



Research Paper

Impact of Blue Economy and Sustainable Development in India with correlation to SDG14: Life under water

ADITYA ARORA

*Received 03 July, 2022; Revised 13 July, 2022; Accepted 15 July, 2022 © The author(s) 2022.
Published with open access at www.questjournals.org*

I. Introduction

Honorable Prime Minister of India Shri Narendra Modi recently said “ To me, the Blue Chakra or wheel in India’s national flag represents the potential of Blue Revolution or the Ocean Economy. That is how central the ocean economy is.”

Oceans are the world’s single largest ecosystem, covering nearly three-fourths of the earth’s surface, thereby providing a massive arena for emerging complex and interconnected development issues such as climate change, livelihoods, commerce, and security. According to estimates by the Global Ocean Commission, ocean resources contribute five percent of the world’s GDP, secure the jobs of three billion people, and sustain the livelihoods of 350 million.

Among the world’s oceanic divisions, the Indian Ocean is the third largest, covering an area of more than 70 million sq km that includes extensive Exclusive Economic Zones (EEZ) of different countries and large “high seas”. The economic and sustainable development issues in the Indian Ocean rim are particularly challenging since the majority of littorals are developing countries. These countries are home to one-third of the world’s population that rely extensively on marine resources for livelihood and food security. The sheer size of this population subjects the Indian Ocean’s resources to pressures from pollution, habitat degradation, and over-exploitation. As the population of the region is projected to increase significantly in the coming decades, its impact on food security and the economy from marine resources would become more substantial. Moreover, the region and its resources face multi-dimensional challenges from climate change impacts such as sea-level rise, ocean acidification, and extreme weather events—the latter, in turn, leading to changes in the distribution of aquatic species, community structures due to migration, and decreased economic productivity.

It is imperative, therefore, to increase cooperation towards conservation and sustainable use of the oceans, seas, and marine resources as outlined in Goal 14 of the Sustainable Development Goals (SDG). Serious efforts are needed to address the growing pressures on ocean resources, to ensure global food security and secure livelihoods for future generations. The concept of ‘Blue Economy’—aimed at generating livelihoods and building resilience against climate change and its concomitant environmental challenges—inspires the use of seas and oceans for sustainable development and inclusive growth. In their Mauritius Declaration on Blue Economy of September 2015, the Indian Ocean Rim Association (IORA) recognized the need for urgent action towards improved governance structures to preserve the ocean’s resources for future generations and so must we.

Research Statement

We aim to introspect the current architecture for Blue Economy and its potential in the Indian Ocean region, particularly in the context of fisheries, environmental protection, and climate change impacts. We then aim to analyze a preliminary assessment of different targets under SDG14 that India has tried to achieve and finally offer recommendations for future courses of action.

Blue Economy in the Indian Ocean

The Indian Ocean is projected to become a dominant global geopolitical and economic force in the 21st century. Indeed, the region’s contribution to global GDP has significantly increased over the last century: from an average of six to seven percent in 1980 to 10 percent or USD 78 trillion in 2014 (See Figure 1). However, based on Gross National Income, only three IOR countries—i.e., Australia, Singapore, and United Arab Emirates—feature among

