Navigating India's blue economy landscape

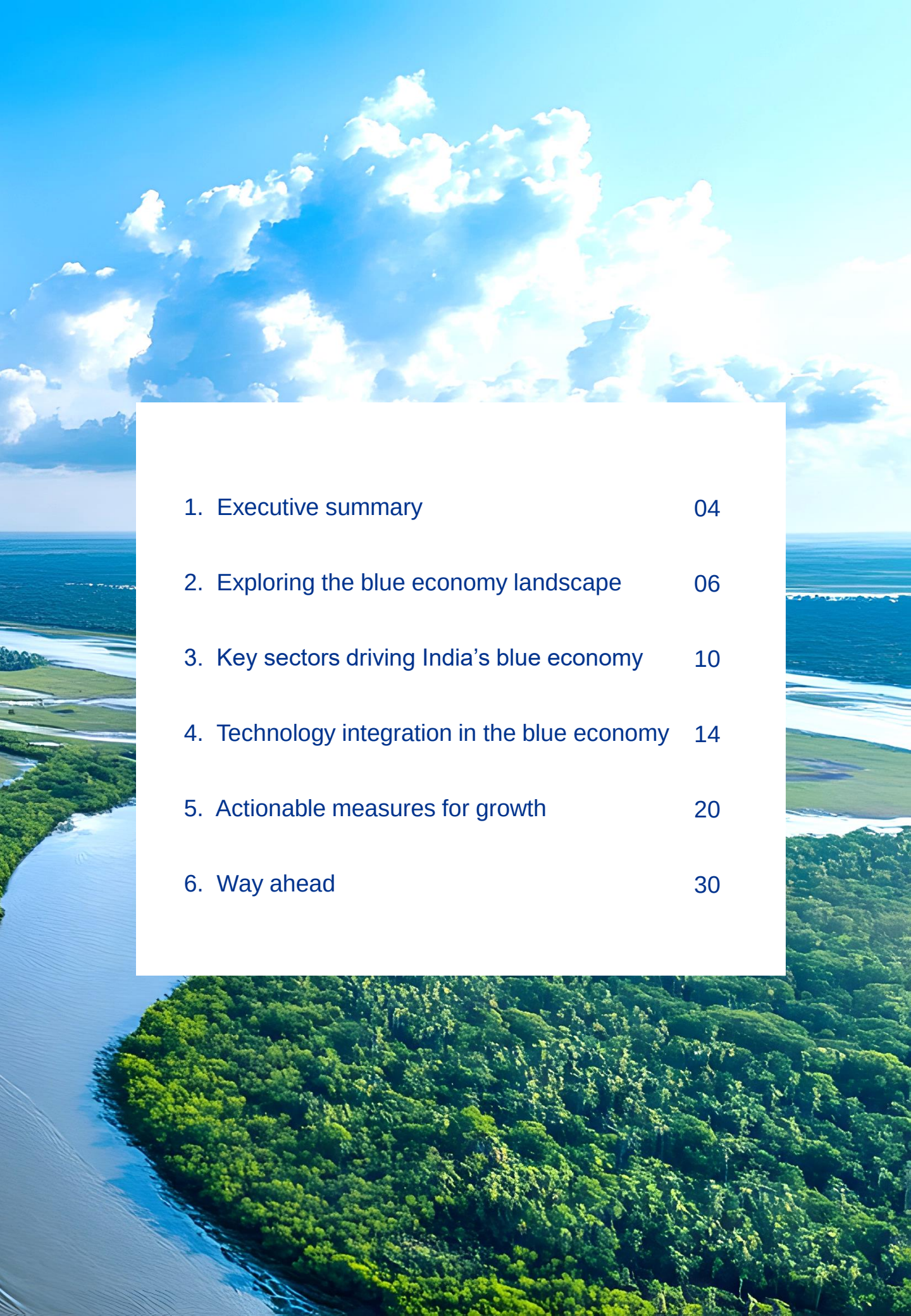
Tapping the tide of innovation and transformation

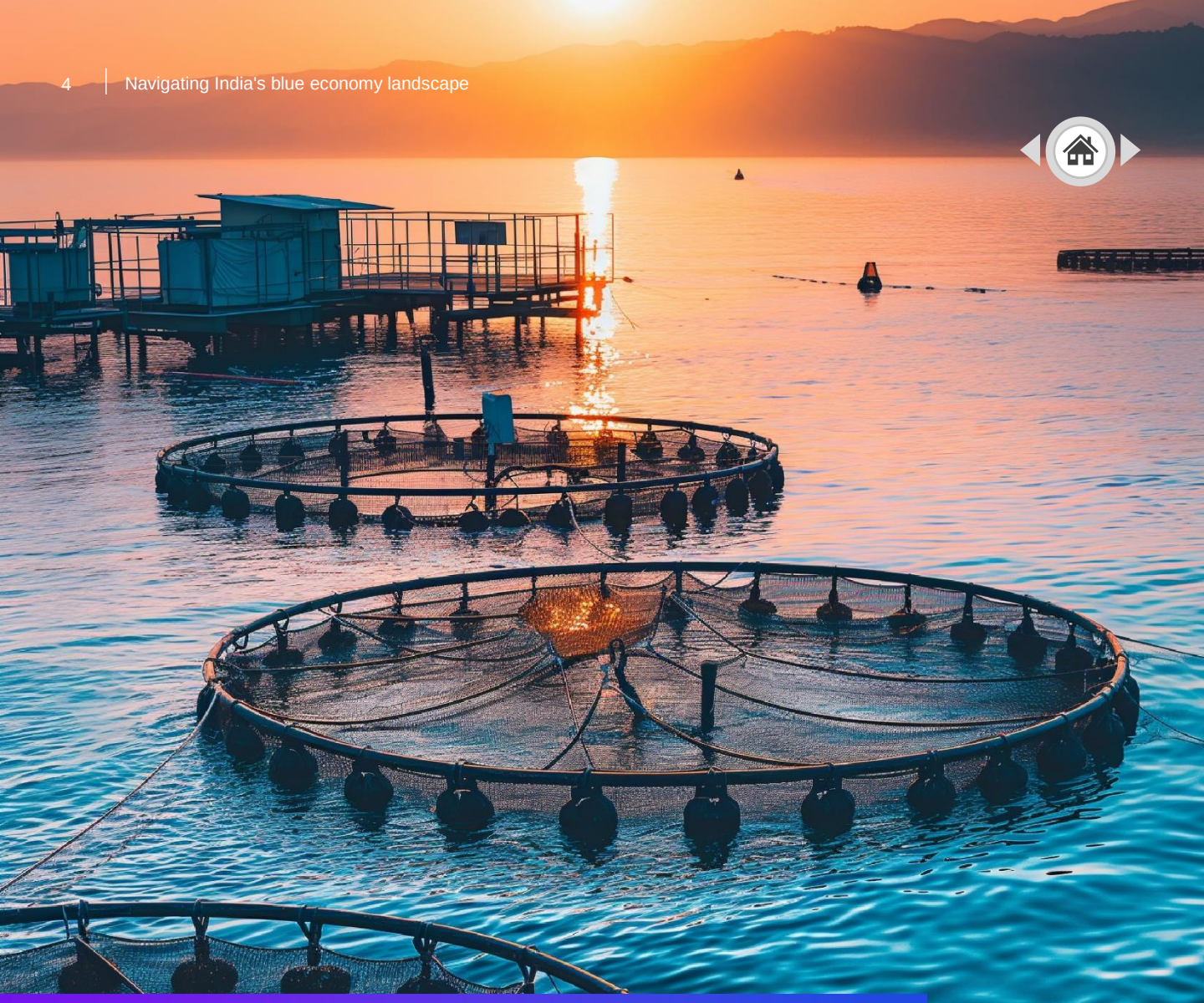
July 2025

kpmg.com/in

KPMG. Make the Difference.

