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GUEST EDITORIAL

Nurturing the blue economy: a call for sustainable ocean utilization

In the contemporary scenario of global economic development, the blue economy stands as a beacon of potential, offering vast opportunities to accelerate economic growth. According to United Nations estimates, the blue economy generates between USD 3 and 6 trillion globally annually, supporting various sectors such as fisheries, aquaculture, tourism, energy, transport, maritime infrastructure and industries.

The current contribution of the blue economy to India's Gross Domestic Production (GDP) is ~4%, noticeably low for a nation surrounded by ocean on three sides, with a long coastline (8118 km) and an Exclusive Economic Zone (EEZ) of 2.02 million square km, constituting about 60% of country's total area. Recognizing this potential, the government has identified the blue economy as a key growth driver. The Economic Advisory Council to Prime Minister has provided a policy framework emphasizing sustainable utilization and management of maritime sectors covering living resources, mineral and energy resources, services, coastal and maritime infrastructure, safety and global diplomacy, and marine spatial planning.

As nations increasingly turn towards the sea for economic growth, the crucial need for sustainable ocean utilization takes centre stage. This editorial advocates for a conscientious and responsible approach to harnessing the immense potential of blue economy.

The concept of blue economy extends beyond conventional economic paradigms, encapsulating a holistic approach to ocean-dependent activities. At its core lies the fundamental principle of sustainable utilization – a commitment to extracting value from the oceans without compromising their delicate ecosystems and overall health. This ethos resonates with the wisdom of great sage Chanakya, who likened tax collection to honeybees gathering nectar – gently and without inflicting pain. In essence, our fortunes are inexorably tied to the well-being of oceans. However, today, oceans face a dual crisis. As the world's population continues to grow and put pressure on natural resources, pollution, climate change and global warming are threatening the health of these ecosystems.

Oceans harbour resources ranging from fisheries and energy to minerals, freshwater and tourism opportunities. It contains 97% of the planet's water, providing food, regulating climate and generating 50% of the oxygen we breathe. It absorbs 30% of the CO₂ we emit. However, the pursuit of these riches must be tempered by a profound understanding

of the interconnectedness of oceanic ecosystems and the fragility of their balance. Sustainable utilization, therefore, becomes the guiding philosophy that ensures the longevity of blue economy and safeguards the health of our oceans for future generations.

A key tenet of sustainable utilization involves adopting innovative technologies and methodologies that minimize environmental impact. This necessitates research and development in ocean science and technology to explore new avenues for economic growth and to ensure minimal ecological damage. The blue economy should be a testament to human ingenuity in finding harmony with nature, rather than a harbinger of environmental degradation. Thus, achieving sustainable utilization and management of the oceans demands a diverse range of data, the ability for informed decision-making, and the implementation of strict governance strategies. Conservation and restoration of marine resources and ecosystems are fundamental to the development of a sustainable blue economy. So the question before us is how we can expand the blue economy by the sustainable utilization of oceans and its resources.

Addressing data gaps and the development of digital data archives will facilitate the integration of economic data with environmental and socio-economic data, critical for making macroeconomic decisions and ensuring sustainability. A fresh framework needs to be developed to assess and account for the gains from activities in the marine environment. The framework should encompass economic value, social benefits, environmental benefits and ease of living. Data on economy, environment, societal well-being and livelihood of all stakeholders involved with blue economy activity should be presented to assess the targets of sustainability and prosperity.

Maritime logistics, infrastructure and shipping play integral roles in economic growth. However, if left unregulated, maritime development can lead to numerous environmental problems, including air pollution, water pollution, coastal erosion, loss of livelihood for the native community and habitat destruction. Thus, it is immensely important to ensure that port and logistics development are done with sustainability in mind. India's flagship project, the Sagarmala, aims to develop maritime logistics, infrastructure and shipping as a priority. Since all these activities are energy-consuming and land-utilizing, energy efficiency, decarbonization, carbon neutrality, environmental protection, green field growth, etc. are to be adopted to achieve the targeted blue growth.