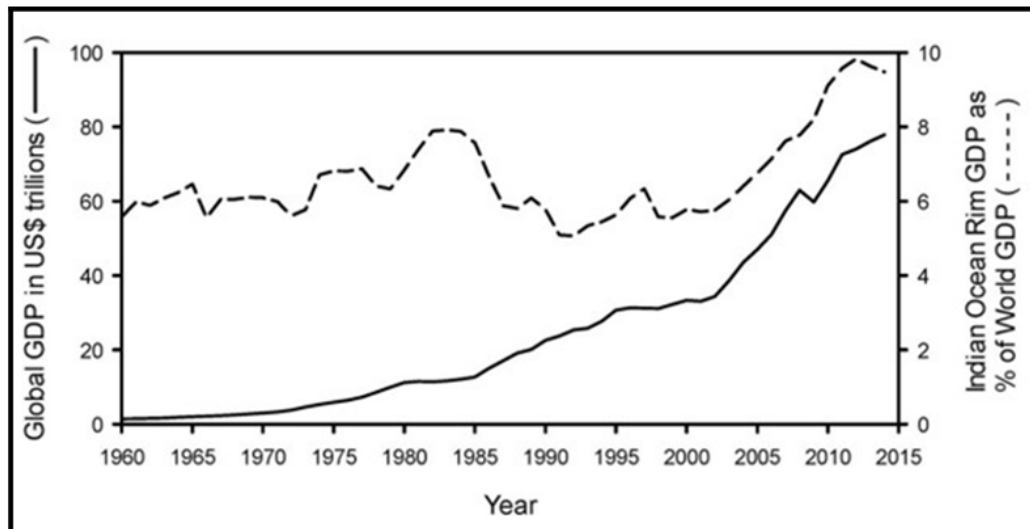


Figure 1: Global GDP (US\$) since 1960 and the percent contribution of Indian Ocean nations

the top 20 nations with the highest per capita gross national income. Owing to the limited land resource base, many of the coastal and island IORCs are dependent on marine resources for economic opportunities. Therefore, pursuing the goals of a blue economy would be critical to the region's prosperity and development.

Blue Economy prospects in the Indian Ocean

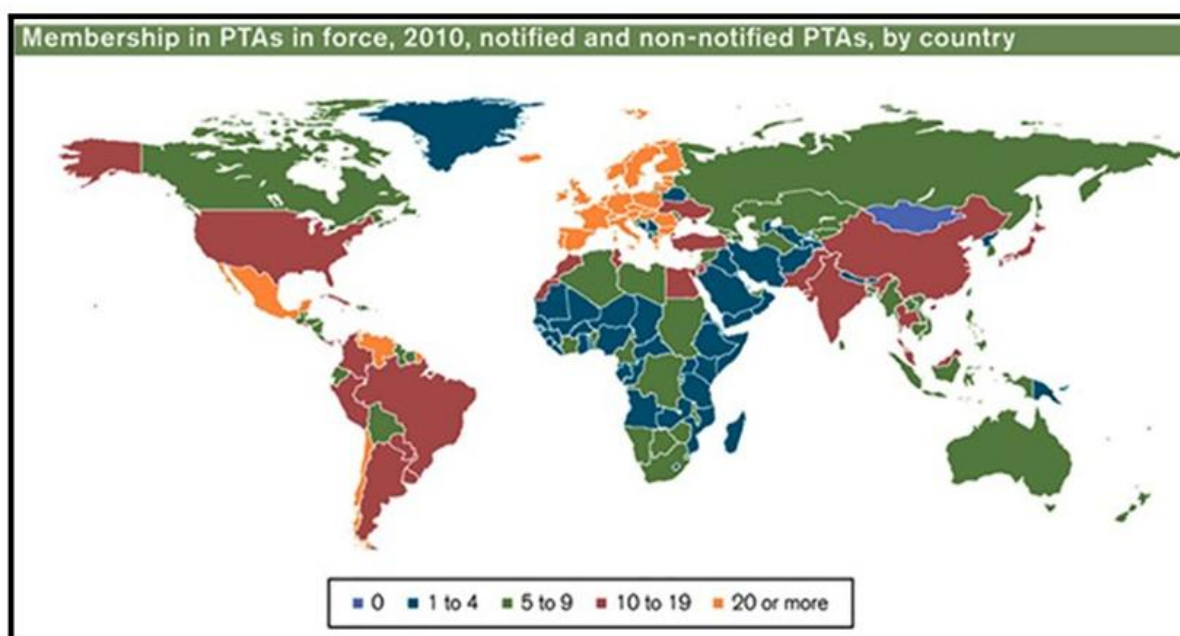
The idea of 'blue economy' was first articulated by Gunter Pauli in 2010 and later discussed at the United Nations Conference on Sustainable Development, Rio+20 in 2012. BE has since emerged as an influential concept in the Indian Ocean region and is a powerful and contested discourse among the member states of the leading regional governance organization, the Indian Ocean Rim Association (IORA). Since its conceptualization, a number of IORA states have been strongly advocating for increased cooperation and improved governance of BE. Bangladesh, for one, has been at the forefront of regional attempts to promote BE; in 2014 it became the first country to host a major conference focused on proposing a Bay of Bengal partnership for Blue Economy. This was followed by an IORA-organised conference, 'Enhancing BE for Sustainable Development', in 2015. Such efforts led to an increased focus on sustainable development in the Indian Ocean region and the emergence of the IORA Declaration on Enhancing Blue Economy Cooperation for Sustainability. Subsequently, BE gained importance in India's strategic and development vision. Prime Minister Narendra Modi has stated it as a tool for India's development, emphasizing the protection of shared marine spaces for 'Security and Growth for All in the Region.'

