical realities", pointing out that certain transboundary stocks (such as Pacific bluefin tuna and Japanese eel) are facing over-exploitation and their biology or migration patterns need special protection and management. As the exclusive economic zones of Japan, Taiwan and the Philippines overlap in the eastern waters of Taiwan, it is expected that the three countries will develop better international cooperation and establish a cross-national management NGO to promote biological conservation.

The second session of the "Minutes of the Conference on Protection of the Marine Environment and the United Nations Convention on the Law of the Sea" was presented by Pooran Chandra Pandey, representative of the US Climate Rating Group, on "Asia in a World of Multilateral Dialogue: Ocean Policy, Climate Treaty and Conference of the Parties (COP) 27". The COP 27 in Egypt in November 2022 will also discuss ocean resources, climate and human well-being, which is gaining importance. Given the strategic importance of Asia, the UNCLOS focus on marine resources, maritime activities, freedom of navigation, protected seabed mining and demarcation has taken on greater significance in the context of security. For multilateralism, freedom of navigation, dialogue and the rule of law can be aimed at the common prosperity of Asia. Taiwan also plays an important role in maintaining international peace and stability.



Following the publication of Assistant Professor Pei-Lun Tsai of National Taiwan Ocean University, "Conservation and Protection of the Marine Environment under UNCLOS: The Contribution of the International Tribunal for the Law of the Sea (ITLOS) Provisional Measures and Advisory Proceedings," it is mentioned that of the 29 cases filed by ITLOS since its inception, cases involving the protection and preservation of the marine environment have often been considered in provisional measures or advisory proceedings. The UNCLOS provisions on the protection of the marine environment are few and mostly abstract, and jurisprudence can play a key role in clarifying the obligations of states towards the environment, especially as ITLOS interim measures have the potential to clarify what needs to be done and to play a more active role in emergency situations. Followed by a presentation from Professor Lorenzo Schiano di PEPE of the University of Genoa, Italy, on "The Infringement procedure before the courts and the enforcement of EU marine environment legislation", which focused on "Infringement proceedings" under Articles 258, 259 and 260 of the Treaty on the Functioning of the EU and their role in the enforcement of the EU legislative framework applicable to the protection of the marine environment. It also touched on the contrast between the international/EU legal systems in the resolution of marine-related disputes. The session concluded with a presentation by Professor Kanami Ishibashi of Tokyo University of Foreign Studies on "Discharge of Japanese Nuclear Wastewater into the Sea in the Context of UNCLOS", which explained that the discharge of sewage is recognized and does not violate Japan's obligations under UNCLOS (the precautionary principle) if all measures are taken, including environmental assessments, to prevent marine pollution from affecting the country or the area under its jurisdiction. ITLOS has also ordered that Japan has an obligation to conduct consultations. The International Atomic Energy Agency (IAEA) accepts this and can provide Japan with monitoring and other related support. However, she concluded that Japan should continue to seek means to reduce the risk of environmental pollution.

The third session of "Marine Resources Conservation and the United Nations Convention on the Law of the Sea" began with a presentation by Professor David ONG of Nottingham Trent University School of Law on "UNCLOS & BBNJ Agreement on Marine Living Resources Conservation: Continuing Legal Issues". Both UNCLOS and the BBNJ Agreement (The United Nations Convention on the Law of Sea on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction, BBNJ) deal with the relationship between "definitive species" and "marine genetic resources (MGR)". Furthermore, under the proposed BBNJ Agreement, international treaty obligations to protect any resource can be juxtaposed with the overall goal of protecting marine biodiversity. The second topic was presented by Associate Professor Shih-Ming Kao from the Graduate Institute of Marine Affairs, National Sun Yat-sen University: "UNCLOS and Taiwan's response to the protection and management of marine fisheries resources", discussing the binding effect of the provisions on the conservation and management of fisheries resources in UNCLOS and subsequent international fisheries legal instruments. The Regional Fisheries Management Organizations (RFMOs) has been recognized as the main mechanism for cooperation between distant-water fishing countries and coastal countries and as the executive body for implementing the conservation and management of marine fisheries resources. Although there is still room for effort, Taiwan has passed a number of domestic laws and regulations to demonstrate its determination to combat Illegal, Unreported and Unregulated (IUU) fishing and forced labor and to fulfill its international obligations. Another presentation by Assistant Professor Wan-Chun Wendy Ho of Soochow University, "A Blue Economy in Transition: Is Fisheries Trade Aligned with Sustainable Development Goals?" This session focused on the contribution of the Fisheries Subsidy Agreement (FSA), adopted at the 12th WTO Ministerial Conference, to the sustainability of the oceans by banning or reducing fisheries subsidies. The new agreement not only fulfills the mandate of SDG 14, but is also the first multilateral trade agreement to focus on environmental obligations. The sustainable use of fisheries resources is crucial to the development of a blue economy. The inclusion of environmental sustainability norms in trade agreements represents a



new trend in the transformation of the international fisheries governance structure for the WTO and the international fisheries regime.

The first day of the international conference on November 2nd was devoted to understanding the key points and trends of the development of international marine environment conservation, marine resources protection and the law of the sea, understanding the practice of UNCLOS and related law of the sea in Japan, Southeast Asia and the European Union, and reviewing the current situation of our country's practice of the law of the sea.

### Second day's meeting focus: safety and law enforcement

The fourth session of "Safety and Law Enforcement" on the following day, Nov. 3rd, began with a presentation by Young Kil PARK, director of the Korea Maritime Institute, on the topic "Tension in the East Sea from a Legal Perspective: Unsustainable Stability?" He stated that according to UNCLOS, there are two types of "temporary arrangements" in the East China Sea, namely, fisheries agreements and oil and gas development agreements. China is not self-restrained in the overlapping EEZ waters, and its assertive stance on enforcement jurisdiction is reflected in the China Marine Police Law and the China Maritime Traffic Safety Law. In the face of this expansion of jurisdiction, cases can be brought before the International Court of Justice, or alternative approaches such as delimitation of EEZ boundaries based on *Ex Aequo Et Bono* (Equitable Principle), or the conclusion of declaration guidelines (or management guidelines) can be pursued. Continuing the discussion on "The South China Sea in a Regional Security System" by Professor Agata W. ZIĘTEK of the Institute of Political Science at the Maria Curie - Skłodowska University of Poland, he pointed out that the South China Sea has become a contested area over the past 20 years, with unresolved sovereignty issues surrounding it. The pressing issues at hand include oil and gas exploration rights, territorial disputes, show of force, and Sino-U.S. relations (including Taiwan). Security issues in the South China Sea can be divided into political and economic security threats, understanding intentions and choosing to respond to security dilemmas, and the military balance of power to prevent the expansion of other states. There is an urgent need to manage the potential risks of conflict through the establishment of a law-based regional order.

This session concluded with a presentation by Associate Professor Wei-Hua Chen of Central Police University on "Taiwan's Maritime Rights and Law Enforcement Dilemmas under the Strategic Competition between the U.S. and China", reviewing and looking at the pressure on Taiwan's maritime rights in the face of the confrontation and competition between the U.S. and China in the Indo-Pacific region. The first is the pressure from the U.S. to legalize the South China Sea arbitration case, and the second is the Chinese military exercises to be held in the waters surrounding Taiwan in August 2022. In 2022, the U.S. Department of State released Maritime Limits NO. 150, which accused China of illegally asserting sovereignty and exclusive jurisdiction over the South China Sea.

The final session of the conference, "Maritime Disputes and the United Nations Convention on the Law of the Sea", was presented by Professor Jay Batongbacal of the University of the Philippines on the theme "Dispute Resolution in UNCLOS Appendix VII Arbitration: Other Possibilities?" The report elaborates on the details of UNCLOS Appendix VII arbitration and the options available to states to resolve disputes peacefully through various mechanisms such as negotiation, mediation, arbitration, and interim measures. Dispute resolution is a process of problem solving, and all parties should handle it step by step with the principles of goodwill, trust, transparency and openness, rather than expecting a one-time solution. Later, Ruei-Lin Yu (Associate Professor and Director of the Institute of Strategic Studies, National Defense University) presented "Legal and Political Issues of Warships Passing through the Taiwan Strait", discussing the legal arguments of the littoral states and the U.S. through international law of the sea, and concluded that the Taiwan Strait is neither international waters nor an international strait, but a strait of exclusive economic zone where warships and military aircraft should



enjoy freedom of navigation and overflight. There is a complete channel of exclusive economic zone in the middle of the Strait, and the right of transit passage in the Taiwan Strait can be excluded according to the Convention, so the right of freedom of navigation can be granted in the channel similar to the high seas. Finally, Associate Professor Chi-Ting Tsai of National Taiwan University published "The False Construct of Sovereignty and the South China Sea Controversy: Special Implications of the South China Sea Arbitration Case", mentioning that the nature of the concept of sovereignty is debatable in international law. China has essentially used the people's rights model and international law to legitimize its claims of territorial, maritime jurisdiction and historical rights in the South China Sea.

### Conclusion

This international conference looked at the development of maritime policy from the perspective of UNCLOS's 40 years of experience and relevant international law and explored in depth the disputes involved in the East China Sea, South China Sea, and Taiwan Strait. In addition, also discussed the UNCLOS arbitration and other dispute resolution methods, as well as the derivative thinking related to the South China Sea arbitration case, which will help our country to grasp the international pulse and serve as a reference for subsequent policy planning.

The controversies involving UNCLOS-related maritime issues and national policies not only reflect the importance of the current international maritime development trend and the possible ways to resolve the disputes, but also highlight the direction of thinking about policy solutions for the disputed maritime areas in East Asia and the development of maritime policies. The online seminar was well attended, and the experts who presented papers provided the latest status of ocean development at all levels, which is beneficial to our government and academia in focusing on these related issues as a basis for governance and policy development.



Figure 2/ International Video Conference Group Photo  
Image by Ocean Affairs Council



# State of the Ocean Report 2022: Pilot Edition With a Focus on Ocean Decade Challenges

Chung-Ling Chen (Professor, Institute of Ocean Technology and Marine Affairs, National Cheng Kung University)

Keywords: State of the ocean, Ocean Decade Challenges, sustainable development

Ocean scientific knowledge contributes to reversing the decline in ocean health, conserving marine life, addressing ocean aspects of climate change, and using the ocean sustainably to improve people's lives. The United Nations proclaimed the UN Decade of Ocean Science for Sustainable Development 2021-2030 in 2017, which is dedicated to enhancing ocean scientific capacity and thus realizing the vision 'the science we need for the ocean we want' by 2030. The Intergovernmental Oceanographic Commission of UNESCO (IOC) issued the pilot edition of State of the Ocean Report 2020, focusing on the challenges in ocean science, called as Ocean Decade Challenges. The report mainly describes the challenges in a descriptive manner and identifies insufficient capacity of the ocean science on marine pollution, ocean observing, protection of marine ecosystems, resilience of coastal communities, etc. This indicates an urgent need of a quantitative description of the challenges in the future in order to establish benchmarks of the state of the ocean as well as the capacity to measure its change. (The content of this essay is mostly excerpted and compiled from [1].)

## Introduction

The United Nations proclaimed the UN Decade of Ocean Science for Sustainable Development 2021-2030 (referred to as 'the Ocean Decade') in the 72nd Session of UN General Assembly in 2017. It aims to realize the vision of the Ocean Decade is 'the science we need for the ocean we want'. 'The ocean we want' consists of a clean ocean, a healthy and resilient ocean, a productive ocean, a predicted ocean, a safe ocean, an accessible ocean, an inspiring and engaging ocean. To make this vision come true, the Ocean Decade specifically identifies ten challenges in ocean science, called as Ocean Decade Challenges.