Table of contents





01

Executive summary

India's blue economy, anchored on sustainable ocean resource utilisation, contributes around 4 per cent to national GDP and facilitates 95 per cent of trade by volume through maritime routes. High-growth sectors such as fisheries, shipping, renewable energy and tourism offer significant potential for economic diversification and job creation. Technology integration emerges as a catalyst in enhancing operational efficiency, real-time monitoring and value creation. Strategic initiatives, including the Maritime Amrit Kaal Vision 2047, will help position India as global leader in ocean-based economic development. By embedding climate-smart practices, innovative models and regional partnerships, India can chart a sustainable and inclusive maritime future.

With **7,517-kilometre-long coastline**, India plays a vital role in the global blue economy

India, one of the world's 17 megadiverse countries, hosts ~5.3 per cent of global marine diversity with about 15,000 coastal and marine species[1]

Government of India's (GoI) **New India 2030 vision** identifies blue economy as one of the key components in its **top 10 priorities**

Opportunities for India's blue economy

Green aquaculture practices

Promoting sustainable aquaculture techniques to enhance productivity while preserving marine ecosystems

Biotech from the deep blue

Leveraging rich marine biodiversity to drive innovation in pharmaceuticals, nutraceuticals and industrial biotechnology

Seabed mining

Exploring responsible extraction of deep-sea minerals to support India's strategic resource security and economic growth

Unlocking blue carbon potential

Harnessing coastal ecosystems like mangroves and seagrasses for carbon sequestration to meet climate resilience

Empowering renewables: wind and solar

Scaling offshore wind and floating solar infrastructure to diversify India's clean energy portfolio

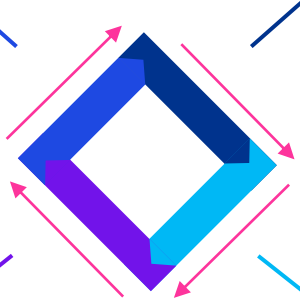
Boost in marine product exports

Enhancing value-added seafood exports through quality standards, traceability and global market integration

Building a resilient, blue future

Global collaborations and investments

Boosting maritime infrastructure and trade



Investing in marine renewables and innovation

Strengthening coastal resilience and climate adaptation

02

Exploring the blue economy landscape

Blue economy is a strategic plan for sustainable development through the prudent utilisation of marine resources. It spans various sectors aiming to balance economic growth, social inclusivity and environmental sustainability.

Global blue economy snapshot

USD3 to USD6 trillion[1]
Estimated annual turnover generated by global blue economy

~USD100 billion/year[1]
Estimated contribution to global economy from fisheries and aquaculture

~260 million jobs[1]
Generated by global fisheries and aquaculture

Oceans, which encompass **over 70 per cent** of the Earth's surface[2], play an integral role in climate regulation, biodiversity support and providing livelihoods for billions. The global blue economy promotes the sustainable utilisation of oceanic resources across various sectors, including fisheries and tourism. It harmonises growth with conservation while tackling challenges, such as pollution and overfishing. By fostering innovation and collaboration, the blue economy safeguards long-term ecological health, social equity and economic prosperity, ensuring that oceans continue to serve as a life source for future generations.

Overview of the blue economy in India

India's prominence in the worldwide blue economy is on the rise, highlighted by its **extensive coastline, significant maritime trade and a growing focus on sustainable management** of ocean resources. With **7,517-kilometre-long coastline, nine coastal states and 1,382 islands**[3], India plays a pivotal role in the global blue economy.

The blue economy encompasses all marine resources and related infrastructure within the country's legal jurisdiction. This includes marine, maritime and onshore coastal zones and is often seen as a **subset of the national economy**. The maritime sector, a key component of the blue economy, notably contributes to the nation's economic output, with India's ports alone handling ~**1,540 million metric tonnes of cargo in FY24**[4]. Given the fact that over **four million individuals** depend on the coastal economy for their livelihood, the ocean plays an indispensable role[5].

India's blue economy contributes

4 per cent

to the nation's **Gross Domestic Product (GDP)**[6], providing indispensable support to fisheries and coastal communities

GoI's Vision of **New India by 2030** has highlighted the blue economy as one of the **crucial elements**[7] in its

top 10 priorities

The average turnaround time (TAT) at major ports in India has decreased from **93.5 hours** in FY14 to **48.0 hours** in FY24, indicating a

48.6 per cent

reduction due to government initiatives such as constructing new terminals, modernising berths, digitalising processes, among others[8]

India has also been actively participating in global dialogues, such as the **G20**, **Global Maritime India Summit** to discuss green ports, cruise tourism, sustainable infrastructure and international investments

During India's 2023 G20 presidency, the **G20 nations** adopted the High-Level Principles for a Sustainable and Resilient Blue/Ocean-based Economy (**HLPSRBE**)[9] to boost blue economy through marine planning studies and promoting sustainable use of ocean resources

This move is key to augmenting India's blue economy while conserving the marine ecosystem. It is set to significantly benefit sectors, such as fisheries, aquaculture and marine biotechnology

Strategic policy framework and initiatives

Due to the vast potential of the blue economy in India, various policies are being implemented to boost the fisheries and maritime sectors, with an aim to drive economic progress. Leveraging its maritime position and rich **exclusive economic zone (EEZ)**, India aims to sustainably use ocean resources for growth by 2030. The Ministry of Ports, Shipping & Waterways (MoPSW) is driving this through **tax reforms and green initiatives**, boosting India's maritime competitiveness. Furthermore, India's **AMRUT 2.0** mission, which aims to preserve water resources and promote a circular water economy, aligns with the blue economy concept.