It is becoming increasingly evident that the concept of BE—straddling principles of marine-led economic growth, protection of the marine environment, and enhanced maritime security in all national and regional manifestations—would have profound implications on regional foreign policy in the coming decades. Therefore, the concept holds particular relevance to the Indian Ocean since the region is defined by "maritime regionalism", in pursuit of similar geopolitical goals. With nearly half the world's population projected to be residing in the Indian Ocean Rim (IOR) countries by 2050, the region is making a geopolitical shift from its identity as the 'Ocean of the South' to the 'Ocean of the Centre', and further to the 'Ocean of the Future' as its core position in terms of global trade, industry, labor, environment, and security is likely to shape the 21st-century world.

Table1: National Estimates of Blue Economy

Country	Size of Blue Economy			Indicative Employment	
	Year	Output (US\$ Billion)	% of GDP	Year	No.
Australia	2004	17.00	3.6	-	-
Canada	2004	15.98	1.5	2006	1,71,365
France	2006	16.69	1.4	2009	4,59,358
New Zealand	2006	2.14	2.0	-	-
United Kingdom	2008	84.27	4.2	2006	5,48,674
United States	2009	138.0	1.2	2010	2,770,000
China	2010	239.09	4.0	2010	9,253,000
Ireland	2007	1.9	1.0	2007	17,000

The Indian Ocean region has been providing a unique ecosystem and connectivity routes to the resources for centuries now. The growth of technology and capabilities has expanded the opportunities further. A sustained—and sustainable—growth of the blue economy in the Indian Ocean region would therefore require concerted efforts by governments, the private sector, and the broader community, including the scientific ones. In terms of domestic consumption and trade, there has been a significant rise in the number of preferential trade agreements in the past two decades (World Trade Organisation, 2011). Yet, the Indian Ocean countries lag behind the rest of the world, especially compared to the United States and Europe that have many more agreements in place (See Map). In the absence of a non-regional approach to sustainable economic growth, recent improvements and efforts being pursued by IOR countries towards global integration and increased productivity would be undermined



Map1. Membership in preferential trade agreements as of 2010 (reproduced with permission World Trade Organisation, 2011). Source: Llewellyn, English and Barnwell, 2016

An increased policy focus of Indian Ocean littoral states towards BE would draw attention to the economic potential of the shared marine resources and their capacity to contribute to larger development imperatives such as poverty reduction, food security, and enhanced economic opportunities. However, this realization should be accompanied by awareness to derive economic development from the marine resources while ensuring the conservation and sustainable management of the marine ecosystem. In this context, increased political and economic attention to sustainable management of marine resources is imperative to foster better governance and security for its vast resources. Steinberg observed that the sea is now being understood as a “resource-rich but fragile space requiring rational management for sustainable development.” It is critical, therefore, to explore existing law and policy frameworks, particularly for food security and sustainable management, to realize the gaps, and propose

solutions for better governance in the region.

Preliminary Assessment of steps taken by India to meet SDG 14 targets

a) Mangrove and Coral Reefs

Historically, India has had a strategy for managing mangrove forests. The scientific management of mangrove forests has been started in the Sundarbans mangroves, which is located in the Bay of Bengal; this is the first scientific management of mangroves in the world. The government of India has given importance to developing special research and development activities on mangrove biodiversity. According to the forest survey of India, it has been seen that as per the current assessment, the mangrove cover of the country is 4921 sq. km, which is 15% of the total geographical area of the country. Out of the total mangrove cover of India, 30.10% is under dense mangrove cover, 30.07% is under moderately dense mangrove forest and 39.89% is under open forest (FSI report 2017). As compared to the 2015 assessment, it has been seen that the net increase in the mangrove cover of the country is 181 square km. It is also seen that the major reason for the increment of mangrove cover is plantation and regeneration and more than 80% of mangroves have been planted with the energetic participation of local communities under the ICZMP (Integrated Coastal Zone Management project).