The IOC issued the pilot edition of State of the Ocean Report 2020 (referred to as 'pilot report'), specifying the Ocean Decade Challenges. However, the pilot report only covers nine of the ten Decade Challenges, not including Challenge 3, which examines how the ocean can sustainably feed the world's population. This aspect is not covered by IOC mandate and therefore not addressed in the pilot edition. In response to these challenges, the pilot report reveals a lack of reliable benchmarks in many aspects of ocean knowledge, and mainly describes these challenges in a descriptive manner. There is an urgent need of a quantitative description.

## Ocean Decade Challenges

### ● Challenge 1: Understanding and beat marine pollution

There is a continued increase and expansion of land-based pollution in the ocean, including pollution from agriculture, aquaculture, and household and industrial wastewater. In recent decades, nitrogen, phosphorous and plastics pollution in the ocean have become ubiquitous and their impact on



marine, with consequences for human health, is discernible. Understanding these pollutants and their impacts on human health and marine ecosystems and developing ways to remove and reduce the pollutants are therefore essential.

Nitrogen and phosphorous can boost growth of aquatic plants and excess plant growth often leads to anaerobic conditions. Globally, there are more than 500 sites of low  $O_2$  areas (i.e.,  $O_2 < 62 \mu\text{mol kg}^{-1}$ ), mostly locating along the east and gulf coasts of the USA, in the Baltic region, and off the coast of Japan (Figure 1). However, despite the global significance of marine pollution, observations remain limited in terms of geographic distribution, being mainly concentrated at the ocean surface and in coastal areas. While a 2-D representation of pollution is a possibility, a 3-D is still beyond reach. To address ocean pollution, a more resourced and systematic approach to observation and synthesis of ocean pollution is urgently needed.

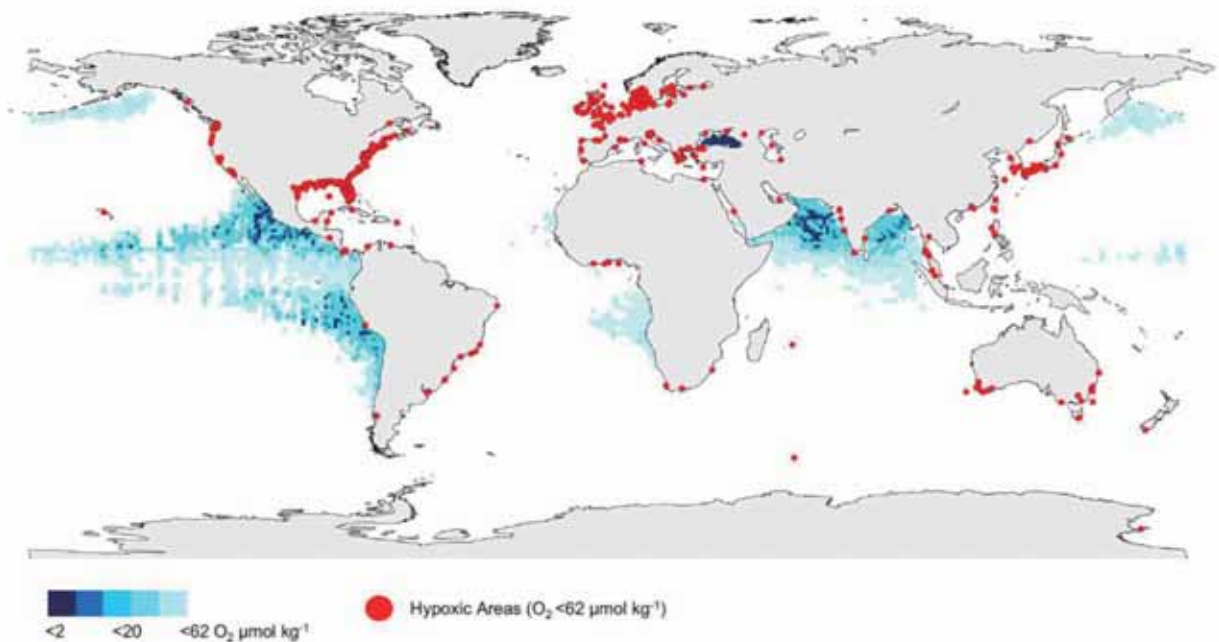


Figure 1/ Locations of low  $O_2$  areas in coastal zone (red dots present the sites where  $O_2$  is less than  $62 \mu\text{mol kg}^{-1}$ )  
Source/ [1]

### ● Challenge 2: Protect and restore ecosystems and biodiversity

Various types of stressors, including acidification, deoxygenation, warming, more stable water stratification, circulation changes, fishing, habitat destruction, invasive alien species and underwater noise, acting individually or interactively, is shaping the current evolution of marine biodiversity. Given this, monitoring, protecting, managing and restoring marine ecosystems and biodiversity is clearly a very high priority, and to make it effective, systematic observations and research need to be strengthened and resourced.

Currently, an overall picture of evolving marine life is emerging through the use of new eDNA techniques, modelling and data syntheses. To date, approximately 240,000 marine species have been recognized in all oceans, with roughly 2,000 new species being found every year. In addition, hypoxia or dead zones, acidification of the ocean, changes in the food chain and migration of species to colder waters are scientifically established facts.



● **Challenge 3: Sustainably feed the global population**

This challenge involves in generating knowledge, supporting innovation, and developing solutions to optimize the role of the ocean in sustainably feeding the world's population under changing environmental, social and climate conditions [2]. Since it cares about sustainably feeding the world's population, which is not within the IOC mandates, the pilot edition did not examine this challenge.

● **Challenge 4: Develop a sustainable and equitable ocean economy**

Systematic research in support of a sustainable ocean economy is in its early stages. Not much is known regarding channels for return on investment, main beneficiaries, legislation, and market mechanisms. The symbiosis between the ocean economy and science requires a better understanding, particularly in the areas of return on investment in marine science and its practical applications. In addition, it is noted that marine spatial planning (MSP) is a key accelerator of the sustainable ocean economy. By April 2022, 102 countries have engaged in approximately 300 MSP initiatives which are in different stages of development, including plans approved, MSP at intermediary stage, and MSP at early stage. To promote MSP and thus realize sustainable ocean economy, it is a need to strengthen capacity development for sustainable ocean planning and management, both at the national level and for the high seas.

● **Challenge 5: Unlock ocean-based solutions to climate change**

Understanding the ocean-climate nexus contributes to seeking ocean-based solutions to climate change. The coastal blue carbon ecosystems (including mangroves, salt marshes and seagrasses) are considered as one significant area of climate change solutions (Figure 2). Forty million hectares of these ecosystems globally are found along the coastline of continents, housing mangroves, salt marshes and seagrasses. These hotspots for carbon storage have sequestration rates per hectare that are up to ten times larger than those of terrestrial ecosystems. Currently, internationally coordinated research has been able to achieve a more precise quantification of location, area, state and potential of carbon sequestration, for these three types of ecosystems.

Improved protection and management of coastal blue carbon ecosystems can reduce current total carbon emissions by up to 2%. However, due to urban and industrial coastal development, coastal pollution, destructive fishing practices, and pollution and pressures on the land use from agriculture and aquaculture, 20-50% of global blue carbon ecosystems have already been lost or degraded. It is worth noting that a reduction in the loss of mangroves is at 0.11-0.13% annually. More alarmingly, a dramatic loss of salt marshes and seagrasses is at 1-2% and 2-7% annually, respectively.



Figure 2/ The coastal blue carbon ecosystems (e.g., mangroves) are considered as one significant area of climate change solutions  
Image by Chung-Ling Chen



● **Challenge 6: Increase community resilience to ocean hazards**

Sea level is one of the best indicators of climate change. Most recent sea level reconstruction based on the tide gauge data indicates a rising trend of sea levels. Specifically, the global mean sea level rose by 12 +/- 5 cm between 1901 and 1990, with a mean rate of rise of 1.3 mm/year over the period. The global mean level rise rate has increased from 2.1 mm/year over 1993-2002 to 4.7 mm/year over 2013-2021. This shows that rising sea levels, together with coastal development and people's migration to coastal zone, put coastal resilience under increasing threat.

Tsunami is one of coastal hazards. To enhance community preparedness in response to this hazard, the IOC developed the global tsunami warning and mitigation System, which comprises a network of 12 tsunami service providers in three oceans basins. This system provides tsunami forecast information. However, such a system will only work if coastal communities have awareness of and preparedness for coastal disasters and then can react efficiently to warnings. For this, the IOC has developed the TsunamiReady Programme, which carries an ambitious objective - 100% coastal communities at risk of tsunami to be recognized by 2030. For these communities recognized, it is a need to further enhance multi-hazard early warning services for all geophysical, ecological, biological, weather, climate and anthropogenic related ocean and coastal hazards as well as strengthen community preparedness and resilience.

● **Challenge 7: Expand the Global Ocean Observing System**

The current Global Ocean Observing System (GOOS) embraces 8,208 ocean observing platforms with 84 contributing to this system, providing users with real-time observing data and information across oceans (Figure 3). Among these observing data, the physical ocean variables are the most developed, including temperature, salinity, density, water color, tides, wave, current, and biogeochemical observations are yet to be expanded. The observing system provides essential data and products to weather, climate and ocean forecasters, maritime commerce, fisheries and coastal communities. However, the areas covered under this system are still insufficient, particularly the areas where observing data are urgently needed, such as the areas with high biodiversity and intense human pressures.

● **Challenge 8: Create a digital representation of the ocean**

Knowing the shape and depth of the seafloor is fundamental to understanding interactions between ocean circulation, climate change and weather forecasting; tides and wave action; sediment transport; tsunami wave propagation; and underwater geohazards. Furthermore, seabed mapping is also essential for the security, safety and economic wealth of nations as it underpins the estimation of natural resources, such as seabed minerals and fishing grounds. Yet, majority of the ocean depths are mostly inferred from satellite altimetry data with very coarse km-scale resolutions that return only a crude representation of the shape of the ocean seafloor. Using advanced echo-sounding techniques to map and measure the ocean depths is therefore a necessary task. The GEBCO Seabed 2030 project is engaged in this task with an ultimate goal of having 100% of the ocean floor mapped. The techniques used include single beam, multibeam echo sounder, satellite-derived bathymetry, light detection and ranging, etc. In the period of six years, from 2015 to 2021, the percentage of total area of the ocean represented by gridded data has increased from 6.7% to 20.6%. It is hoped that through multi-stakeholder collaboration, a comprehensive digital representation of the ocean be developed, which means using digital data to represent global oceans' topography, providing free and open access for all.