August 2024

- The union minister of port shipping and waterways launched the standard operating procedure (SOP) for **Green Tug Transition Program (GTTP)** to replace **traditional fuel-based harbour tugs**[#] in major Indian ports with **environmentally friendly alternatives (cleaner and sustainable alternate fuels)**[10]
  - **By 2040**, all tugs at India's major ports are expected to be eco-friendly green tugs, standardising a green fleet nationwide[11]

July 2024

- India's Finance Minister announced a financial initiative for the creation of a **Nucleus Breeding Centre (NBC) network** for shrimp brood stocks to ensure high-quality seed production[12]
  - Advanced facilities in NBCs are expected to enhance aquaculture species' genetic quality, reduce dependence on import and increase productivity of **shrimp brood stock**
- Shrimp exports witnessed a substantial rise from USD0.98 billion* in 2011 to USD4.8 billion* in FY24[12].

October 2023

- **The Prime Minister** launched **Maritime Amrit Kaal Vision 2047** at the **Global Maritime India Summit 2023** to transform India's maritime sector with a proposed investment of **~USD960 billion***[13]
  - Building on the **Maritime India Vision (MIV) 2030**, it plans to develop top-tier ports, advance inland water transport and coastal shipping and bolster the blue economy
  - It proposes **over 300 initiatives** to enhance ports, shipping and waterways by **2047**[7].

September 2021

- The Ministry of Earth Sciences (MoES) launched the **Deep Ocean Mission (DOM)** to explore ocean resources and develop sustainable technologies
  - This multi-institutional mission aligns with the **UN SDG-14**, highlighting the **ocean's crucial role** in sustaining life and the environment on Earth
  - It is implemented in a **five-year, phase-wise plan costing USD480 million***. The estimated cost for the **first 3-year phase** was around USD330 million* **(from 2021 to 2024).**[14]

[#]A tug (tugboat) is a robust vessel used to maneuver other ships that cannot or should not move on their own in places, such as crowded harbours.

Other initiatives include **Pradhan Mantri Matsya Sampada Yojana (PMMSY)** and the **Sagarmala Programme**. GoI introduced PMMSY in May 2020 to revolutionise the fisheries sector sustainably and responsibly[15]. The Union Cabinet approved the Sagarmala Programme, a flagship initiative of the Ministry of Shipping (MoS) to support port-led development [16]. Additionally, India's draft policy framework on the blue economy emphasises creating a **national accounting framework for ocean governance and the blue economy,** utilising robust data collection mechanisms, forming an expert group and learning from global best practices through international partnerships.

03

Key sectors driving India's blue economy

India's blue economy, reliant on marine resources, is driven by fisheries, tourism and maritime activities. These sectors are crucial for the nation's development, underscoring their importance in advancing India's blue economy.

Maritime sector

India's maritime sector, a critical component of the economy, encapsulates shipping, port services, shipbuilding and repairs, coastal and inland water transportation and maritime tourism, among others. It serves as the backbone of India's trade and commerce, handling around **70 per cent of the country's trade by value** and **95 per cent by volume**[1].

The sector, integral to international trade and economic expansion, is progressively transitioning towards **sustainability and efficiency**, propelled by technological advancements and policy reforms. Notable initiatives, such as the Harit Nauka green transition guidelines and Harit Sagar green port guidelines**,** are fostering the development of **hydrogen/ammonia hubs** and **carbon-neutral ports**. Concurrently, efforts are being directed towards the exploration of **alternative fuels** and the implementation of **emission reduction strategies**.

Key initiatives

- The establishment of India's 13th major port in **Vadhavan, Maharashtra**, worth **USD9 billion***[2] is part of a significant transformation of the maritime sector. It aims to attract public-private partnerships (PPPs) for infrastructure development and expand export-import trade capacity
- Additionally, **Galathea Bay in the Andaman & Nicobar Islands, with a USD5.2 billion* budget,** is expected to be developed under a PPP model and aims to capture transshipped cargo handled outside India at present. The first phase is expected to be operational by 2029[2]
- These initiatives launched at the Maritime State Development Council (MSDC) in September 2024 are aimed at **improving infrastructure and safety, fostering innovation,** collaboration and growth. The integration of **digital platforms** and the enhancement of business-friendly initiatives are crucial steps towards establishing India as a global leader in maritime trade.

- GoI is significantly boosting the maritime industry's growth through policies, such as permitting **100 per cent FDI** under the automatic route for port and harbour projects and giving a **10-year tax holiday** to port development enterprises[1]
  - These strategies, along with India's growing trade networks, make the maritime industry a vibrant part of its economic goals
- As the **world's 16th largest maritime country**, India plays a significant role in global shipping routes[1]. Most of the cargo ships moving between **East Asia**, **America, Africa and Europe** pass through Indian waters, emphasising India's strategic significance.

Fisheries sector

The fisheries sector in India, encompassing inland and marine fishing, aquaculture, seafood processing, marketing and export, is recognised as a sunrise sector. It also includes the production of fishing equipment, fisheries research, offering education and managing governmental administration. Playing a pivotal role in India's economic landscape, the sector supports the livelihood of **nearly 30 million individuals**[3], predominantly from the vulnerable and marginalized demographics.

Post its separation from the **Department of Animal Husbandry, Dairying & Fisheries** in 2019, the sector has been fortified with strategic programmes, such as **PMMSY** and the Fisheries Infrastructure Development Fund (**FIDF**), propelling it towards remarkable achievements. Adhering to the **reform-perform-transform** motto, GoI continues to prioritise the development of this sector as a major contributor towards a **Viksit Bharat by 2047**.

- Increase in budget for Department of Fisheries (DoF) from USD313 million* (FY25) to USD324 million* (FY26)[3]

- Record fish production – **184 lakh tonnes in FY24**[3]
- Currently, India is the world's **second-largest** fish producer, accounting for **8 per cent** of global production[3]

- Inland fishing plays a crucial role in providing job opportunities and creating livelihood prospects for fish farmers and other stakeholders. By fostering overall economic development, it boosts the state economy and contributes to gross state domestic product (GSDP)
- West Bengal, due to its vast array of water bodies, holds a significant role in inland fish production. The West Bengal Inland Fisheries Policy 2023 by the DoF aims at providing employment to rural youth and boosting the production of freshwater fishes[4].

Tourism sector

Under the blue economy framework, India's tourism sector covers **coastal and marine activities**, contributing to sustainable growth and job creation. As part of maintaining clean and eco-friendly beaches and marinas, India has around **12 blue flag beaches[5],** including Golden Beach (Odisha), Shivrajpur Beach (Gujarat) and Rushikonda Beach (Andhra Pradesh), among others, to stimulate sustainable maintenance of the beach areas.

Additionally, recognising the untapped potential of the cruise sector, GoI, through the **Cruise Bharat Mission**, aims to capitalise on India's extensive coastline for cruise tourism, as part of a broader commitment to leverage the blue economy while preserving the environment.

National Strategy for Sustainable Tourism[6]

In April 2022, the Ministry of Tourism formulated a **national strategy for sustainable tourism** to position India as a **favoured global destination** for ecological and responsible tourism

- Promoting environmental and economic sustainability and protecting biodiversity, among others, were identified as the **strategic pillars** for tourism development across the country.