India is running an initiative 'Mangroves for the Future' with IUCN and UNDP. Under this initiative, India has identified four major coral reefs for rigorous conservation and management. Further, India has 25 Marine Protected Areas in the peninsular region and 106 in islands, collectively covering approximately 10,000 square km of the country's geographical areas. A marine protected area (MPA) is basically an area in the ocean where human activities are strictly regulated compared to the surrounding waters. These areas are special in terms of protection of natural or historic marine resources by the government authorities.

b) Coastal and Marine Ecosystems Protection

To protect and conserve the marine and coastal environment, the Government of India has developed a lot of national and sub-national legislation. Regarding the use of oceans and their resources, the Government of India has done ratification with some of the international conventions including the United Nations Convention on the Law of the Sea. An online mechanism has been developed to predict the movement of oil spills; in 2015, an Oil Spill Advisory System has been launched. The government has also developed the National Oil Spill Disaster Contingency Plan, 2015, which basically reveals the important national and international regulations relating to

marine and oceans. Regarding controlling marine pollution, the government has established some monitoring stations along the coastline. Further, levels of marine pollution are being monitored by the government at various locations along the country's coastline through the Coastal Ocean Monitoring and Prediction System (COMAPS). India is also setting up a Marine Observation System along the coast to gain a better understanding of coastal processes and monitor water quality.

Through COMAPS Programme, the Ministry of Earth Sciences, Government of India, has been monitoring the marine pollution level at about 80 locations along the entire coastline of the country. The prime objective of this program is to do a long-term assessment and know the tendency of coastal and marine environmental quality. Nearly 25 environmental parameters (including physical, chemical, biological, and microbiological characteristics of water and sediment) are being collected with the help of research and development institutions in the 0–10 km sector of these locations.

c) All-Inclusive Islands and Coastal Areas Development

To ensure the holistic development of the island and coastal areas, in 2016, the Government of India has launched a flagship program named 'Sagarmala'. The basic objective of this program is the enhancement of the port connectivity, modernization and establishment of a new port, coastal community development, and port-linked industrialization. The vision of Sagarmala is to decrease the logistics cost (domestic and EXIM cargo) through optimization of infrastructural investment. The Sagarmala program predicts that the overall cost savings will be around INR 35,000–40,000 cr. per annum.¹¹ The Sagarmala program will continue up to 2025. The sustainable development of coastal communities is one of the key pillars of this program. For better livelihood opportunities, the Government of India is promoting coastal tourism under the Sagarmala program. According to the SDG 19 report, out of four estimated parameters, it has been seen that three (1) Mean area that is protected in marine sites important to biodiversity (%) 29.0; (2) Ocean Health Index Goal-Clean Waters (0–100) 22.7; and

(3) Fish caught by trawling(%) 10.2 are in stagnating stage and only one is in improving stage (i.e. Percentage of Fish Stocks overexploited or collapsed by EEZ(%) 12.4)

Importance of SDG 14 and Blue Economy on livelihood opportunities in India

One of the major fallout of the Covid-19 pandemic has been the loss of livelihoods and depleting job opportunities. Home to the world's second-largest workforce (World Bank 2020), India now faces the challenge of ensuring adequate livelihoods and jobs. Some of the major sectors that provide millions of jobs and hold prospects for more are ocean-based sectors including fisheries, shipping, tourism, deep-sea mining, offshore energy resources, marine research, ocean conservation, and ocean sciences. Additionally, India's blue economy framework also provides the right agenda for all stakeholders to explore opportunities and invest in these sectors for long-term gains.

Blue economy for India means a vast ocean of economic opportunities playing an equally important role in generating and sustaining livelihoods. With an over 7,500-km-long coastline spread across nine coastal states, four union territories (UTs) - including two island UTs, 12 major, and 200 minor ports, India's blue economy supports 95% of the country's business through transportation and contributes an estimated 4% to its Gross Domestic Product (GDP). India is also the third-largest fish producing and second-largest aquaculture fish producing country in the world (NFDB 2020a). Therefore, all the sectors across the blue economy have the potential to engage a large workforce and have been doing so for the past many decades at least in sectors such as fishing, aquaculture, fish processing, marine tourism, shipping, and port activities. Now, engagement in new sectors such as offshore wind, marine biology, biotechnology, and other activities like shipbuilding and shipbreaking is also rising extensively.