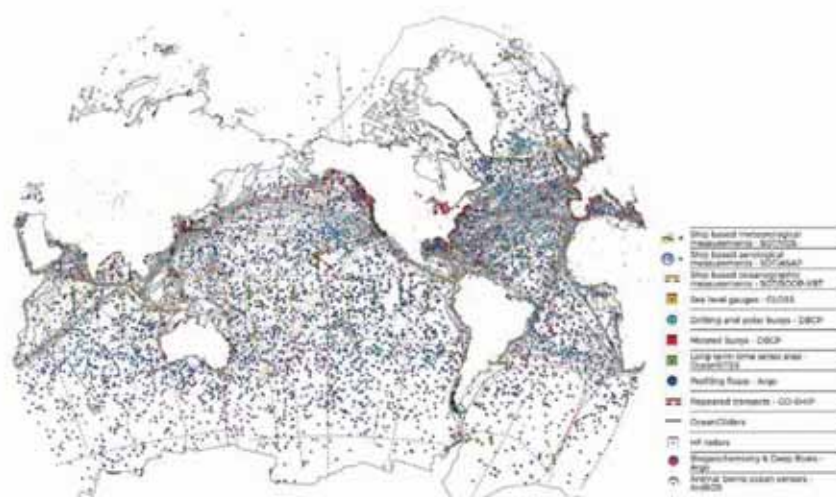


Figure 3/ Global Ocean Observing System consists of more than 8,208 ocean observing platforms

Source/ [1]

#### ● Challenge 9: Skills, knowledge and technology for all

There is an urgent need to increase the capacity of ocean science to address various challenges and successfully contribute to sustainable development. To this end, the Ocean Teacher Global Academy (OTGA) is dedicated to capacity development of ocean science. It already set up a learning platform which organized over 40 online training courses in 2020-2021, with more than 1,000 participants from all continents. In 2022, 17 OTGA Regional and Specialized Training Centres were further established to offer courses and training programs tailored to specific regional needs. It is envisioned that by delivering comprehensive capacity development for the ocean, equitable access to data, information, knowledge and technology across all aspects of ocean science is ensured for all stakeholders.

#### ● Challenge 10: Strengthen humanity's relationship with the ocean

All the issues relating to the ocean are the direct consequence of too little understanding of our influence on the ocean and its influence on us. It is therefore critical to enhance global ocean literacy to the future sustainability of the ocean, coasts and seas. Recent years have witnessed a growing emphasis on the need to understand the complex relationships between society and the ocean. Major advances have been made in this area, with the increased availability of various learning resources such as toolkits, school activities, training courses, networks, etc.

### Conclusion

Marine science contributes to understanding of the state of the ocean. While we are aware in principle of what is happening in the ocean, and what should be done about it, the quantitative description of the ocean is drastically incomplete and, as a result, current knowledge is insufficient to effectively inform solutions to the ocean issues that humanity is now facing.

The pilot report is the result of strenuous efforts on the part of the IOC Secretariat and many leading experts. While it mainly focuses on Ocean Decade Challenges, it points out that the description tends to be descriptive and a quantitative description of the state of the ocean is an urgent needed in order to fully understand the ocean issues. As a result, more quantitative information will be included in subsequent editions.

### References

[1] IOC-UNESCO (2022). State of the Ocean Report, pilot edition. Paris, IOC-UNESCO. (IOC Technical Series, 173).

[2] Implementation Plan Summary: The United Nations Decade of Ocean Science for Sustainable Development (2021-2030).



## Through Blue Economy Vision in India: Giving the World a Better Taiwan

Compiled by Cheng-Chi Chung (Distinguished Professor, Dept. of Shipping and Transportation Management, National Taiwan Ocean University); Ching-Wen Shih, Pin-Ni Chen, and Chi Chung (Master Degree Student, Dept. of Shipping and Transportation Management, National Taiwan Ocean University)

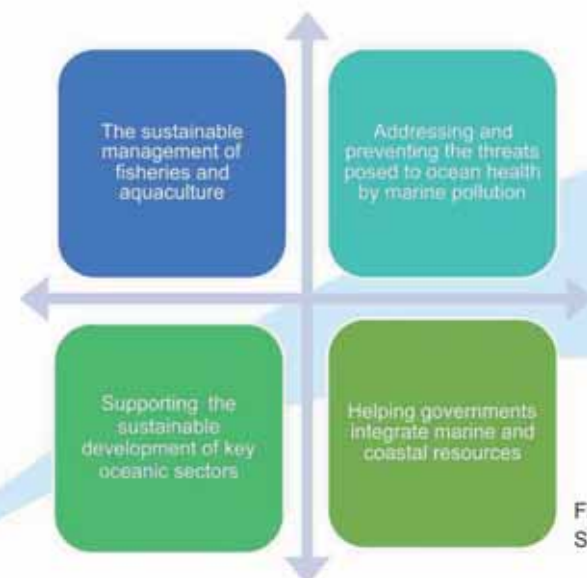
Keywords: Sustainable development, blue economy vision, India's blue economy

The blue economy promotes the symbiosis of human beings and the ocean, making a balance between economy and ecology. According to the estimate of the World Wildlife Fund for Nature (WWF), the blue economy created by worldwide ocean and coastal areas reaches USD 2.5 trillion per year [1]. Many countries have begun to advocate the blue economy, enacting and implementing relevant policies. This article dives into the blue economy vision in India to rethink blue economy issues in Taiwan and give the world a better Taiwan, in order to grow together and protect the earth.

### The Definition of the Blue Economy

Before the concept of blue economy was built, green economy has been widely discussed and applied. According to the United Nations Environment Programme (UNEP), a green economy is defined as low carbon, resource efficient and socially inclusive [2], and the blue economy can be regarded as an extension of the green economy. Additionally, the main point of the green economy is circulation; while the blue economy emphasizes on regeneration.

In 2010, Gunter Pauli published the book "The Blue Economy", emphasizing that the economic model should imitate the ecosystem. By using existing resources and taking advantage of their richness to create employment opportunities to benefit more people. Meanwhile, this improves the economy and optimize the society without generating any waste. According to the World Bank, the blue economy is defined as the sustainable use of ocean resources for promoting economic growth, improving livelihoods and employment, and protecting the health of ocean ecosystem [3]. The range of the blue economy includes renewable energy, tourism leisure, climate change, waste management, marine transport, fisheries, and etc. In 2018, the World Bank launched the "PROBLUE" trust fund, which is an umbrella multi-donor trust fund (MDTF), with the purpose of assisting every country to lead the road of blue economy. The PROBLUE focuses on four key themes (Figure 1).



From Figure 1, the PROBLUE focuses on four key themes, namely "the sustainable management of fisheries and aquaculture, addressing and preventing the threats posed to ocean health by marine pollution, supporting the sustainable development of relevant oceanic sectors, and helping governments integrate marine and coastal resources." These directions are mainly aimed at the ocean environment management and development. Ultimately, the goal is to protect the human beings' living space and enhance the quality of life.

Figure 1/ The PROBLUE Focuses on Four Key Themes  
Source/ [4]



## The Goal of India's Blue Economy

India has a unique maritime position. The country has 12 major ports and 187 non-major ports, handling about 1.4 billion tons of cargo every year [5]. India's exclusive economic zone of over two million square kilometers is rich in living and non-living resources and holds significant recoverable resources of crude oil and natural gas. The coastal economy also sustains over four million fishermen and other coastal communities [5]. With these massive maritime interests, the blue economy in India has a vital relationship with the nation's economic growth. Thus, caring about ocean economy has become an important issue for India's development.

In the union budget of India 2019, the Ministry of Finance laid out the vision of 2030 while highlighting India's transformation. India is poised to become a \$10 trillion economy by 2030 [6]. With this comprehensive ten-dimensional vision, India will become a modern, technology driven, high growth, equitable and transparent society.

The Indian government's emphasis on the need to formulate and integrate marine policies in different sectors, the Economic Advisory Council to the Prime Minister (EAC-PM) initiated a cross-ministerial consultation with stakeholders to formulate a draft for blue economic policy framework. The objective of this policy framework is to enhance the country's GDP by promoting sustainable and inclusive economic growth in this new domain while aligning India's development agenda with national security goals and international commitments.

Considering the existing policies and regulations, the global scenario of the industry, short-term and medium-term strategies and assessments will face challenges; the EAC-PM formulated seven working

Table 1 / The key objectives of the working groups in the seven major areas

Working Group	Key Objectives
1. National Accounting Framework for Blue Economy and Ocean Governance	Sector-specific studies are carried out regularly to assess the relative composition of the different subsectors in the blue economy, with the aim of assessing the weight of the different components in sectors relevant to the blue economy.
2. Coastal Marine Spatial Planning and Tourism	Examine the potential and methodologies for coastal marine spatial planning and coastal and marine economic tourism, and propose approaches to coastal marine spatial planning, including adoption and adaptation of the Intergovernmental Oceanographic Commission (UNESCO-IOC) 2009 Guidelines, to development new national maps and data policy recommendations.
3. Marine Fisheries, Aquaculture and Fish Processing	Review all aspects related to fisheries development, management, processing, marketing and finance, and propose detailed recommendations including increasing sustainable marine capture fisheries, increasing mariculture production, and ocean health monitoring, assessment and management.
4. Manufacturing, Emerging Industries, Trade, Technology, Services and Skill Development	Study broadly on interrelated economic development issues, carefully identify the 'blue' aspects of manufacturing, trade, technical services and skills, and should be integrated with the national economy. Strengthen capital injection, form an expert group to deal with various problems encountered by blue trade, set up a research and development center, and promote the application of artificial intelligence (AI) and other new technologies in deep-sea mining, ocean logistics, and shipping.
5. Logistics, Infrastructure and Shipping (including transshipments)	To study the entire shipping and port infrastructure, as well as issues related to the logistics sector and the maritime field, and set up a maritime development fund to conduct research and proposals for shipbuilding and maritime cluster development.
6. Coastal and Deep-sea Mining and Offshore Energy	To consider the possibility of extracting value from mineral and metal resources in the ocean, and to generate renewable energy from offshore wind, wave, tidal and geothermal resources, and to examine areas for future scientific research and development.
7. Security, Strategic Dimensions and International Engagement	Study the strategic, security and geopolitical aspects of the blue economy in the context of the global and maritime neighborhood, and introduce recommendations including emphasizing awareness in the maritime domain, international cooperation and blue diplomacy to safeguard India's interests in the long run.

Source/ [5]



groups related to the key priority areas of India's development of the blue economy. The working groups are "National Accounting Framework for Blue Economy and Ocean Governance," "Coastal Marine Spatial Planning and Tourism," "Marine Fisheries, Aquaculture and Fish Processing," "Manufacturing, Emerging Industries, Trade, Technology, Services and Skill Development," "Logistics, Infrastructure and Shipping (including transshipments)," "Coastal and Deep-sea Mining and Offshore Energy," and "Security, Strategic Dimensions and International Engagement" respectively [5]. The key objectives of the working groups in the seven major areas are shown in Table 1.

As can be seen from Table 1, the working groups in the seven major areas have a detailed division of labor, and in addition to their respective key research and review projects, they put forward strategies and propositions for the development in each field. India hopes to use the potential of the blue economy to optimize GDP and employment growth, ensure the welfare, safety and livelihood of fishermen in coastal areas, achieve innovation to ensure zero waste, low-carbon technology, and bring economic dividends to a large part of the population, and also promote marine safety and balanced international engagement.

### The Vision of India's Blue Economy

The blue economy is based on the concept of no waste and no emissions, and expands the concept of green economy. It is expected to add value to marine fields, including coastal manufacturing, shipping, and offshore or coastal related energy technologies [6], and has a significant relationship with the growth up of the national economy. Relying on the puissant vantage, India strives for efficient and sustainable utilization of ocean resources, both integrates and boost the related capabilities in maritime domain, and simultaneously protects the development of marine environmental objectives sustainably. The ten development visions for India in 2030 are shown in Figure 2.

As can be seen from Figure 2, India's development visions include the development of coastlines and marine waters. Through a comprehensive planning and the enforcement of blue economy policy, it can accelerate economic growth in coastal areas, not only ameliorate the living standard of people and employment issues, but also maintain the health of the marine ecosystem.

In recent years, owing to the extreme global climate change, it has caused serious threats to the environment and ecosystems in deteriorating areas, result in causing doubts about the survival of island countries; therefore, the ecological protection system of the Indian Ocean is the primary concern [6]. In order to advocate the pursuit of sustainable use of earth resources, Prime Minister Modi proposed five overall visions for India's blue economy, as shown in Figure 3.