Swadesh Darshan 2.0 (SD2.0)[7,8]

The Ministry of Tourism restructured the Swadesh Darshan Scheme into Swadesh Darshan 2.0 (SD2.0) to create **sustainable tourism destinations**

- The ministry selected **57 sites across 32 states/union territories (UTs)** for development under SD2.0, including spots in Gujarat, Maharashtra, Rajasthan, among others[8]
- This initiative supports the blue economy by promoting eco-friendly tourism, generating employment in coastal regions and helping preserve marine ecosystems while boosting local economies.

Eco-tourism in the UTs[9]

GoI has undertaken various initiatives to enhance **eco-tourism in the UTs of Andaman & Nicobar Islands and Lakshadweep**. To promote eco-friendly and sustainable tourism, essential infrastructure is being developed in these regions. It includes:

- Development of eco-tourism resorts, beach villas, tent resorts and India’s **first water villas** in **Lakshadweep**
- Eco-tourism projects have been planned in the Andaman & Nicobar Islands, featuring a **holistic development framework** that includes the construction of premium island resorts, tents and tree houses.

Cruise tourism[10]

Under the Maritime Amrit Kaal Vision 2047, India is anticipated to operate **25 cruise terminals**, handling an estimated **5 million cruise passengers annually** by 2047**.**

04

Technology integration in the blue economy

Technological innovation to boost the blue economy

Under MIV 2030, India is advancing in marine technology, including autonomous underwater vehicles and advanced sensors. These eco-friendly innovations align with India's dedication to sustainability, aiding in the conservation of its marine resources. By adopting such technologies, India is supporting its fisheries, aquaculture and maritime transport sectors.

Prioritising innovation for waste-free and low carbon tech

With its extensive coastline and abundant marine biodiversity, India is harnessing its potential to stimulate economic advancement while addressing environmental challenges. By adopting sustainable ocean resource utilisation and low-carbon technologies as well as embracing zero waste, India is contributing to climate change mitigation and promoting sustainable development.

October 2024

MoPSW plans to use **low or zero-emission fuels** and convert all Indian vessels in Indian waters to **green vessels by 2047** thus harmonising environmental sustainability with commercial progress[1].

February 2024

The Union Minister of Ports, Shipping and Waterways and Ayush introduced **Maritime Single Window (MSW)** and **Mercantile Maritime Department (MMD) modules** on the SagarSetu platform to digitise documentation, data exchange, vessel tracking and inspection. The MSW module could cut vessel and goods' port waiting time by up to **40 per cent** and accelerate vessel turnaround **through online processes**[2]

Such improvements streamline supply chains, reduce costs and increase the competitiveness of India's maritime sector.

Next-generation sensing and tracking systems

Advanced sensors and artificial intelligence (AI) are transforming maritime operations, enhancing ecosystem monitoring, climate change predictions, shipping routes and ocean liner resilience. MoES plans to integrate AI with traditional weather prediction, encourage AI and machine learning (ML) in earth sciences and improve computing infrastructure to offer precise fishing advisories.

June 2023

SAGAR SAMRIDDHI, launched by MoPSW, is an advanced online dredging[#] monitoring system designed to accelerate the Waste to Wealth initiative. It upgrades the old draft and loading monitor system by integrating multiple reports, providing real-time dredging data and daily and monthly visualisations[3]

- This system significantly improves the tracking of **dredger performance** and reduces downtime
- It boosts operational efficiency and productivity in the maritime sector. This increased efficiency **preserves marine ecosystem health**, thereby driving the blue economy progress.

[#]Dredging is the removal of sediments and debris from the bottom of lakes, rivers, harbors and other water bodies.

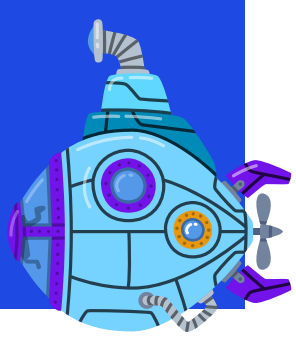
Exploring the depth with autonomous underwater vehicles (AUVs)

India is leveraging AUVs for multiple applications, including environmental monitoring, oceanographic research and underwater exploration. These vehicles are equipped with advanced sensors and cameras, enabling detailed mapping and data collection of marine ecosystems.

February 2025

Matsya-6000, India's flagship deep-ocean submersible, combines features of remotely operated vehicles (ROVs) and autonomous remote vehicles. This cutting-edge submersible is engineered to accommodate three humans, marking a significant milestone in India's ocean exploration capabilities[4]

- The Matsya has undergone a broad series of integrated dry tests over an operational range of 500 meters to ensure a seamless integration of all systems within its exo-structure.



Case study India and Denmark boost green maritime collaboration[5]

Introduction

- India and Denmark are enhancing their maritime relations through the **India-Denmark green strategic partnership**, focusing on promoting **sustainable practices** in numerous areas, including **green shipping, maritime training and port control**
- Denmark, a leader in eco-friendly maritime technologies, is aiding India's Sagarmala initiative and Maritime India Vision 2030 by sharing their knowledge in green and digital solutions.

Implementation and collaboration

- The collaboration cemented by a **2019 memorandum of understanding (MoU)**, **revised in 2022**, includes the establishment of a **centre of excellence (CoE) in India** to deepen **green maritime technology expertise**
- Denmark's proficiency in **port digitalisation and cybersecurity** is assisting India to become a worldwide leader in **smart ports**.

Way forward

- Both nations are targeting **decarbonisation**, with projects aimed at developing **hydrogen and ammonia-based fuels for ships**. Denmark's success in **offshore wind energy** and leadership in **maritime training** offer more collaboration opportunities, supporting India's **Maritime Amrit Kaal Vision 2047** to decarbonise its ports and upgrade **seafarer training programs**
- Under the **Joint Action Plan On Green Strategic Partnership (2021-2026)**, the two countries aim for continuous collaboration on port modernisation, maritime digitalisation, advanced seafarer training and green fuel development.

The maritime alliance between India and Denmark serves as a testament to the capacity of **international collaboration** to propel worldwide innovation and sustainability in the maritime industry, while also advancing towards the fulfilment of **sustainability and climate objectives**.

Innovation within the blue economy

To boost India's blue economy, government-backed marine research, along with persistent innovation, is crucial. Key initiatives, including DOM for deep-sea exploration and environmental protection, along with advancements in renewable ocean energy and marine biotechnology, are essential. Commitment to these innovations and sustainable practices is anticipated to drive economic growth and protect marine ecosystems.

- The Panch Karma Sankalp, unveiled in May 2024, presents five key initiatives centred on green shipping and digitalisation. MoPSW plans to allocate **30 per cent of financial support** to advance green shipping[6]
  - Under GTTP (an initiative under the Panch Karma Sankalp), Jawaharlal Nehru Port, VO Chidambaranar Port, Paradip Port and Deendayal Port are anticipated to each acquire two green tugs. Additionally, Jawaharlal Nehru Port, Deendayal Port and VO Chidambaranar Port are expected to be developed into **green hydrogen hubs**[6].