Among these, the fisheries sector alone provides livelihood to about 16 million fisherfolk and fish farmers at the primary level and almost twice that number along the value chain. The government envisions this sector to have immense potential to more than double the fisherfolk and fish farmers' incomes. The shipping sector is also one of the key livelihood providers in the blue economy as India has one of the largest merchant shipping fleets among the developing countries and ranks 17th in the world. The number of Indian seafarers who are employed on Indian and foreign flag vessels crossed over two lakh in 2018, showing an unprecedented increase of 35% over the previous year.

State	Fishing Villages	Fishing Families	Fisherfolk Population
Andhra Pradesh	555 (16.2)	163,427 (18.7)	605,428 (14.9)
Gujarat	247 (7.2)	62,231 (7.1)	336,181 (8.3)
Tamil Nadu	573 (16.7)	192,697 (22.0)	802,912 (19.8)
Odisha	813 (23.7)	114,238 (13.1)	605,514 (14.9)
Karnataka	144 (4.2)	30,713 (3.5)	167,429 (4.1)
Kerala	222 (6.5)	118,937 (13.6)	610,165 (15.0)
Goa	39 (1.1)	2,189 (0.3)	10,545 (0.3)
Maharashtra	456 (13.3)	81,492 (9.3)	386,259 (9.5)
West Bengal	188 (5.5)	76,981 (8.8)	380,138 (9.4)

Table 2: Population dependent on fisheries for livelihood among coastal states in India (according to Blue Economy Working Group Report, Economic Advisory Council to the Prime Minister 2020)

Note: Figures in brackets show the shares in percentages

Sea ports are also a large source of employment. Unlike India's major ports, jobs in smaller ports have increased over the years from 1,933 in 2003 to 19,102 in 2017 (Blue Economy Working Group Report 4). In the past five years, smaller ports have edged out the major ports in the growth of cargo volumes as well. This is because they tend to be more strategic location, with modernized infrastructure and more efficient operations.

Marine tourism is also a sector that has been one of the fastest growing globally and in India. Particularly in coastal states like Kerala, Karnataka, and Tamil Nadu, coastal tourism has contributed largely to both the state economies and livelihood creation. In Kerala, the total number of jobs created directly and indirectly by the sector between 2009 and 2012 turned out to be around 23% of the total employment. In 2016, the total share of tourism in Tamil Nadu's employment was more than 22% and 23% in Karnataka's. This sector has been among

the worst hit because of the Covid-19 fallout, but now coastal states are re-strategizing to attract local and domestic tourists with focus on single or small groups interested in adventure and eco-tourism. In an example of appealing to newer interests, a campaign named 'Keralam Kanaam' was launched by the Tourism Department of Kerala that aimed to offer luxury staycations at affordable rates to people from the state itself. Similar initiatives are being taken up in other coastal states to increase tourism.

New ocean economy opportunities due to the emergence of SDG 14 principles

Blue economy is now expanding as it has never been before with new and emerging sectors that include various types of energy generation, ocean thermal energy conservation (OTEC), marine biology and biotechnology. Out of all the different renewable energy generated from oceans, the offshore wind energy industry is the most developed. Amongst these, the lack of skills and training, technological support, and investment is a major factor that has led to their slow growth. To aid their growth in India, the Union Minister of State for Power and New & Renewable Energy (IC) and Skill Development & Entrepreneurship approved and declared ocean energy as Renewable Energy in 2019. However, the sector still requires more push to fully reach its potential in terms of both output and generating employment.

With the increasing instances of climate change impacts on marine ecosystems, the role of marine biologists is also becoming important to help address many of these issues. Their work ranges from working for offshore oil and

gas companies to reduce the negative impact of their operations on marine life, to developing designated marine reserves and creating artificial reefs/wrecks in order to encourage marine wildlife into an area.