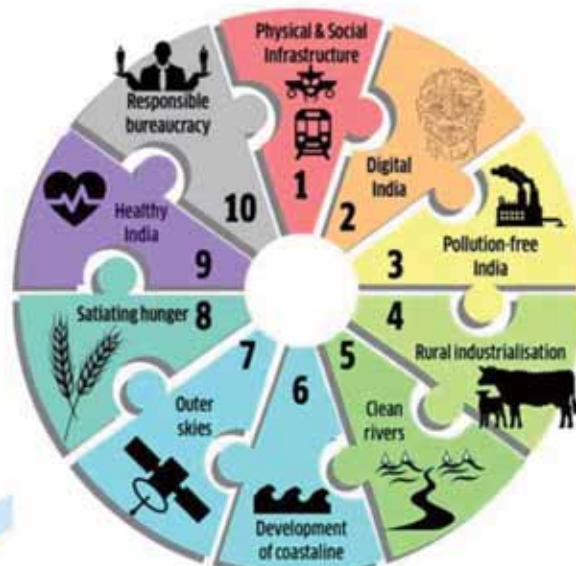


Figure 2/ India's Ten Development Visions for 2030  
Source/ [7]



Figure 3/ The Five Visions for India's Blue Economy  
Source/ [6]



India expects to achieve safety and growth within the Indian Ocean region in the future. Prime Minister Modi stated that India is well prepared to cooperate with all regional partners to prosper all Indian Ocean regions. In order to achieve the above objectives, India adopts the following three cooperative initiatives:

- I. **Security Measures:** According to the trilateral security mechanism with Sri Lanka and Maldives, and bilateral naval exercises with regional partners, India provides substantial equipment or training of human capacity and investigation of maritime incidents for Sri Lanka and Maldives.
- II. **Development Partnerships with Surrounding Regions:** From the East Coast of Africa to the Western Pacific Ocean, with the Republic of Seychelles, Singapore and Samoa as the main partnership, to build a significant emerging economy and stabilize the development of the blue economy.
- III. **Education and Cultural Cooperation:** The purpose of marine education research is to formulate wide comprehensive strategies to protect marine ecological resources, improve the knowledge of the marine environment and economy through the understanding of the coast, and promote the marine education program through personnel training.

Due to the limited resources of earth, it must be planned by an effective strategy to maximize the use of marine resources and achieve sustainable development goals. Meanwhile, ecological protection and the commercial interests of residents in coastal areas are involved nowadays [6] to ensure that the opportunities of extending blue economy would be realized.



Figure 4/ India and Taiwan  
Image by Cheng-Chi Chung

### Reflection on the Blue Economy Issues in Taiwan

In June of 2020, the Ocean Affairs Council (OAC) in Taiwan published the National Ocean Policy White Paper [8], which discussed the blue economy in the chapter on marine industry development and innovation. The contents and latest information are integrated with suggestions as follows.



- I. **Talent Cultivation Issues:** Starting from the maritime education for the publics, expanding the sense of identity with the ocean, and making everyone in our country have maritime literacy. The government, businesses and schools should realize maritime education implementation plan formulated in the National Ocean Policy White Paper from 2022~2026, promote cooperation between industries and schools, and nurture excellent maritime industry talents to enrich the strength of the maritime industry.
- II. **The Marine Industry Issues:** On the premise of sustainability, except from the traditional shipping industries in Taiwan, we should take more advantage of abundant marine resources and develop emerging marine industries, such as marine biotechnology, offshore wind power, ocean current power generation, wave energy, submarine cables, deep-sea water, and marine environmental protection industries.
- III. **Ocean Tourism Issues:** Taiwan is surrounded by the sea with unique landscape, beautiful coastal scenery, and diverse marine resources. We should seize these advantageous conditions, combine Taiwan's maritime culture, develop maritime tourism, leisure and recreation, strengthen the tourism and leisure industry scale, and thus, connect with international maritime leisure.
- IV. **Industrial Cooperation:** Taiwan must establish a thorough industrial chain and value chain for maritime emerging industries. With the cooperation between the central and regional governments, strengthen the mutual assistance relationship between industries, promote the active participation of non-governmental organizations, and then connect with the world to improve our international competitiveness.
- V. **Legal Issues:** "Ocean Basic Act" was passed in November of 2019. At that time, the Ocean Affairs Council promoted the "Marine Conservation Law", "Ocean Area Management Law", and "Marine Industry Development Regulations" and etc. However, the three regulations are currently on the draft, hoping relevant regulations can be actively promoted in the future.

## References

- [1] The World Bank, Value at Risk in the Blue Economy.  
[https://wwfint.awsassets.panda.org/downloads/metabolic\\_wwf\\_value\\_at\\_risk\\_in\\_the\\_blue\\_economy\\_29112019\\_lr.pdf](https://wwfint.awsassets.panda.org/downloads/metabolic_wwf_value_at_risk_in_the_blue_economy_29112019_lr.pdf) (Nov. 29, 2019)
- [2] The United Nations Environment Programme (UNEP).  
<https://www.unep.org/regions/asia-and-pacific/regional-initiatives/supporting-resource-efficiency/green-economy> (Nov. 15, 2022)
- [3] The World Bank (Jun. 06, 2017). What is the Blue Economy?  
<https://www.worldbank.org/en/news/infographic/2017/06/06/blue-economy>
- [4] The World Bank (Feb. 10, 2022). The World Bank's Blue Economy Program and PROBLUE: Supporting integrated and sustainable economic development in healthy oceans.  
<https://www.worldbank.org/en/topic/environment/brief/the-world-banks-blue-economy-program-and-problue-frequently-asked-questions>
- [5] Economic Advisory Council to the Prime Minister Government of India New Delhi (2020), "India's Blue Economy: A Draft Policy Framework," India.
- [6] Vision of New India by 2030, Journals of India, Law and Policy.  
<https://journalsofindia.com/indias-vision-of-new-india-by-2030/> (Nov. 7, 2022)
- [7] Deccan Herald (Feb. 1, 2019). Government's 10-point Agenda for Vision 2030.  
<https://www.deccanherald.com/business/dus-ka-dum-716104.html>
- [8] Ocean Affairs Council (OAC) in Taiwan (Jun, 2020). The National Ocean Policy White Paper.



## India's Ministry of Earth Sciences (MoES) and Major Ocean Initiatives

Chi-Heng Tsai (PHD student, National Taiwan Ocean University)

Huan-Sheng Tseng (Assistant Professor, National Taiwan Ocean University)

Keywords: India, Ministry of Earth Sciences, Ocean Initiatives

There are 36 Biodiversity Hotspots in the world, India has as many as 4 Biodiversity Hotspots [1], accounting for 1/9 of the world. India had signed lots of ocean initiatives in the past, those also benefit a huge potential driver for economic growth, innovation and employment. However, the Indian government also aware that environmental pressures from overfishing, climate change, marine pollution and loss of biodiversity are gradually weakening the value of the ocean. Therefore, in order to improve the health of marine ecology and sustainable development, the Indian government has implemented many strict strategies, and strive to make people pay more attention to marine issues. The Indian government focuses on more research on climate, ocean and coastal areas, hydrology, earthquakes and natural disasters. They hope to explore marine biological and non-living resources in a sustainable manner, and explore the three poles of the Earth (Arctic, Antarctic and Himalayas). For the purpose mentioned above, in July 2006, the Indian government had changed the original Department of Ocean Development (DOD) to the current Ministry of Earth Sciences (MoES).

### History of India's Ministry of Earth Sciences

MoES was formerly the DOD, which was created in July 1981 as a part of the Cabinet Secretariat directly under the charge of the Prime Minister of India. It came into existence as a separate department in March 1982. The function of DOD was to be a nodal institution for organizing, coordinating and promoting ocean development activities in the country. The Indian government notified DOD as the Ministry of Ocean Development in February 2006. Until July 2006, the Ministry of Ocean Development was reorganized by the Indian government into the new Ministry of Earth Sciences (MoES). This brought the Indian Meteorological Department (IMD), Delhi, the Indian Institute of Tropical Meteorology (IITM), Pune, and National Centre for Medium Range Weather Forecasting (NCMRWF), Noida under the range of MoES administration. In terms of organizational setup, MoES governs the Earth System Science Organization, which consists of 2 subordinate offices, 3 attached offices, and 5 autonomous bodies [2] (Figure 1).

### Functions of the Ministry of Earth Sciences

The vision of establishing MoES is to improve knowledge and technology in the field of Earth Sciences and bring socio-economic benefit of the society. The functions of MoES are [3]:

- I. To augment and sustain long-term observations of atmosphere, ocean, cryosphere and solid earth to record the vital signs of Earth System and changes.
- II. To develop forecasting capability of atmosphere and oceanic phenomena through dynamical models and assimilation techniques and to build prediction system for weather climate and hazards.
- III. To understand interaction between components of Earth Systems and human systems at various spatial and temporal scales.



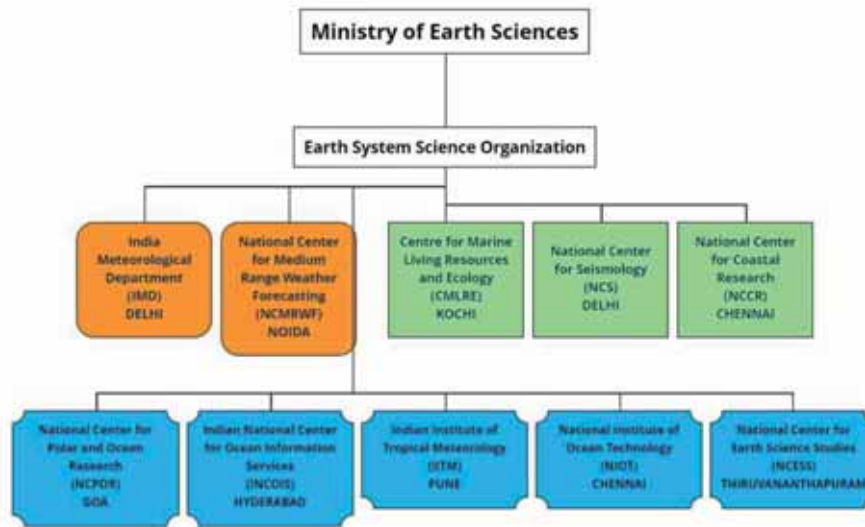


Figure 1/ The Organization Setup of Indian Ministry of Earth Sciences (MoES) (The orange background is the subordinate offices, the green background is the attached offices, and the blue background is the autonomous bodies)

Source/ The official website of MoES, compiled and drawn by the author <https://moes.gov.in/index.php/about-us/organization-setup>

- IV. To explore polar and high seas regions of the Earth towards discovery of new phenomenon and resources.
- V. To translate knowledge and insights from Earth systems science into services for societal, environmental and economic benefit.
- VI. Development of ocean technology for exploration of oceanic resources and societal applications.

MoES aims to become a world leader in providing high-quality services in Earth Sciences knowledge while contributing to the economy and society. MoES also would like to be a leader in providing all possible services in Earth Sciences to developing countries in Asia and Africa. At the same time, considering the various indicators of the Sustainable Development Goals (SDGs), it also proposes a vision document until 2030. This document looks forward to continuing the research of weather, climate and hydrological services, ocean services and marine geology, ocean survey and exploration, atmospheric and ocean technology, polar sciences and cryosphere, geosciences and seismology, multi-hazard early warning systems for disaster risk management and basic research, infrastructure, human resources development and international collaboration [4].