Blue economy's future hinges on sustainable innovations in marine conservation, renewable energy, fisheries and biotechnology. Prioritising research and development (R&D) and advanced technologies is likely to unlock its full potential for growth and ecosystem health.

Some of the vital future blue economy-based innovation

- **Blockchain for supply chain transparency – an avenue to stimulate sustainability**
- **Smart aeration system with an internet of things (IoT) technology for water quality management**
- **Sustainable fishing platforms**
- **Marine pollution monitoring technology**

Rising **coastal urbanisation** necessitates innovative, eco-friendly infrastructure resilient to climate change, boosting **sustainable tourism** and **protecting coastal communities**. Balancing ecological preservation and coastal community development through **smart urban planning** is crucial for the sustainable growth of India's blue economy.

05

Actionable measures for growth

India's blue economy offers a myriad of opportunities across diverse areas, including renewable energy, sustainable aquaculture, coastal development and marine biotechnology, among others. These areas ensure food security, health advances, revenue generation and climate change mitigation, underscoring the immense potential for sustainable development.

Opportunities	Government schemes/initiatives boosting blue economy growth
Green aquaculture practices The sustainable and responsible management of aquaculture could address the rising demand for seafood, promote rural development and reduce poverty, creating significant opportunities in India's blue economy.	• PMMSY, with **USD2.4 billion*** investment, is being implemented across India from FY21 to FY25. It offers financial assistance up to 40 per cent of unit cost (for general beneficiaries) and 60 per cent of unit cost (for SC/ST/women beneficiaries) for fisheries development activities and establishment of **re-circulatory aquaculture system (RAS)** and bio-floc systems, promoting sustainability in the sector[1] – The Department of Expenditure, Ministry of Finance, has approved the extension of PMMSY until FY26, maintaining the current scheme design, funding pattern and approved outlay sanctioned by the union cabinet[2] • **February 2024:** GoI launched the Pradhan Mantri Matsya Kisan Samridhi Sah Yojana (PMMKSSY) under the PMMSY with an investment of **USD720 million*** to fortify the fisheries sector, offer **incentives for aquaculture insurance** and enhance value chain efficiency[3] • MoPSW aims to increase renewable energy usage in major ports to **60 per cent from the current level of less than 10 per cent of the total power demand** and reduce carbon emissions by 30 per cent/ton of cargo handled by 2030[4].
Biotech from the deep blue The oceans, rich with unique organisms, offer vast potential for innovative drug development. Investing in marine biotechnology research could lead to significant pharmaceutical advancements.	• The Odisha Biotechnology Policy 2024 seeks to foster collaboration in **research and technological innovation** among industry, academia and society. It offers a comprehensive framework with both financial and non-financial incentives, as well as marketing support, to spur sector growth • The policy aims to bolster Odisha's position in biotechnology and ensure its advancements positively impact the socio-economic landscape[5].
Seabed mining India's blue economy has huge potential, with the seabed of the Indian Ocean rich in minerals and metals.	• GoI submitted two applications to the **International Seabed Authority** in January 2024, showcasing India's strategy to harness resources[6] – For extending the exploration of polymetallic sulphides in the Carlsberg Ridge of the Indian Ocean to 300,000 square km from the current 10,000 square km – For the cobalt-rich ferromanganese crusts exploration at the Afanasy-Nikitin Seamount in the central Indian ocean. This is expected to aid India with the **sourcing of rare-earth elements**.

Opportunities	Government schemes/initiatives boosting blue economy growth
Unlocking blue carbon potential • Blue carbon initiatives protect coastal ecosystems and are crucial for carbon repossession and climate resilience • This could boost job creation and attract climate finance, promoting sustainable growth.	• **January 2024:** The government of Tamil Nadu (TN) launched the **TN Coastal Restoration Mission**, focusing on enhancing coastal biodiversity, protection and livelihoods and pollution control across **14 coastal districts**[7] — This mission is expected to establish the Tamil Nadu Blue Carbon Agency for **ecological restoration** and various conservation centres to harness the blue economy.
Empowering renewables: Wind and solar • Using renewable energy for desalination plants and electric boats enhances sustainability • Offshore wind farms could meet energy needs, while solar energy offers sustainable electricity, reduces urban heat and conserves water.	• **June 2024**: The union cabinet approved the **Viability Gap Funding (VGF) scheme** with a USD894 million* budget. This includes USD822 million* for installing and commissioning 1 gigawatt of offshore wind energy projects (500 megawatt each off the coast of Tamil Nadu and Gujarat) and USD72 million* for upgrading two ports to support these projects[8] — This scheme complements the **offshore wind energy** development in India and creates the necessary ecosystem to support **ocean-based economic activities**.
Boost in Indian marine product exports Boosting Indian marine product exports can enhance the blue economy by creating jobs, supporting coastal communities, fostering sustainable fishing practices and promoting international trade, thus driving economic development and strengthening the maritime sector.	• GoI launched several programs and subsidies, with the Marine Products Export Development Authority (MPEDA) providing essential support to **boost seafood exports**. It also initiated PMMSY and a **cluster-based approach** to improve competitiveness and efficiency across the entire value chain, from production to exports — In FY24, the seafood industry's export value of ~**USD7.2 billion*** showcased the government's effective strategies and efforts, contributing notably to the enhancement of the blue economy[9].

The success story of an Indian coastal state

With a 1,600-kilometer coastline, Gujarat drives India's blue economy through fisheries, seaweed farming, tourism and maritime trade. In FY24, the state was India's top fish producer with a total production of 907,716 metric tonnes (MT)[10]. Additionally, it is the country's second-largest seaweed producer and is a significant seaweed cultivation hub. Recognising the potential of seaweed's application in food, pharmaceuticals and biofuels, Gujarat is expanding production to promote sustainable marine resource utilisation and economic diversification[11].

With infrastructure projects worth over USD2.7 billion*, including the Tuna Tekra deep draft terminal at Deendayal Port, Gujarat is poised to bolster its global trade position in the blue economy landscape[12]. The state is also investing in maritime tourism by working towards launching India's first submarine-based underwater tourism facility in Dwarka. Gujarat reinforces its leadership in India's blue economy by promoting both economic growth and environmental preservation.