Marine biotechnology is another emerging field focused on investigating and developing technological applications of living marine organisms, their derivatives, and their bioprocesses. The Marine Biotechnology program was initiated during 1988-89 to support R&D and demonstration nature projects towards development of useful

products and processes from marine resources. However, only 180 people have been trained till date through the programme. At the national level, the Department of Biotechnology (DBT) also established a Task Force on Aquaculture and Marine Biotechnology in 1998 which has been overseeing individual research projects and network projects with national and international partners since then. At the state level, states like Gujarat have identified a marine

biotechnology plan. This sector is, hence, undergoing the process of development and like many other new and emerging sectors, this too requires both financial and technological push, followed by skill development to meet future demands.

Recommendations for the path forward in line with SDG 14

National Accounting Framework for Blue Economy and Ocean Governance

→ The size of the Blue Economy in India has conservatively been estimated to be about 4% of Gross Domestic Product. It is likely to be even higher if the methodology is improved. A new robust mechanism needs to be devised to collect data for estimating the Blue Economy in India. The first step should be to constitute an Expert Group to identify sectors and sub-sectors/ activities, which fall under the purview of the Blue Economy.

→ In this context, India needs to learn from global best practices. For this there is a need to establish active scientific collaborations with leading countries/institutions to develop suitable scientific tools and methodologies relevant to Blue Economy measurement and management.

→ In order to generate reliable data regarding the Blue Economy, the following is recommended

A) Enlarge the 2008 National Industrial Classification to accommodate various untapped activities associated with the blue economy.

B) Engage with all relevant ministries for the collection of data.

C) Constitute or identify an official agency to secure relevant data at the disaggregated industry level.

D) Intervene in the formative process of the UN International Standard Industrial Classification of All Economic Ac

Activities (ISIC) Revision

Increasing Sustainable Marine Capture Fisheries

- In order to increase the sustainability of marine fishing India must take following actionable suggestions with clear objectives:
- Develop a new national policy for the marine capture fisheries sector, putting in place legal and institutional frameworks for the effective management of marine fisheries.
 - Prevent significant adverse impacts on Vulnerable Marine Ecosystems (VMEs) to achieve Potential Yield Estimates (PYE).
 - Explore the deployment of a dedicated satellite system for management and regulation of fisheries and allied activities.
 - Ensure mandatory data input availability from primary stakeholders (fishermen) via logsheets; integration of marine resources survey data and commercial landings data.
 - Assess commercially valuable stocks by a body designated by Department of Fisheries (DoF).
 - Strengthen the Fisheries Survey of India (FSI) with state-of-art fisheries resources survey vessels.
 - Strengthen Monitoring Control and Surveillance such as the Vessel Monitoring System (VMS) to track the movement of fishing vessels in order to know where and when the fish are caught, how, and by whom.
 - Regulate fisheries practices and revisit fishing closure seasons and undertake patrolling in high seas and Areas Beyond National Jurisdiction (ABNJ).

Enhancing Mariculture Production

- Mariculture is a subset of aquaculture and is the farming of marine organisms in salt water for food and other products such as pharmaceuticals and Jewellery items like pearls. This is an important emerging subsector of the Blue Economy. In order to encourage sustainable mariculture production, India must take the following steps:
- Form a new implementing agency which will be called the 'Mariculture Authority of India'.
 - Develop a comprehensive National Mariculture Policy
 - Develop and commercialize mariculture, including brood banks, nucleus breeding centers, hatcheries and nurseries and feed supply through approaches such as cage farming for finfish, bivalve farming, seaweed farming, Integrated Multitrophic Aquaculture (IMTA) and Recirculating Aquaculture System (RAS) and encouraging marine ornamental fisheries.
 - Prevent aquatic diseases and create health management infrastructure by technological backstopping.
 - Promote R&D for long term sustainable development of mariculture.