India is the second-largest and fourth-largest producer of aquaculture and capture fisheries respectively, in the world. However, the marine fish landing remained within 2.7 to 3.8 million metric tonnes (MMT) during 2013–22 against an estimated potential of ~5.3 MMT. The conservative estimate of mariculture in the coastal waters of India is ~4.1 MMT annually by utilizing 1% of the Indian coast. Being in the tropical waters, Indian seas are home to thousands of species of finfishes, molluscs and crustaceans. Of which about 1200 species of finfish are commercially harvested. The fisheries and aquaculture sectors are set to play a pivotal role in the blue economy. But it has to be backed by significant technological advancements in the development of energy-efficient systems, environmentally benign culture systems, re-use systems like self-cleaning re-circulatory aquaculture systems, breeding and seed production of fishes suitable for intensive culture, stringent culture protocols, digital databases, decision support systems, energy-efficient fish storage and supply chains, etc. Considering the importance of the sector, the Government of India has recently rolled out the Pradhan Mantri Matsya Sampada Yojana to promote sustainable blue revolution and double fisher's income through a variety of interventions and address the challenges beset by the sector.

Sustainable coastal tourism is a major contributor to blue economy, emphasizing a delicate balance between environmental preservation and economic development. Ensuring the well-being of the environment and human population is paramount. Responsible use of marine resources is pivotal for fostering economic growth while conserving ecosystems. A comprehensive assessment of tourism capacity, including spatial analysis and ecological considerations, along with strict anti-pollution measures, is crucial for the sustainable growth of coastal tourism. Maritime India Vision 2030 and the Coastal Regulation Zone notification underscore the country's commitment to building a blue economy in an environmentally conscious manner. Tourism and mariculture, when approached sustainably, can emerge as engines of economic growth in the blue economy. Case studies and best practices guide the development of these sectors responsibly, ensuring that the allure of our oceans does not come at the cost of their well-being.

Documentation and bio-prospecting of rich marine biodiversity offer vast opportunities for the commercial production of pharmaceuticals, medicinal and industrial compounds. Innovative techniques like genomics facilitate quick documentation and bio-prospecting without harming diversity. Embracing the concepts of marine protected areas, conservation, and sustainable use of marine biological diversity, as advocated by international conventions, is essential. India's initiatives, including the Wildlife Protection Act, National Committee on Mangroves, Wetlands and Coral Reefs, Biological Diversity Act, and associated guidelines, ensure sustainability while expanding commercial exploration and utilization of biodiversity.

Increased interest in coastal and deep-sea mineral resources has been driven by the rising demand for metals and

sustainable low-carbon energy sources. Exploration and extraction of marine minerals hold the potential to drive innovation, technological advancements, economic growth and job creation. Various resources such as rare earth, placer minerals, polymetallic nodules, cobalt-rich Fe–Mn crusts and polymetallic sulphides contain high amounts of valuable metals. However, the fragile ecosystems hosting these mineral deposits necessitate the development of mining technologies with minimal environmental impact to ensure sustainability under the blue economy framework. India's Deep Sea Mission, promoting the development of indigenous technologies for seabed mining, extraction of renewable energy from ocean waves and currents, and extraction of freshwater using such energy sources, contributes to the sustainable growth of the blue economy.

Operational Oceanographic Services play a crucial role by providing timely advisories to fishermen, forecasts for safe navigation and insights into the state of the ocean. Integrating these services into the fabric of blue economy optimizes resource utilization, mitigates risks and promotes sustainable practices. Marine spatial planning is equally pivotal in orchestrating the sustainable dance of economic activities along coastlines and adjoining areas. A consultative and inclusive approach to planning aligns development with ecological sensitivity.

As we navigate the United Nations Decade of Ocean Science for Sustainable Development (2021–2030), the imperative for sustainable ocean utilization in the blue economy becomes more pronounced. Policymakers, researchers, industry stakeholders and environmental advocates must collaborate to develop and enforce robust governance frameworks balancing economic aspirations with ecological imperatives. Establishing an effective institutional framework for implementing activities related to the blue economy is crucial. Building infrastructure, human resources, finances and governance systems pave the way for a climate-resilient blue economy, ensuring the sustainability of oceans for the benefit of people.

Since more than 60% of the ocean is beyond national jurisdiction and EEZ, regional and global cooperation is vital for the protection of marine ecosystems while balancing competing priorities. The blue economy holds extreme importance for the Global South because a significant percentage of vulnerable ocean-dependent communities reside in these countries.

In conclusion, the sustainable utilization of oceans is not merely a choice; it is an ethical obligation we owe to our planet and future generations. Let the blue economy be a testament to our commitment to prosperity that is harmonious, enduring and respectful of the precious oceans that cradle our civilization.

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