In addition, MoES has launched many projects to deepen research in the field of Earth Sciences, including:

#### I. Atmospheric, Climate Science and Services, ACROSS [5]

Focusing on the research of Monsoon Convection, Clouds, and Climate Change (MC4), High Performance Computing System (HPCS), Monsoon Mission (MM-II), Atmospheric Observations Network, Weather & Climate Services, Upgradation of Forecast System, Commissioning of Polarimetric Doppler Weather Radars (DWRs).

#### II. Polar Science and Cryosphere Research, PACER [6]

The Polar Regions amass massive reserves of water (in the form of snow and ice), they significantly affect global climate and are in turn also acutely affected by the ongoing climate changes. Hence, studying the Polar Regions is key to unlocking the past, better understanding the present and predicting the future. National Centre for Polar and Ocean Research (NCPOR), which belongs to MoES, has four sub-schemes under it to strength the study of the Polar Regions, namely, the Antarctic Program, Indian Arctic Program, Indian Southern Ocean Program and Cryosphere and Climate Program.



### III. Seismology and Geosciences, SAGE [7]

Focusing on the research of seismological monitoring and microzonation, geodynamics and surface processes, Indian deep ocean observations and dynamics of lithospheric evolution, scientific deep drilling in the seismic zone, seismicity and earthquake precursors and setting up a facility for geochronology.

### The major Ocean Initiatives of Ministry of Earth Sciences

In the purpose of continuing to explore marine biological and non-living resources in the way of sustainable development, MoES adopts many strategies and ocean initiatives, which will reduce the pressure and difficulties of marine environment, and enhance the benefits that the ocean can bring to human society. The major Ocean Initiatives include:

#### I. Blue Economy Policy

India has a remarkable marine position with 7,517 kilometers of coastline and comprises 199 ports of which 12 are major ports (Figure 2) that handled 541.76 million tonnes in 2021. In addition, exclusive economic zone of India covers an area of more than 2 million km<sup>2</sup> and is rich in biological and non-living resources (oil and natural gas). The coastal economy sustains over 4 million fishermen and coastal towns [8]. Therefore, India's blue economy is regarded as a part of the national economy, including: the entire marine resource system and the ocean within the jurisdiction, land and coastal economic infrastructure, which is conducive to production and economic growth, and has an important potential position.

MoES established the "National Policy for India's Blue Economy" in 2021, with suggestions and opinions from various stakeholders including industry, NGOs, academia and citizen. The draft outlines a vision of domestically available marine resources that the Indian government can adopt. The goal of the policy document is to increase the blue economy's contribution to India's GDP, improve the lives of coastal residents, protect marine biodiversity, and ensure the national security of maritime areas and resources [9]. The four objectives of this blue economy policy are: framework for robust mechanism, sustainable framework for a national coastal marine, framework to domestic manufacturing, emerging industries, trade, tourism, technology, services and skill development connected with the BEP, framework for ocean governance [10].

#### II. Marine Spatial Planning, MSP

MSP is an important issue in global ocean management, and it is a tool for sustainable development of ocean management. It aims to create a framework for the ocean that minimizes conflicts between economic sectors and maintains the good environmental status of the ocean through the identification of ocean spaces that are appropriate for different uses and activities (Figure 3). MoES, through National Centre for Coastal Research (NCCR), had previously developed Coastal Zone Management (CZM) plans for three areas, namely Chennai, Goa and Gulf of Kutch, which pertained only to the coast and near coastal areas. Although these programs only involve coastal areas, they have all proved to be very successful [11].



Figure 2/ 12 major ports in India  
Source/ International Shipping Magazine  
<https://www.seanews.com.tr/india-s-12-major-ports-see-box-throughput-rise-to-730-000-teu-in-july/152412/>



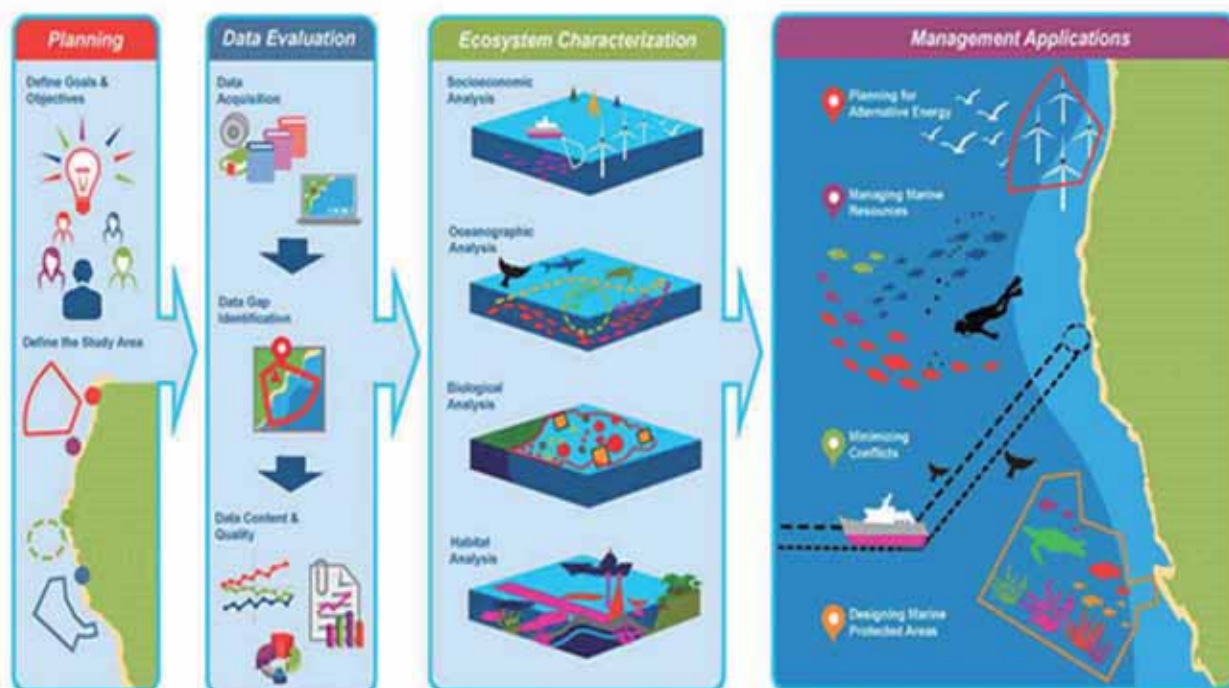


Figure 3/ The process of Marine Spatial Planning  
Source/ Pacific Islands Protected Area Portal  
<https://pipap.sprep.org/content/01-what-marine-spatial-planning>

In January 2019, India and Norway signed Memorandum of Understanding (MoU) of "India-Norway Ocean Dialogue". In the MoU, the two sides emphasized "the need to move towards integrated and ecosystem-based approaches in the management of renewable and non-renewable natural resources" and identified it as a common area for future collaboration. Lakshadweep and Puducherry in India have been identified as test sites for the project. These sites have been chosen for the pilot project in view of their setups with unique opportunities for multiple sectors (such as industries, fisheries, and tourism) to flourish. The Government of India's initial investments for undertaking the studies and planning are estimated to be around INR 8-10 crores per annum. In the future, MSP framework of these two key areas can be replicated to other coastal areas of India [12].

### III. National Decade Coordination Committee, NDCC

Since the United Nations announced the 10 years from 2021 to 2030 as the "United Nations Decade of Ocean Science for Sustainable Development (Ocean Decade)", it aims to stimulate the generation of marine knowledge, and raise public awareness of marine science and sustainable development [13].

MoES constituted a National Decade Coordination Committee (NDCC), which involved various national institutions and stakeholders, under the chairmanship of Secretary. Its mandate is to coordinate existing programs and develop new programs at the national level to achieve the goals of the Ocean Decade. On February 3, 2021, India's "Ocean Decade Conference" was officially launched at the Indian National Centre for Ocean Information Services (INCOIS). Ocean Decade Conference recommends developing a National Ocean Decade Implementation Plan in consultation with other national research centers and stakeholders to highlight India's contribution to the awareness of primary school students and the public on the importance of the ocean. In addition, India has also continued to strengthen the maritime construction measures of the countries along the Indian Ocean [14].



## Conclusion

After the establishment of the Ocean Affairs Council (OAC) of Taiwan in April 2018, the National Academy of Marine Research (NAMR) affiliated to the OAC was also established in April 24, 2019. The main tasks are to plan marine policy, study on marine resource and marine scientific research [15]. It is regarded as a national marine think tank, similar with MoES in India, both of which conduct marine science research. However, MoES has been established for a long time (including the predecessor DOD), and has a certain foundation on research in various fields of earth sciences, especially in climate science, polar science and natural disaster prevention. In addition, India has also signed many Memorandum of Understanding with the United States, the United Arab Emirates, the United Kingdom, Mauritius, Norway, Germany and other countries to strengthen research on marine science. Taiwan's NAMR is still in the development stage, but it has achieved many research results in integrating marine scientific research information, improving basic marine surveys, enhancing the development of marine research, cultivating cultural heritage talents, and leading the upgrading of the marine industry.

MoES has also proposed many ocean initiatives for the sustainable development of the ocean. Among them, the blue economy policy is a strategy adopted by many countries to sustainably use the ocean, including: Australia, Brazil, the United Kingdom, the United States, Russia and other countries. Ecosystem-based marine spatial planning is also the focus of the MoES, and Taiwan is also making continuous efforts in the institutional and legal aspects of marine spatial planning. The National Decade Coordination Committee established by India is also one of the initiatives which is worthy for Taiwan to refer. Only by carrying out policy planning under a clear future blueprint can the process be improved and the goal achieved.

## References

- [1] ENVIS Resource Partner on Biodiversity (2021). Global Biodiversity Hotspots with Special Emphasis on Indian Hotspots. [http://www.bsienviis.nic.in/database/biodiversity-hotspots-in-india\\_20500.aspx](http://www.bsienviis.nic.in/database/biodiversity-hotspots-in-india_20500.aspx) (Nov. 10, 2022)
- [2] Ministry of Earth Sciences, About Our Ministry. <https://moes.gov.in/index.php/about-us/about-our-Ministry> (Nov. 18, 2022)
- [3] Ministry of Earth Sciences, Vision and Mission of the Ministry. <https://moes.gov.in/index.php/about-us/Vision-and-Mission-of-the-Ministry> (Nov. 20, 2022)
- [4] Ministry of Earth Sciences (2016). Vision for 2030. [https://moes.gov.in/sites/default/files/inline-files/ver\\_8\\_0\\_Earth\\_Science\\_Vision-2016\\_240716.pdf](https://moes.gov.in/sites/default/files/inline-files/ver_8_0_Earth_Science_Vision-2016_240716.pdf) (Nov. 20, 2022)
- [5] Ministry of Earth Sciences, ACROSS. <https://moes.gov.in/index.php/schemes/atmospheric-climate-science-and-services> (Nov. 18, 2022)
- [6] Ministry of Earth Sciences, PACER. <https://moes.gov.in/index.php/schemes/polar-science-cryosphere> (Nov. 21, 2022)
- [7] Ministry of Earth Sciences, SAGE. <https://moes.gov.in/index.php/schemes/Seismology-and-Geosciences> (Nov. 21, 2022)
- [8] IBEF (2022). Importance of India's Blue Economy. <https://www.ibef.org/blogs/importance-of-india-s-blue-economy> (Nov. 19, 2022)
- [9] Economic Advisory Council to the Prime Minister Government of India (2020). India's Blue Economy- A Draft Policy Framework. [https://incois.gov.in/documents/Blue\\_Economy\\_policy.pdf](https://incois.gov.in/documents/Blue_Economy_policy.pdf) (Nov. 18, 2022)
- [10] IBEF (2022). Importance of India's Blue Economy. <https://www.ibef.org/blogs/importance-of-india-s-blue-economy> (Nov. 19, 2022)
- [11] Indian Science and Technology (2020). Ocean Initiatives. <https://www.indiascienceandtechnology.gov.in/listingpage/ocean-initiatives> (Nov. 10, 2022)
- [12] Ministry of Earth Science (2022). India and Norway agree to conduct marine spatial planning in Lakshadweep and Puducherry. <https://pib.gov.in/PressReleasePage.aspx?PRID=1702137> (Nov. 16, 2022)
- [13] UNESCO. United Nations Decade of Ocean Science for Sustainable Development (2021-2030). <https://en.unesco.org/ocean-decade> (Nov. 16, 2022)
- [14] ESSO. Ocean Decade and National Decade Coordination Committee. <https://incois.gov.in/portal/ndcc.jsp> (Nov. 19, 2022)
- [15] National Academy of Marine Research (2019). <https://www.namr.gov.tw/ch/home.jsp?id=10&parentpath=0,1> (Nov. 16, 2022)