Several factors position Gujarat as a pioneer in the country's blue economy

Advancing seaweed farming with High-Density Polyethylene (HDPE) floating raft technology

- The Veraval regional station, a research centre of ICAR-CMFRI[#], directed an economically viable seaweed farming initiative in Kutch's coastal communities using HDPE floating rafts technology. The project included comprehensive training, equipping local fisherfolk with sustainable cultivation techniques and resource management skills

Implementation and outcomes

– Upon completion of the training, a seaweed farm was established. The farm utilised 20 rafts, 10 designed with monoline and another 10 with net-tube structures, with an initial stocking of 3 kg per line. The rafts were deployed for 45-55 days, with periodic harvesting[13]

– Each raft produced ~260 to 350 kg of seaweed in a 100 sq. ft. area, averaging 305 kg per raft. It resulted in a cumulative harvest of 6.1 tonnes of seaweed[13]

Impact

- This initiative has set a benchmark for seaweed farming in Gujarat, enabling local fisherfolk through farmer participatory research (FPR). The success of this project underscores the impact of focused training on coastal livelihoods, turning seaweed farming into a sustainable and profitable activity that aids environmental conservation and socio-economic advancement.

The Siddi community: Emerging entrepreneurs in India's blue economy

- The Siddi community in Gujarat, descendants of East Africa's Bantu people, have faced economic marginalisation despite their rich cultural heritage and historical ties to seafaring and labor-intensive occupations

Solution offered by ICAR-CMFRI

— The ICAR-CMFRI, with support from the Department of Science and Technology (DST), launched India's first mariculture science and technology innovation (STI) hub in Veraval, Gujarat. The programme includes integrated multi-trophic aquaculture, sea cage farming and seaweed cultivation and entrepreneurial development, leading to economic upliftment, skill enhancement and cultural integration of the community[14]

Impact

- This initiative aims to integrate the Siddis into the blue economy as skilled entrepreneurs, fostering economic independence and sustainable livelihoods. This approach serves as a model for community-driven economic growth through inclusivity.

[#]ICAR: Indian Council of Agricultural Research; CMFRI: Central Marine Fisheries Research Institute

Gujarat Maritime Board: Driving sustainable maritime growth

- Established in 1982 as India’s first maritime board, the Gujarat Maritime Board (GMB) oversees 48 minor ports and one major port, spearheading Gujarat’s rise as a key maritime hub[15]
- Under the Sagarmala Programme, GMB has implemented projects, such as the greenfield port at Chhara and India’s first CNG terminal at Bhavnagar port, promoting clean fuel adoption. Additionally, under MIV 2030, India is developing mega port clusters in select states, including Gujarat, with a combined capacity of over 300 million tonnes per annum (MTPA)[16]

Additional projects undertaken under GMB

— Expanding coastal shipping and water transport to reduce logistics costs and emissions. A prime example is the launch of the ro-pax ferry service between Hazira and Ghogha in 2020[17]. This initiative not only cut down travel time but also paved the way for additional ferry routes

— Fostering domestic shipbuilding at the marine shipbuilding park in Bhavnagar and sustainable recycling at the Alang ship recycling yard

— Establishing a maritime services cluster at Gujarat International Finance Tec-City (GIFT City) to centralise maritime financial and legal services, bolstering Gujarat's global maritime business standing[18]

— Developing the national maritime heritage complex at Lothal to preserve India’s maritime legacy, which is anticipated to serve as an educational and tourism landmark with museums, theme parks and research centres. Phase 1A is under implementation and is expected to be completed by 2025[19]

Impact

The strategic initiatives implemented by GMB have considerably bolstered Gujarat's maritime competencies. These advancements have catalysed trade and employment, whilst advocating for sustainability. As a result, Gujarat has become a key region driving economic growth through maritime activities.

Gujarat’s blue revolution: Advancing marine, inland and brackish water fisheries

- Gujarat’s marine fisheries sector, contributing 20 per cent of India's total marine fish output[16], has seen significant growth due to government programs and advanced technology. Initiatives include providing navigational aids, strengthening infrastructure, financially supporting deep-sea fishing, promoting artificial reefs and sea cage culture for marine biodiversity and providing subsidies for processing and equipment to improve efficiency
- With over 348,000 hectares of reservoirs, 22,000 hectares of village ponds and 3,865 kilometers of rivers, Gujarat has established a comprehensive inland fisheries framework through policy-driven reservoir leasing and sustainable farming techniques[10]. For instance, the introduction of yearling fish seed stocking, biofloc and recirculating aquaculture systems (RAS) farming has revolutionised freshwater aquaculture, improving yield and sustainability by increasing productivity and minimising post-harvest losses
- Owing to the 376,000 hectares of saline land[10] in the coastal area, Gujarat promotes shrimp farming and brackish water aquaculture to provide jobs for coastal communities. The state’s coastal mapping and collaborations with the Central Institute of Brackishwater Aquaculture (CIBA) have boosted aquaculture research and expansion. Additionally, seaweed cultivation in Kutch and the Asian seabass cage rearing are diversifying marine farming and promoting alternative livelihoods.

Impact

- Gujarat's innovative approach to fisheries illustrates sustainable and profitable practices. Its continued leadership in maintaining a balance between productivity and long-term resource preservation is fueled by infrastructure development, digital governance, scientific progress and strategic partnerships.

Actionable measures for other coastal cities

India's extensive coastline presents a significant opportunity to integrate blue economy principles into its infrastructure, tourism and industry. With rising sea levels and extreme weather conditions, amphibious and sustainable infrastructure can be invaluable for Indian coastal cities. Global models demonstrate innovative approaches for building sustainable, resilient coastal cities. Indian cities can adopt these principles to develop more environmentally friendly coastal hubs. Some of these global models are:

- **Oxagon (Saudi Arabia):** A floating industrial city, Oxagon integrates advanced manufacturing, AI-driven logistics and renewable energy to create a sustainable blue economy hub. It aims to transform maritime trade and urban living by leveraging the Red Sea's strategic location while minimising environmental impact[20]
- **Maldives floating city (Maldives):** A climate-resilient urban solution, this floating lagoon city is designed to combat sea level rise and preserve marine biodiversity. It features solar-powered homes, coral reefs for natural protection and sustainable tourism models, making it a benchmark for small island nations adapting to climate change[21]
- **Oceanix city (South Korea):** A prototype for floating urban developments, Oceanix city is designed to withstand rising sea levels and operate on renewable energy. It integrates systems for energy, water, food and waste management, promoting sustainable living[22]
- **Dogen city (Japan):** A self-sufficient floating metropolis, Dogen city is envisioned as a carbon-neutral, ocean-integrated urban ecosystem. It emphasises marine research, aquaculture and renewable energy, showcasing how floating cities can expand coastal economies while ensuring environmental harmony[23].

Chennai

Chennai stands as a natural hub for incorporating blue economy concepts, such as sustainable shipping, marine biotechnology and aquaculture.

Drawing inspiration

Dogen City concept offers insights into creating a sustainable coastal city that effectively responds to climate change. Its key features include the habitable ring, the undersea edge data centre and autonomous floating architecture. Levering this insight, Chennai can create floating infrastructure, especially in the flood-prone areas to provide safe living places.