Monitoring, Assessment and Management of Ocean Health

- Ocean health needs effective monitoring and management, for which the following steps are recommended:
- Use of technology to monitor, prevent and mitigate marine pollution, including from plastics and microplastics.
 - Encourage low carbon fisheries to improve water quality near coral reefs and put in place integrated tracking-map-based information systems to indicate closed and protected areas.
 - Develop innovative technologies which will be critical for the restoration of the deteriorated sensitive ecosystems like coral reefs, mangroves and wetlands

Marine Biotechnology and Bioprospecting

- There is an urgent need to control marine bioprospecting, an input into marine biotechnology. To do so, the following steps are necessary:

- a) Map the genetic biodiversity of the oceans and generate a germplasm inventory. This will facilitate a well-informed decision on the conservation of oceanic resources.
- b) Pursue interventions in mariculture by selective breeding, Qualitative Trait Loci (QTL) analysis, trait manipulation etc. to enhance productivity of mariculture activities.
- c) Create a separate National level institution for “Marine Biotechnology” that focuses on the non-food sector for generation of new technologies to tap the immense potential for commercialization. National Maritime Policy and Apex Body

→ The extremely complex and strategic maritime sector has multiple stakeholders with conflicting interests.

Therefore, a National Maritime Policy for integration and coordination within and between various stakeholders in central and state governments for more effective management of maritime regions, resources, economy, ecology and security is a necessity.

→ Currently there is no overarching national authority that coordinates and integrates maritime initiatives and

programmes of the Ministries and states and creates ‘common cause’ with all stakeholders. There is therefore, an urgent need to institutionalize maritime affairs in an organized manner that maximizes the potential of the Blue Economy. Such an organization should be at the Apex Level in Government drawing various stakeholders on a single platform to debate, discuss and balance conflicting interests, prevent duplication of efforts and optimize utilization of maritime resources for the sustainable development of India’s Blue Economy.

II. Conclusion

These recommendations aim to significantly enhance the contribution of the Blue Economy to India’s GDP in the next five years, improve the lives of coastal communities, preserve our marine biodiversity and maintain the security of our marine areas and resources. Today, the Blue Economy holds the promise of being the next multiplier of economic growth and well-being, provided that the strategy places sustainability and socio-economic welfare at the center stage.

With their enormous resources, oceans are the ultimate frontier that shall help to transform the economy of the society from scarcity to abundance. With the extended Exclusive Economic Zone, India’s Ocean jurisdiction equals the land area. Hence an integrated approach with long-term vision, technology, management, monitoring, and time-bound regulatory reforms are essential for building a sustained blue economy for India. It is beyond doubt that the upcoming blue economy shall serve as a growth catalyst for the robust Indian economy envisioned to reach US\$10 trillion by 2030.

India’s asset is its diversity of institutions and expertise available to deal with issues related to achieving SDG 14. While the current plans and approaches need an overhaul to effectively deal with achieving the goal and targets of this SDG, it is also important to take the responsibility and ownership of achieving the same to States, local bodies and the civil society including the corporate sector.

Bibliographic

- [1]. https://incois.gov.in/documents/Blue_Economy_policy.pdf
- [2]. <http://site.ieee.org/indiacouncil/files/2019/10/p106-p115-2.pdf>
- [3]. https://ris.org.in/pdf/SDGs_Report_Chapter_14.pdf
- [4]. <https://www.orfonline.org/research/blue-economy-in-the-indian-ocean-governance-perspectives-for-sustainable-development-in-the-region-47449/>
- [5]. https://www.researchgate.net/profile/Tuhin-Ghosh-2/publication/343232808_Ocean_and_Sustainable_Development_A_Preliminary_Assessment_for_India/links/5f2e727ba6fdcccc43b31b4b/Ocean-and-Sustainable-Development-A-Preliminary-Assessment-for-India.pdf
- [6]. <https://www.teriin.org/article/blue-economy-ocean-livelihood-opportunities-india>
- [7]. <https://data.worldbank.org/products/wdi>
- [8]. Lyndon E. Llewellyn, Susan English, and Sharon Barnwell, “A roadmap to a sustainable Indian Ocean blue economy,” *Journal of the Indian Ocean Region* 12, no. 1 (2016): 52-66.
- [9]. Pauli, Gunter A. *The blue economy: 10 years, 100 innovations, 100 million jobs*. Paradigm publications, 2010.
- [10]. Dubey, Madhuri (2018), *Skill development in the fisheries sector – a catalyst for blue revolution in India*, National Skills Network. <https://www.nationalskillsnetwork.in/fisheries-sector-blue-revolution/>
- [11].