## Earth System Science Organization - Indian National Centre for Ocean Information Services (ESSO-INCOIS)

Meng-Syue Li (Associate Researcher, Marine Science and Information Research Center, National Academy of Marine Research)

Translated by Linguitronics

Keywords: India, ocean information services, ESSO-INCOIS

This report introduces India's national-level ocean information center Earth System Science Organization - Indian National Centre for Ocean Information Services (ESSO-INCOIS) in the hopes that Taiwan can improve its application of ocean information by following the example of other nations' ocean information services.

Founded in 1999, ESSO-INCOIS falls under the authority of Ministry of Earth Science (MoES) and is a department within the Earth System Science Organization. The mission of ESSO-INCOIS is to monitor the oceans and provide society, industry, academia, and government institutions with high-quality ocean information and consulting services. Systemic and focused research is continually advanced in hopes of becoming the leader of knowledge and information technologies in the ocean sector.

### Founding Principles and Missions of ESSO-INCOIS

The founding principles and missions of ESSO-INCOIS include:

- Establish, maintain, and manage ocean information service systems to collect, analyze, interpret, and preserve relevant data.
- Take on, support, promote, guide, and coordinate research and related services in the field of ocean information (including satellite oceanography).
- Utilize satellite technology, vessels, buoys, or other platforms to conduct surveys and monitoring to output data on the fishing industry, mining industry, and oil industry, as well as organisms, hydrology, topographical mapping, geology, weather, and coastal management.
- Provide users with output data and the value-added services of relevant data.
- Cooperate with ocean, atmosphere, and coastal management institutions of other nations for the remote monitoring of international waters.
- Establish early warning systems for tsunamis and storm surges.
- Support research centers in conducting relevant research for data integration, analysis, and collection on ocean processes, air-sea interactions, and coastal information.
- Organize training courses, symposiums, and seminars to promote research related to ocean science and technology.
- Utilize viable technologies to spread information, research results, ocean data products, maps, and digital data to the general public to promote research and satisfy society's demand for a rising standard of living.
- Provide consultation services for ocean information.
- Utilize satellites to obtain the most advanced ocean data remotely.



## Organizational Structure

The organizational structure of ESSO-INCOIS primarily includes 3 groups and 8 divisions (Figure 1), namely:

- Operational Ocean Services & Applied Research (OSAR): Includes the 2 divisions of Operational Ocean Services (OOS) and Applied Research and Research to Operations (ARO).
- Ocean Observations, Modeling & Data Assimilation (OMDA): Includes the 2 divisions of Ocean Modeling & Data Assimilation (MDA) and Ocean Observations Network (OON).
- Information & Communication Technology and Data Management (ICTD): Includes the 2 divisions of Ocean Data Management (ODM) and Information & Communication Technology (ICT).

Additionally, there are the divisions of Program Planning & Coordination and Capacity Development (PPC) and Executive Support Services (ESS).

In terms of human resources, the number of full-time employees at ESSO-INCOIS as of March 2021 included one director, 40 scientists, 19 research assistants, and 10 administrative staff for a total of 70 employees. Project-based human resources included 28 project scientists, 28 project assistants, 18 postdoctoral research fellows, and 20 administrative staff for a total of 94 positions.

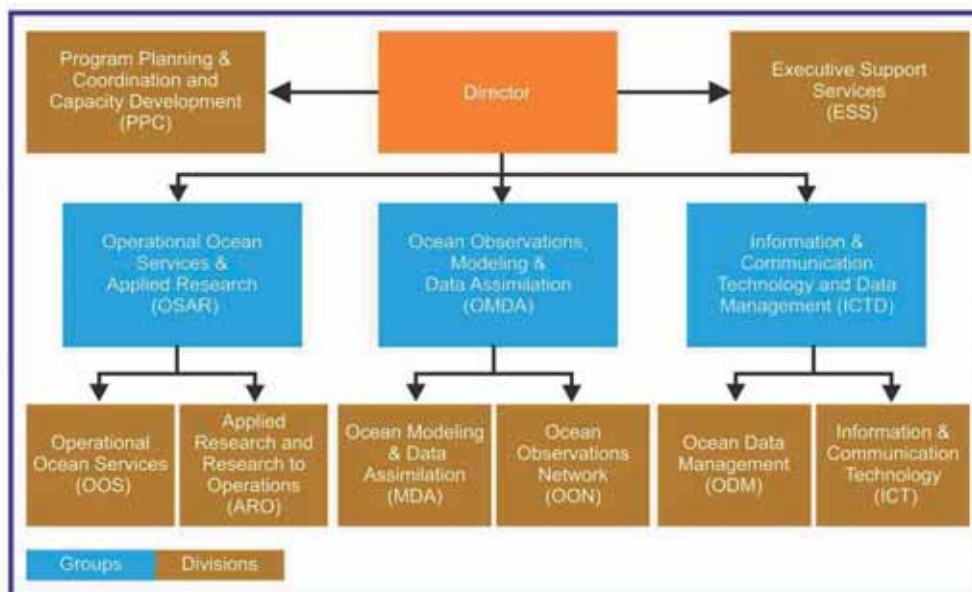


Figure 1/ Organizational Structure of ESSO-INCOIS  
Source/ [1]

## Tsunami Early Warning Services (TEWS)

On December 26, 2004, Sumatra-Andaman earthquake occurred 160 kilometers west (3°19'N, 95°51.24'E) of Sumatra, Indonesia. The 9.1-9.3 magnitude quake occurred at a depth of 30 km [2] and caused a massive tsunami in South Asia. Regions severely damaged by the tsunami included Indonesia's Aceh province, Thailand's Phuket resort area, Sri Lanka, and India's Tamil Nadu, resulting in the death or injury of 300,000 people. This was partly because a regional tsunami early warning service similar to those installed in the Pacific Ocean did not exist in the Indian Ocean or Atlantic Ocean at the time. In the Pacific Ocean, multiple sets of tsunami sensors with real-time connection to monitoring centers have been installed so that in the event of a tsunami, civilians will receive real-time warnings for them to evacuate before the tsunami arrives. While Thailand is a member of the Pacific TEWS, the country's tsunami sensors are installed in their eastern waters as opposed to the Indian Ocean. The United States Geological Survey (USGS) believes that establishing



tsunami monitoring and early warning systems can effectively reduce the loss of life. This is especially true in Sri Lanka and India, where there were 3 or more hours after the initial earthquake to evacuate civilians in coastal regions; however, systemic negligence still led to severe deaths and injuries. Additionally, people more susceptible to potential tsunamis in countries around the Pacific Ocean are generally more aware of tsunamis, understanding that a sudden ebbing of the tide on the coast represents a massive incoming wave. Also, the excessively slow earthquake analysis in India and Sri Lanka led to warnings being issued too late. As such, the Indian government included TEWS into their ocean information services.

The Indian government established an Indian Tsunami Early Warning Centre (ITEWC) in ESSO-INCOIS that launched operations in October 2007. ITEWC is a Tsunami Early Warning Centre that operates 24-7 and includes a seismic monitoring station on land and ocean observation network (tsunami buoys and tide station) to offer continuous detection and monitoring of tsunamis caused by earthquakes. The use of 12 undersea bottom pressure sensors (BPR) enables earthquake testing and uses seismic parameters to estimate and track the occurrence of tsunamis, instantly sending this data to ITEWC and offering real-time recommendations to vulnerable regions (Figure 2).

Generally, tsunami simulations can be categorized into 3 parts: I. Tsunami generation; II. Propagation, and III. Retrograde motion (Overflow). Tsunami generation models often utilize models such as [3] and [4] to calculate changes in static seabeds. These models require basic parameters including the fault area (length and width), strike angle, dip, slip, fracture depth, dislocation, and seismic magnitude to generate an initial waveform. Tsunami propagation speed is closely related to water depth. Tsunami waves travel at speeds between 500-1,000 km/hour when deep underwater and in the open seas. When they approach coastal areas,

tsunamis are affected by shoaling, which causes a height increase. High-resolution terrain elevation data can be applied to establish potential flood maps for quickly evaluating the possible affected area of disasters. ESSO-INCOIS applied the TUNAMI N2 (Tohoku University's Numerical Analysis Model for Investigation of Near field tsunamis) model in 5 simulations of recorded earthquakes, predicted flood areas, and drew a potential flood map for the reference of relevant agencies.

The rapid calculation system for tsunami propagation in the Indian Ocean includes a database of 50,000 tsunami scenarios, covering a range from 30 to 40°N and 30 to 130°E latitude with grid spacing of about 0.0450° (5.01 km). The Indian Ocean's two tsunami generation zones are covered using sensitivity analysis and historical earthquake data to set up 975 simulation points on the subduction zone. Each simulation point includes 6 different depth combinations (10, 20, 40, 60, 80, and 100 km) and 7 levels of magnitude (Mw) (6.5, 7.0, 7.5, 8.0, 9.0, and 9.5 Mw), as well as a pre-defined unit source. In total, approximately 50,000 scenarios, each with different coastal locations, arrival time, and wave height are predicted and stored in the database. In the event of a tsunami, the closest scenario can be selected to identify risk areas. The tsunami that occurred on September 12, 2007 was used to conduct verification as shown in Figure 3.