Potential benefits

By adopting floating infrastructure, Chennai can create sustainable and adaptable spaces, thereby strengthening its resilience to climate change, providing safe living spaces during floods and reducing the strain on existing infrastructure.

Goa

Goa is widely recognised as India’s most famous tourist destination, celebrated for its beautiful beaches and vibrant coastal ecosystem.

Drawing inspiration

By emulating the Maldives floating city, Goa can introduce floating hotels and resorts that seamlessly blend with a coastal ecosystem, offering luxury eco tourism options. Oceanix city’s architecture can facilitate the creation of adaptive, modular housing solutions that are resilient to flooding and rising sea levels.

Potential benefits

Embracing these innovative solutions could reduce the environmental impact of tourism in Goa. It is expected to preserve its marine biodiversity through the implementation of sustainable resort practices. Floating housing can enhance disaster resilience, providing a safe shelter during extreme weather conditions.

Kochi

Kochi, strategically situated on the southwestern coast, is increasingly emphasising international trade, positioning itself as an ideal hub for blue economy R&D.

Drawing inspiration

By establishing marine research centres similar to those in Oceanix City, Kochi can focus on sustainable marine technologies

Moreover, adopting Oxagon’s circular economy principles could help create a zero-waste ecosystem in Kochi’s ports, powered by renewable energy.

Potential benefits

Embracing innovative solutions can transform Kochi into a major marine research and innovation hub, creating sustainable industries and green jobs. It also reduces pollution from port activities, leveraging renewable energy and circular economy practices. Furthermore, the development of cutting-edge marine technologies is anticipated to position Kochi as one of the key players in the global export market.

Mumbai

Mumbai, with its significant port activity and rising population pressures, grapples with issues such as high pollution levels and land scarcity.

Drawing inspiration

By drawing on the innovations of Oxagon in Saudi Arabia, Mumbai can adopt circular economy systems that include smart waste management, energy-efficient infrastructure. Additionally, taking inspiration from the Maldives floating city, Mumbai can explore the development of floating communities, offering resilient housing solutions to combat sea level rise.

Potential benefits

The implementation of smart technologies has the potential to alleviate congestion, reduce emissions and improve quality of life. Floating housing developments could ease the strain on Mumbai's already densely populated areas. Furthermore, eco-friendly resorts that align with marine conservation efforts could promote sustainable tourism, contributing to the preservation of Mumbai's coastline.

Strategies for mitigating hurdles in sustainable blue economic growth

India's blue economy offers substantial potential for the country's growth. However, it faces challenges, such as overfishing, restricted market access, inadequate infrastructure and environmental damage that threaten its sustainability and could potentially harm the marine ecosystem. Consequently, there is an acute need for immediate and effective solutions to surmount these challenges and ensure sustainable development.

Solutions

Unsustainable fishing practices: Threat to marine life

India's marine resources are facing challenges due to excessive and harmful fishing practices, leading to reduction in biodiversity. It is imperative to implement more stringent regulatory measures and promote sustainable fishing methodologies to address this issue.

Sustainable marine resource management

- To mitigate unsustainable fishing, it is important for India to impose stricter regulations and ban harmful fishing methods. Implementing licensing mechanisms, quotas and real-time monitoring can help prevent over-exploitation.

Infrastructure constraints: A barrier to progress

Inadequate infrastructure, such as ports, storage facilities and transport networks are major hurdles in the growth of India's blue economy. Upgrading these facilities is crucial for the efficient movement of goods and services.

Innovating coastal infrastructure

- PPPs play a crucial role in enhancing India's maritime infrastructure by leveraging private sector expertise, efficiency and funding. PPPs can help the government attract investments to modernise ports, develop logistics hubs and build critical coastal infrastructure without solely relying on public infrastructure
- Adopting advanced digital technologies, such as blockchain, AI and the IoT, can improve port operations. AI algorithms can forecast port congestion and digital platforms can streamline cargo handling, customs clearance and vessel handling.

Impact of environmental degradation

Marine ecosystem is experiencing substantial damage due to pollution, climate change and habitat destruction. Immediate implementation of sustainable resource management and enhanced conservation efforts is essential to prevent further degradation.

Safeguarding the marine ecosystem

- Strengthening pollution control measures by establishing water treatment units near coastal areas to prevent waste from entering the ocean. Creating rapid response procedures for marine oil spills
- Additionally, promoting renewable energy and blue carbon ecosystems, such as restoring mangroves, salt marshes and seagrass beds, can enhance carbon sequestration and combat climate change.

06

Way ahead

The future of India’s blue economy depends on a balanced approach that integrates economic aspirations with environmental sustainability. By embracing a holistic policy framework, fostering innovation and strengthening global collaborations, India can emerge as one of the leaders in the global blue economy. A well-planned and inclusive blue economy strategy by focusing on various key fundamentals, can ensure that India's maritime wealth remains preserved for future generations.

Global partnerships and investments: Unlocking cooperation opportunities

India's strategic location along the Indian Ocean significantly enhances its leadership role in promoting the blue economy. This leadership can be further solidified through collaborations with neighbouring countries and active participation in maritime agreements and meetings.

- Collaborating with international partners can introduce advanced technologies and expertise to develop various aspects of the blue economy, such as sustainable fisheries, renewable marine energy and eco-friendly tourism practices
- Foreign investments can bridge the funding gap required for large-scale projects, including port modernisation, coastal infrastructure development and marine science research
- International collaborations can lead to the sharing of best practices from other countries' experiences in developing their blue economies.

Boosting maritime infrastructure and trade

- Modernising ports and logistics infrastructure with digital technologies, such as AI, blockchain and IoT to enhance efficiency
- Expanding green port initiatives by transitioning to hydrogen and ammonia-based fuels.

Investing in marine renewable energy and innovation

- Scaling-up investments in tidal energy, offshore wind energy and ocean thermal energy conversion (OTEC) to diversify India’s energy mix
- Establishing blue economy-focused innovation hubs to foster R&D in marine robotics, deep-sea exploration and carbon sequestration technologies.

Enhancing coastal resilience and climate adaptation

- Implementing coastal climate adaptation strategies to protect vulnerable coastal communities from extreme weather events and rising sea levels
- Promoting nature-based solutions, such as mangrove restoration, artificial coral reefs and sustainable sand mining practices to enhance marine biodiversity.

**The currency across the document has been converted as per the conversion rate of INR1 = USD0.012 as of 25 April 2025*

References

01 Executive summary

1. Blue Economy-Opportunities for Income Generation, Employment News, Ministry of Information and Broadcasting, Government of India, Issue No. 16, 15-21 July 2023

02 Exploring the blue economy landscape

1. Exploring the potential of the blue economy, United Nations – Department of Economic and Social Affairs, accessed on 14 November 2024
2. How much water is in the ocean?, National Ocean Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, 16 June 2024
3. Deep Ocean Mission (DOM), Ministry of Earth Sciences, Government of India, accessed on 11 November 2024
4. Cargo volume handled by Indian ports, PIB, 05 February 2025
5. Ministry of Earth Sciences hosts Inter-Ministerial Joint Workshop on Blue Economy, PIB, 22 March 2024
6. Nurturing the blue economy: a call for sustainable ocean utilization, Indian National Centre for Ocean Information Services, 25 January 2024
7. Year End Review-Ministry of Ports, Shipping and Waterways 2023, PIB, 02 January 2024
8. Average Turnaround Time of Major Ports, PIB, 03 December 2024
9. Year end Review- Ministry of Environment, Forest and Climate Change, PIB, 22 December 2023
10. Greening in India gets a boost with Green Tug Transition Program (GTTP) SOP launched by Shri Sarbananda Sonowal, PIB, 16 August 2024
11. Sagarmanthan 2024: India's Maritime Vision, PIB, 19 November 2024
12. A total budgetary allocation of Rs. 2,616.44 crore has been made for the Department of Fisheries for the year 2024-25, PIB, 23 July 2024
13. India secures over 10 lakh crore investments within three days of unveiling of the Maritime Amritkaal Vision 2047, PIB, 19 October 2023
14. Annual report 2023-24, Ministry of Earth Sciences
15. Making India a blue economy, PIB, 25 March 2022
16. Sagarmala Programme, PIB, 12 March 2020

03 Key sector driving India's blue economy

1. Sagarmanthan 2024: India's Maritime Vision, PIB, 19 November 2024
2. 20th Maritime State Development Council (MSDC) in Goa Concludes Successfully, PIB, 13 September 2024
3. Budget 2025-26 Proposes Framework For Sustainable Harnessing of Fisheries from Indian EEZ and High Seas, PIB, 01 February 2025
4. West Bengal Inland Fisheries Policy, 2023, Department of Fisheries, Government of West Bengal, accessed on 25 April 2025
5. Swachh Beaches: The face of tourist attraction, PIB, 31 October 2023
6. National strategy for sustainable tourism, Ministry of Tourism, 29 April 2022
7. Increasing tourism in Lakshadweep islands, PIB, 08 February 2024
8. New Projects To Promote Tourism, PIB, 25 July 2024
9. Promoting new types of tourism in Union Territories, PIB, 27 November 2024
10. A giant step towards achieving the goal of 5 million cruise passengers in India by 2047, PIB, 03 November 2023

04 Technology integration in the blue economy

1. India Charts Course towards Maritime Decarbonization at High-Level Conference, PIB, 03 October 2024
2. Shri Sarbananda Sonowal launches Maritime Single Window and MMD Modules in SagarSetu (NLP-Marine), PIB, 01 February 2024
3. Shri Sarbananda Sonowal launches 'SAGAR SAMRIDDHI' to bring transparency & efficiency, PIB, 09 June 2023
4. Matsya-6000: India's Fourth-Generation Deep-Ocean Submersible successfully Completes Wet Testing, PIB, 17 February 2025
5. India-Denmark Maritime Collaboration Gathers Momentum with Focus on Green Shipping, Digitalization and Sustainable Development, PIB, 18 September 2024
6. Sagarmanthan 2024: India's Maritime Vision, PIB, 19 November 2024

References

05 Actionable measures for growth

1. New blue resolution, PIB, 06 August 2024
2. Implementation of PM-MSY, PIB, 11 February 2025
3. Union Minister of State Shri George Kurian participates in the National Fisheries Digital Platform Registration Outreach Program in Madhya Pradesh, PIB, 20 February 2025
4. Share of renewable energy in ports to increase by 60%, PIB, 21 February 2023
5. Odisha Biotechnology Policy, 2024, The Odisha Gazette, 25 January 2024
6. The Government of India submits two applications for approval of plans of work for seabed exploration in the Indian Ocean, International Seabed Authority, 18 January 2024
7. Tamil Nadu government launches Tamil Nadu Coastal Restoration Mission, Tamil Nadu government portal, 11 January 2024
8. Cabinet approves Viability Gap Funding (VGF) scheme for implementation of Offshore Wind Energy Projects, PIB, 19 June 2024
9. India's seafood industry achieves unprecedented growth over five years, PIB, 06 August 2024
10. Commission of Fisheries, Government of Gujarat, accessed on 02 April 2025
11. Manufacturing of Seaweed Based Food Products and Biodegradable Packaging for Food, Agro and food processing, Government of Gujarat, Vibrant Gujarat, January 2024
12. PM to inaugurate the Global Maritime India Summit 2023 on 17th October, PIB, 16 October 2023
13. ICAR-Central Marine Fisheries Research Institute newsletter, April-June 2024
14. India: Initiative aims to make Siddis 'blue economy' entrepreneurs, ICSF, 22 October 2024
15. Gujarat Maritime Board, Sagarmala, accessed on 02 April 2025
16. Maritime India Vision 2030, Ministry of Ports, Shipping and Waterways, Government of India, February 2021
17. PM to inaugurate Ro-Pax terminal at Hazira and flag off Ro-Pax ferry service between Hazira and Ghogha on 8th November, PMIndia, 06 November 2020
18. Gujarat at the Forefront of India's Maritime Success Story (State Series), PIB, 29 September 2022
19. Cabinet approves development of National Maritime Heritage Complex (NMHC), Lothal, Gujarat, PIB, 9 October 2024
20. Oxagon – A reimagined industrial, Noem, accessed on 25 April 2025
21. Threatened by rising sea levels, the Maldives is building a floating city, World Economic Forum, 19 May 2021
22. Explore OCEANIX Busan, accessed on 25 April 2025
23. Creating a new habitable zone - Dogen City, N-ARK, accessed on 25 April 2025

Acknowledgements

We sincerely thank everyone involved in the publication of this report. We acknowledge the efforts put in by the core team, from the initiation to publication of this report.

Reshma Pai, Lead-Research

Insights Centre Research team

Harmehr Chandok, Manager, ESG

Meenakshi Gautam, Manager, ESG

Brand and Communications:

Nisha Fernandes, Associate Director

Design:

Shveta Pednekar, Manager

KPMG in India contacts:

Akhilesh Tuteja
Partner and Head
Clients and Markets
E: atuteja@kpmg.com

Neeraj Bansal
Partner and Head
India Global
E: nbansal@kpmg.com

Namrata Rana
Partner and National Head
ESG
E: namratarana@kpmg.com

Mohit Bhasin
Partner
Government and Public Services
E: mohitbhasin@kpmg.com

Ramesh Shanmugam
Partner
Government and Public Services
E: rameshs2@kpmg.com

Access our latest insights on KPMG Insights Edge

Follow us on:

kpmg.com/in/socialmedia

KPMG Assurance and Consulting Services LLP, Lodha Excelus, Apollo Mills Compound, NM Joshi Marg, Mahalaxmi, Mumbai - 400 011 Phone: +91 22 3989 6000, Fax: +91 22 3983 6000.