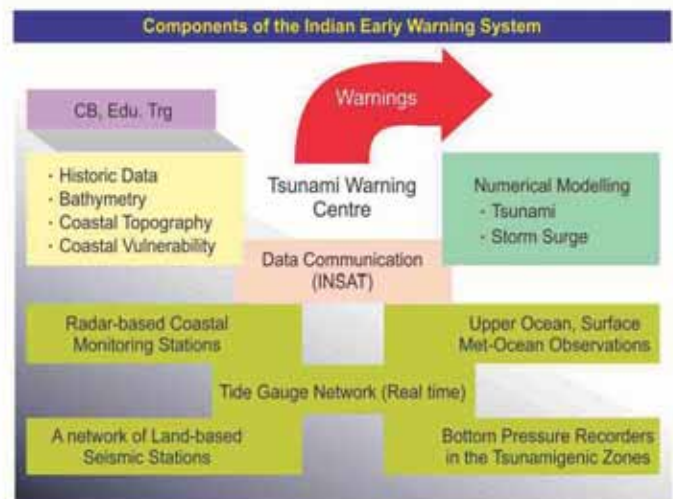


Figure 2/ Operation of TEWS in the Indian Ocean  
Source/ [1]



### Storm Surge Early Warning Model

Similar to typhoon damage in Taiwan, the coasts of Northern India suffer from hazards such as storm surges and flooding due to tropical winds. A storm surge is a phenomenon in which the sea level rises rapidly due to wind shear and air pressure (Figure 4), similar to powerful wind fields caused by tropical winds, such as typhoons in Asia and or hurricanes in the Americas. Their gale and low central pressure push and squeeze seawater towards coasts, which is added to the topographic effect of slopes in the ocean and astronomical tides (tides) to repeatedly trigger incidents where

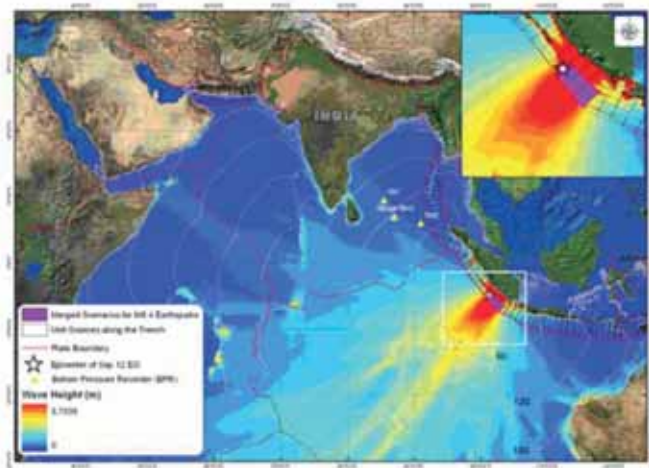


Figure 3/ Tsunami Propagation Map After the 8.4 Magnitude Earthquake of September 12, 2007  
Source/ [1]

new records in water level and wave height occur. Extreme water levels cause hazards by flooding low-lying regions, causing rivers to overflow, leading to soil salinization due to salt from seawater flooding inland, thereby endangering crops and livestock, or driving seawater to enter the water table, resulting in scarcity of drinking water. On the other hand, tropical winds also bring intense, concentrated rainfall of up to 500mm/day. The uncertainty in their prediction further exacerbates the risks of storm surges, especially in India's Bay of Bengal. ESSO-INCOIS established an Indian Storm Surge Early Warning System due to the cumulative loss of life and property from storm surges. The system applies the ADvanced CIRCulation (ADCIRC) model to calculate ocean currents generated by tides and winds, thereby estimating the rise in sea level caused by topographic effects in coastal regions. The factors considered for storm surges due to tropical winds include maximum storm radius, gale intensity, central movement speed, movement trajectory, center air pressure, landing location, coastal land elevation, and coastal features. The early warning system categorizes the risk of India's coastal regions as follows: Surge heights below 1.5 m are considered light risk zones, surge heights between 1.5 m to 3 m are considered moderate risk zones, surge heights between 3 m to 5 m are considered high risk zones, and surge heights above 5 m are very high risk zones. The early warning process is as shown in Figure 5.



Figure 4/ Storm Surge Diagram  
Source/ [1]



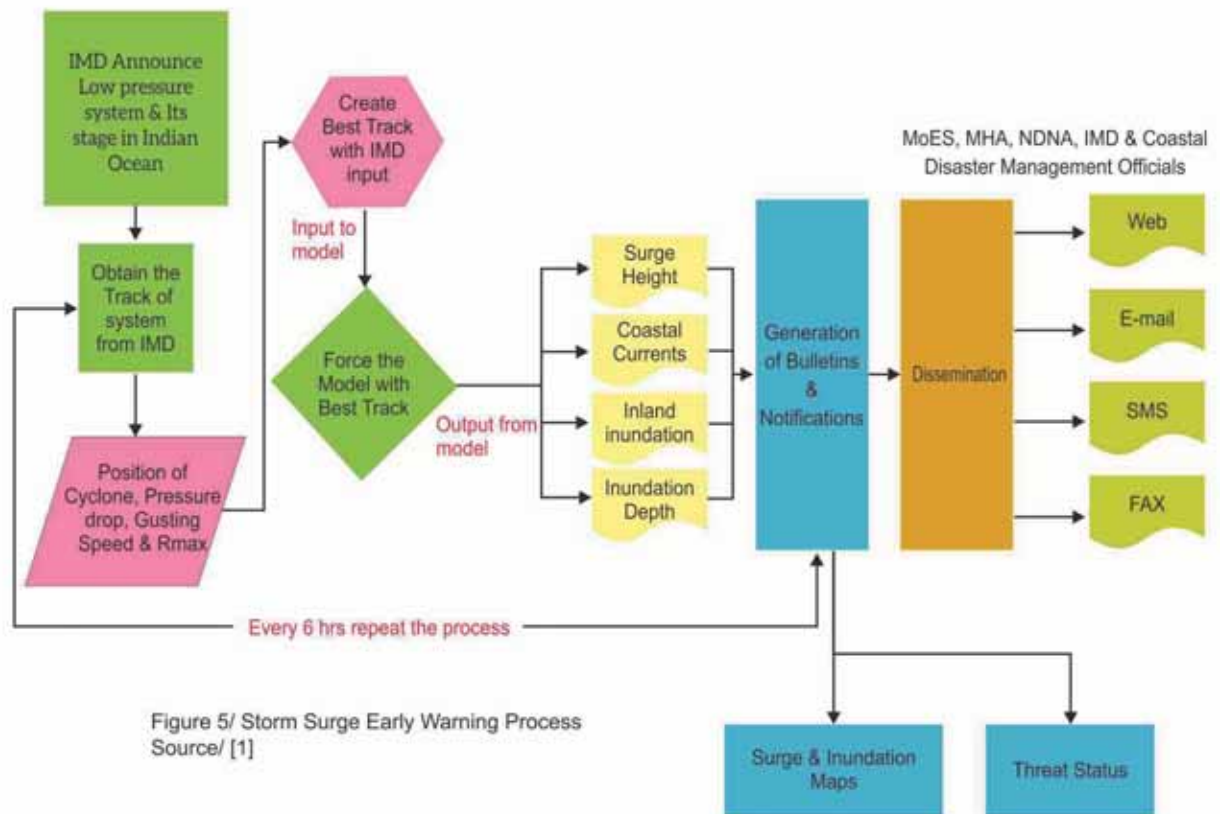


Figure 5/ Storm Surge Early Warning Process Source/ [1]

## Conclusion

This article offers an introduction of the organization and operations of the ESSO-INCOIS. It is clear that India's government places great emphasis on the management, value-adding, and sharing of ocean data. Taiwan's Ocean Affairs Council (OAC) is responsible for consolidating ocean affairs, as well as the planning and implementation of ocean policies. Article 12 of the Ocean Basic Act requires OAC to conduct long-term, practical, and basic surveys and research, as well as establish and maintain a national marine information system and sharing platform. In the light of this, OAC has instructed the National Academy of Marine Research (NAMR) to establish and implement a National Ocean Database and Sharing System (NODASS) to maximize the synergistic effect of consolidating ocean scientific resources. Hopefully, the consolidation, data governance, visualization, and sharing of data can be applied to plan for marine development, protect ecological environments, and assist in marine rescue, disaster prevention, and emergency relief, as well as establish mechanisms of environmental conservation. This can help the public learn about our oceans and approach them more easily, writing the oceans into our DNA.

## References

- [1] ESSO - Indian National Centre for Ocean Information Services (INCOIS)(n.d.). <https://incois.gov.in/> (Dec. 9, 2022)
- [2] Nalbant, S. S., Steacy, S., Sieh, K., Natawidjaja, D., and McCloskey, J. (2005), "Seismology: Earthquake risk on the Sunda trench." *Nature*, 435(7043): 756-757.
- [3] Okada Yoshimitsu (1985), "Surface deformation due to shear and tensile faults in a half-space." *Bulletin of the Seismological Society of America*, 75(4): 1135-1154.
- [4] Titov V. V., Gonzalez F. I. (1997), "Implementation and Testing of the Method of Splitting Tsunami (MOST) Model." NOAA/Pacific Marine Environmental Laboratory, No. 1927.



# The State of Ocean Governance in the Western Indian Ocean Region

Shih-Ming Kao (Associate Professor, National Sun Yat-sen University)

Keywords: Western Indian Ocean (WIO) Region, Ocean Governance, the Nairobi Convention, Areas Beyond National Jurisdiction (ABNJ), Blue Economy

This Article aims to introduce the state of ocean governance in the Western Indian Ocean (WIO) region. Coastal States in the WIO region mainly include Comoros, France (Reunion and Mayotte), Kenya, Madagascar, Mauritius, Mozambique, Seychelles, Somalia, Tanzania and the Republic of South Africa. Following, this Article presents regional mechanisms and thematic and important issues in relation to ocean governance in the WIO region.

## The State of Regional Mechanism in Relation to Ocean Governance

Regional mechanisms in relation to ocean governance in the WIO region are to enable coastal countries to cooperate with neighboring countries with which they share the ocean, including shared fish stocks, prevent transboundary pollution, conserve ecosystems, and facilitate marine transport. In addition, issues such as piracy, deep seabed mining and ocean acidification also benefit from a regional approach [1].

### I. Ocean and Coastal Environment: Nairobi Convention

Several regional mechanisms in relation to ocean governance have been established in the WIO region (In addition to the Nairobi Convention, other regional conventions include the Convention for the Cooperation in the Protection and Development of the Marine and Coastal Environment of the West and Central African Region [Abidjan Convention], the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean [Barcelona Convention], and the Regional Convention for the Conservation of the Red Sea and of the Gulf of Aden Environment [Jidda Convention] that are related to ocean governance in the WIO region), among which the Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Eastern African Region (Nairobi Convention) is the only regional institution mandated to address the environmental governance of land and sea sources of pollution, integrated coastal zone management, conservation of habitats, including through protected areas, and transboundary pollution emergency management. Currently, three protocols; on combating pollution [2], pollution emergencies [3], and habitat protection [4] have been adopted and in effect. In addition, currently the Nairobi Convention has begun to examine measures to advance the region's blue economy, and its role with respect to Areas Beyond National Jurisdiction (ABNJ) [5].

### II. Marine Fisheries Resources: Regional Fisheries Management Organizations

In relation to the conservation and management of fisheries resources, there are three regional fisheries management organizations (RFMOs) that are responsible for this task in the WIO region:

- i. The Indian Ocean Tuna Commission (IOTC), which has a mandate to manage the tuna stocks (specified highly migratory species, HMS) of the entire Indian Ocean;
- ii. The Southern Indian Ocean Fisheries Agreement (SIOFA), which is tasked with managing fisheries outside the exclusive economic zones (EEZs) (excluding tunas and other HMS falling under the IOTC mandate); and



- iii. The South West Indian Ocean Fisheries Commission (SWIOFC), which does not have a management role but regularly assesses the status of fishery resources and provides a means of coordinating the fisheries policies and activities of the region's coastal countries.

In addition, the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), the Commission for the Conservation of Southern Bluefin Tuna (CCSBT), and the International Whaling Commission (IWC) are also relevant to the conservation and management of fisheries resources because the fish stocks they manage may migrate into the WIO region [1].

### Thematic and Important Issues in Relation to Ocean Governance in the WIO region

Recent thematic and important issues related to ocean governance include:

#### I. Maritime Boundaries and Areas Beyond National Jurisdiction

Coastal States have already agreed on many bilateral maritime boundaries in the region, including between Mauritius and Seychelles as well as between Kenya and Tanzania. However, there are still some outstanding bilateral maritime boundaries negotiations, such as negotiations between Comoros and Mozambique as well as between Comoros and Tanzania.

Except for Comoros, all coastal States in the WIO region have submitted their information to the Commission on the Limits of the Continental Shelf (CLCS) established by the 1982 United Nations Convention on the Law of the Sea (UNCLOS) for an extended continental shelf that is beyond 200 nm measured from the territorial baselines. In 2012 Mauritius and Seychelles agreed to the establishment of a Joint Management Area (JMA) in which the two States exercise sovereign rights jointly for the purpose of exploring the continental shelf and exploiting its natural resources. In addition, an agreement also exists between Mozambique and South Africa with respect to the harmonization of extended continental shelf claims.

In relation to ABNJ, vast areas of the WIO lie in the ABNJ, including numerous ocean ridges and seamounts, particularly south of Madagascar and Réunion and between Somalia and Maldives. Among these areas, most of the Mascarene Plateau that hosts the world's largest seagrass area lies within the JMA and the EEZs of Mauritius and Seychelles, where both Mauritius and Seychelles exercise sovereign rights over the seabed and subsoil as per article 77 of UNCLOS [1].

#### II. Maritime Security

Maritime security and the rule of law are the foundation of environmentally-healthy oceans and the blue economy. All WIO States except Somalia have ratified the 1998 Convention for the Suppression of Unlawful Acts Against the Safety of Maritime Navigation (SUA) but not the more recent amended 2005 SUA. Piracy is the most concerned among those related to maritime security, particularly Somali piracy has resulted in an estimated loss of US\$18 billion per year to the world economy.

To this end, the Contact Group on Piracy off the Coast of Somalia (CGPCS) was established in 2009 to coordinate the response to piracy and consolidate and develop regional maritime security in the region. In addition, the Djibouti Code of Conduct was adopted in 2017, which is a binding multilateral agreement to combat piracy in the region through the collaboration between WIO coastal States, Middle Eastern States and relevant UN organizations [1].

#### III. Blue Economy

Since 2015, the Parties to Nairobi Convention (also the coastal States in the WIO region) have decided to discuss how to pursue a blue economy approach to development. Blue economy includes a diversity of



economic activities in the WIO region, including shipping, offshore renewable energy (particularly offshore wind power) and non-living resources, deep sea mining, coastal tourism, etc. As to the development of shipping, the key elements include the emphasis of the implementation of the International Convention for the Prevention of Pollution from Ships (MARPOL) and related instruments from the International Maritime Organization (IMO), as well as the development of green ports.

As regards to offshore renewable energy, despite the fact that it is still in its infancy in the WIO region, there is considerable potential. Measures to promote offshore renewable energy include investment incentives, public private partnerships, opening access to the electric grid and technology transfer, and to underpin investment and avoid, or minimize negative through measures such as marine spatial planning (MSP) and environmental impact assessments (EIAs). In relation to offshore non-living resources, there are huge oil, gas, and mineral reserves in the African region, but the costs for exploitation may also be high. In addition to continue encouraging investments, emphasis should be placed to prevent negative impacts to the environment when States exploit these non-living resources in the WIO region. Through regional regulatory mechanism will effectively achieve this goal.

In relation to deep sea mining, currently five contracts have been approved by the International Seabed Authority (ISA) for deep sea mining in the Indian Ocean ABNJ. However, subject to the costs, pioneering nature and advanced technology involved, the existing ISA contracts are with State-sponsored agencies rather than private companies. Coastal States in the WIO region lack adequate marine-mining policies, experience and resources to deal with the ISA requirements, and therefore they may associate with other countries to participate in technologies and benefits. However, some of the liability for environmental damage would remain with any such sponsoring coastal States in the WIO region.

Regarding coastal tourism, other than the operation of cruise ships and yachts, marine leisure and coastal tourism is largely a matter of national governance, but can benefit from regional and global experiences. All coastal States in the WIO region share similar sustainable tourism goals, and use many of the same tools to plan and foster sustainable tourism, including integrated coastal zone management (ICZM), marine spatial planning (MSP), creation of marine protected areas and reserves, and use of codes of conduct for tourism operators. Many States have growing domestic tourism, but the protection of any right of public access to the foreshore, as well as the protection of vulnerable habitats and species (e.g., sea turtles, sharks, coral reefs) varies considerably in the region [1].

#### **IV. Environment and Nature Resources**

Currently, issues related to environment and nature resources concerned in the WIO regions include coastal zones, sustainable coast cities, rivers and wetlands, biodiversity, pollution, sustainability in ABNJ, climate change and ocean acidification, and fisheries. In particular, the impact of the growing coastal urban population presents a major challenge to sustainable oceans and conservation of maritime heritage sites, as well as negative impacts on all habitats and natural resources: reefs, mangroves, rivers and wetlands and the quality of air and water. In addition, all coastal States in the WIO region have established Marine Protected Areas (MPAs). However, these range from small private MPAs and community MPAs to large ocean-scape MPAs such as that in Seychelles. In addition, they provide different levels of protection functions from 'no take' areas to limited extractive or recreational use.

In relation to the sustainability in ABNJ, as mentioned above RFMOs have become the primary management mechanism for fisheries resources in ABNJ. Despite the fact that the negotiation of the Nations Convention on the Law of Sea on the conservation and sustainable use of marine biological



diversity of areas beyond national jurisdiction (BBNJ) Agreement is currently discussing in the United Nations, flag states are unwilling to cede their exclusive jurisdiction rights on the high seas. Without an effective enforcement mechanism, the proposed global BBNJ Agreement is likely to be adopted in the near future. This is where a regional approach can move from global provisions, which are difficult to negotiate, to specific provisions targeting clearly-defined regional challenges [1].

## Conclusion

According to the above sections, there are already many regional mechanisms in relation to ocean government in the WIO regional, particularly the Nairobi Convention which specifically addresses marine environment issues as well as RFMOs that manage marine fisheries resources. In addition, ocean governance issues concerned in the region include maritime boundaries and conflicts among maritime claims, maritime security, blue economy, and environment and natural resources.

Despite the existence of these relevant regional mechanisms in relation to ocean governance, coastal States in the WIO region are mostly developing States. Comparing to developed States, they are insufficient in technology, finance, and human resources in this regard. Assistance from other States or international organizations for the development of blue economy and law enforcement is highly needed. Therefore, capacity building will be the first priority in relation to ocean governance in the WIO region.

## References

- [1] United Nations Environment Programme / Nairobi Convention (2020). The State of Ocean Governance in the Western Indian Ocean. <https://wedocs.unep.org/20.500.11822/33767> (Dec. 7, 2022)
- [2] Nairobi Convention (1985). Protocol concerning Cooperation in Combating Marine Pollution in cases of Emergency in the Eastern African Region. [http://nairobi-convention.org/CHM%20Documents/Protocols/Nairobi\\_Convention\\_Text\\_1985-35-43.pdf](http://nairobi-convention.org/CHM%20Documents/Protocols/Nairobi_Convention_Text_1985-35-43.pdf) (Dec. 7, 2022)
- [3] Nairobi Convention (1985). Protocol concerning Protected Areas and Wild Fauna and Flora in the Eastern African Region. [http://nairobi-convention.org/CHM%20Documents/Protocols/Nairobi\\_Convention\\_Text\\_1985-22-34.pdf](http://nairobi-convention.org/CHM%20Documents/Protocols/Nairobi_Convention_Text_1985-22-34.pdf) (Dec. 7, 2022)
- [4] Nairobi Convention (2016). The Amended Nairobi Convention and the Protocol on Land Based Sources and Activities. <https://www.nairobi-convention.org/clearinghouse/sites/default/files/The%20Amended%20Nairobi%20Convention%20and%20Protocol%20-%20prepared%20April%202016.pdf> (Dec. 7, 2022)
- [5] United Nations Environment Programme (2010). Protocol for the Protection of the Marine and Coastal Environment of the Western Indian Ocean from Land-Based Sources and Activities. <https://leap.unep.org/sites/default/files/treaty/TRE-157174.pdf> (Dec. 7, 2022)



# 國際海洋資訊

22  
February 2023  
雙月刊 | Bimonthly



## International Ocean Information

發行：海洋委員會

地址：806610高雄市前鎮區成功二路25號4樓

電話：(07)3381810

E-mail：master@oac.gov.tw

網址：https://www.oac.gov.tw/

執行：財團法人台灣經濟研究院

地址：104222臺北市中山區德惠街16-8號7樓

電話：(02)2586-5000分機888

傳真：(02)2595-7131

網址：http://www.tier.org.tw/

發行人：管碧玲

副發行人：洪文玲、周美伍、吳美紅

總編輯：劉國列

編輯委員：黃向文、陳建宏、謝亞杰、  
沈建中、許啓業、王茂城、  
黃世偉、林麗英、李子嘉、  
陳致延、紀琇雯

編輯顧問：錢樺、張正杰

執行主編：鍾嘉雯、陳璋玲

執行編輯：黃釋緯、涂凱柔、謝惠子

美編設計：不賴的廣告

電話：(02)2783-3033

傳真：(02)2783-0978

Published by Ocean Affairs Council

Address：4F., No. 25, Chenggong 2nd Road,  
Qianzhen District, Kaohsiung City 806610,  
Taiwan

Telephone：(07)3381810

E-mail：master@oac.gov.tw

Website：https://www.oac.gov.tw/

Executive：Taiwan Institute of Economic Research

Address：7F., No. 16-8, Dehuei St., Jhongshan District,  
Taipei City 104222, Taiwan

Telephone：(02)2586-5000 Ext.888

Fax：(02)2595-7131

Website：http://www.tier.org.tw/

Publisher：Bi-Ling Kuan

Vice Publisher：Wen-Ling Hong, Mei-Wu Chou, Mei-Hung Wu

Editor-in-Chief：Kuo-Lieh Liu

Editorial Board：Hsiang-Wen Huang, Jiahn-Horng Chen,  
Ya-Chieh Hsieh, Chien-Chung Shen,  
Chad C.Y. Hsu, Mao-Chen Wang,  
Shin-Wei Huang, Li-Ying Lin,  
Zi-Jia Li, Chih-Yen Chen, Siou-Wun Ji

Reviewer：Hwa Chien, Cheng-Chieh Chang

Managing Editor：Chia-Wen Chung, Chung-Ling Chen

Executive Editor：Shi-Wei Huang, Kai-Jou Tu, Hui-Tzu Hsieh

Designed by Pride Advertising Agency Ltd.

Telephone：(02)2783-0978

Fax：(02)2783-3033

讀者意見回饋，請來電(02)2586-5000分機888或E-mail至d11743@tier.org.tw



# 國際海洋資訊

22  
February 2023  
雙月刊 | Bi-monthly



## International Ocean Information



封面／位於印度洋北部的拉克代夫海（Laccadive Sea），與印度、馬爾地夫和斯里蘭卡接壤，海洋生態豐富，以捕魚、觀光等產業聞名

封底／海洋委員會「《聯合國海洋法公約》40週年與海洋政策國際研討會」會議合照

中華民國112年2月出版（每雙月出版）

中華民國108年8月創刊

ISSN 2706-638X（紙本）

ISSN 2706-6398（電子）

中華郵政高雄雜字第236號執照登記為雜誌交寄

高雄郵局許可證 高雄字第2084號

著作權所有未經同意不得轉載



線上全文

 海洋委員會  
Ocean Affairs Council 發行

 台灣經濟研究院 編印  
Taiwan Institute of Economic Research

贈閱