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Ministry of Earth Sciences
Govt. of India

Ocean of opportunities:

Trade, Investments and Startups in the Blue Economy

July 2025

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डॉ. एम. रविचंद्रन
Dr. M. Ravichandran

Foreword

The oceans have been central to India's identity for millennia, shaping our culture, trade, and strategic outlook. As we chart our course through the Amrit Kaal towards a Viksit Bharat by 2047, our vast Blue Economy emerges as a new frontier of unprecedented opportunity. It is a cornerstone of our national vision for sustainable and inclusive growth, holding the promise of millions of livelihoods and immense economic prosperity.

The Government of India, under the visionary leadership of our Honourable Prime Minister, has adopted a 'whole-of-government' approach to harness this potential. As the nodal ministry, the Ministry of Earth Sciences is proud to spearhead the efforts to advance a resilient and inclusive blue economy. Through landmark initiatives like the Deep Ocean Mission and a suite of coordinated sectoral schemes, we are laying a robust foundation of science, technology, and infrastructure to unlock the ocean's treasures responsibly.

However, the government's role is that of a facilitator. The true dynamism of our Blue Economy will be driven by the spirit of Indian enterprise. Realizing our $100 billion ambition requires a vibrant confluence of private investment, entrepreneurial innovation, and seamless global trade. We must actively foster a world-class startup ecosystem and relentlessly improve the ease of doing business along our coasts and in our seas.

This white paper is a timely and valuable contribution to this critical discourse. By focusing on the three crucial pillars of Trade and Investment, the Startup Ecosystem, and Ease of Doing Business, it addresses the very engines that will power our blue growth. I am confident that its insights will spark constructive dialogue and inspire actionable strategies among policymakers, industry leaders, and innovators.

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Message

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सत्यमेव जयते

पृथ्वी विज्ञान मंत्रालय
भारत सरकार
MINISTRY OF EARTH SCIENCES
GOVERNMENT OF INDIA

Message

The Blue Economy is more than just a new economic opportunity, it is a complex system where the environment, society, and economy are deeply connected. As scientists and policymakers, we understand that the ocean is a living, changing environment shaped by many physical, chemical, and biological processes. For any activity in this space to succeed in the long run, it must be based on strong evidence-based science and a deep understanding of the oceanic processes.

The Ministry of Earth Sciences (MoES) is fully committed to building the scientific and technological foundation needed for India's Blue Economy. Our role goes beyond making policies, we also collect and generate vital data to support sustainable use of ocean resources. With our wide network of ocean observation systems, advanced models, marine technology development and key initiatives such as the Deep Ocean Mission, we are working to map and understand India's vast marine spaces. This scientific knowledge is essential, it reduces risks for investors, drives innovation, and helps generic employment opportunities for India's youth.

This white paper, Ocean of opportunities: Trade, investments, and startups in the Blue Economy, plays an important role in connecting our growing scientific capabilities with the business and investment needed to realize the Blue Economy. Turning marine research ocean data into societal applications for coastal communities for safer shipping, or deep-sea engineering technology into new resources all depends on strong partnerships between science, government, and industry.

I appreciate this effort by EY, the strategic knowledge partner to MoES, to impactful discussion on building a sustainable Blue Economy through such focused and collaborative efforts that India can grow its ocean economy in a way that benefits both people and the planet for generations to come.

P K Srivastava

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FOREWORD

India today stands at a remarkable inflection point, where national ambition and economic momentum are converging to unlock new frontiers of growth. Few frontiers are as vast or as vital as our Blue Economy. This is more than just a new sector; it is the nexus where economic opportunity, environmental sustainability, and our strategic maritime legacy meet. At EY, we believe that catalyzing the Blue Economy is fundamental to realizing the vision of a prosperous and resilient Viksit Bharat.

While the government has commendably created the policy impetus, the journey from potential to performance requires a robust partnership with the private sector. The critical question is no longer why we should focus on the Blue Economy, but how can we accelerate its growth. How do we translate policy into bankable projects that attract global capital? How do we nurture nascent technologies from the lab into scalable, market-leading enterprises? And how do we streamline the operating environment to make it a competitive advantage for India?

This is the core purpose of this white paper "Ocean of opportunities: Trade, investments, and startups in the Blue Economy" As advisors to both public and private sector clients, we at EY have a unique vantage point on the challenges and opportunities that lie at this intersection. This paper distills our cross-sectoral experience and insights from extensive stakeholder consultations into a pragmatic roadmap. It moves beyond theory to provide actionable recommendations on the three levels we believe are most critical to unlocking value: facilitating Trade and Investment, energizing the Startup Ecosystem, and enhancing the Ease of Doing Business.

Our commitment to Building a better working world compels us to contribute to dialogues that can shape a more sustainable and equitable future. We offer this paper as a catalyst for collaboration platform for government, investors, corporations, and innovators to come together.

We are confident that by working in concert, we can build a vibrant, globally competitive, and sustainable Blue Economy that will be a powerful engine for India's growth for decades to come.

Rakesh Mishra, Partner,

Business Consulting, GPS, EY LLP

India's Blue Economy is rapidly emerging as a cornerstone of sustainable economic growth and environmental preservation, creating significant opportunities across various ocean-based sectors. With its extensive coastline, strategic maritime positioning, and growing investments in marine science and technology, India is uniquely placed to lead in the global maritime landscape. Encompassing diverse, dynamic sectors, the scope of the Blue Economy is broadening rapidly with a remarkable surge in interest from both domestic and international investors. The sector holds immense potential to contribute significantly to the country's GDP while ensuring livelihood opportunities and employment, especially to the coastal and island communities.

This is primarily driven by enabling policies, groundbreaking scientific innovation, and a heightened global awareness of the need for ocean sustainability. Advancements in ocean data systems and AI driven tools, marine spatial planning, and climate risk modeling are further revolutionizing the management and development of marine resource. This publication, Ocean of opportunities: Trade, investments, and startups in the Blue Economy, offers invaluable insights into India's strategic capabilities and the opportunities that lie ahead for creating a competitive, sustainable and resilient maritime future. There is a need to move beyond the traditional investment and financing approach to leverage new and unique cross-sectoral opportunities that are emerging unlocking the massive untapped potential of the Blue Economy. The complex landscape of Blue Economy not only requires large scale private investments, but also small investments championed by startups that have been successfully demonstrating innovative initiatives. Given the nascent stage of the sector, information asymmetry and involvement of multiple stakeholders with overlapping and competing mandates, attracting and sustaining these investments requires a thriving ecosystem and an enabling investment climate by consciously focusing on multiple, interrelated ease of doing business initiatives.

Specializing in the economic development advisory, we have worked with governments, multilateral organizations, and private sector leaders to design and implement integrated strategies, for attracting investments, facilitating trade, improving ease of doing business and supporting a thriving startup ecosystem to unlock responsible investments for shaping sustainable and impactful economies across multiple sectors, within India and internationally. As knowledge partners to the Ministry of Earth Sciences, Government of India, we look forward to creating waves of impact as the Blue Economy, with its multiple growth avenues for enhanced GDP, exports and inclusive employment, plays a pivotal role in India progressively moving towards its target of a developed economy by 2047.

Abhishek Gupta, Partner,

Economic Development Advisory, EY LLP

Executive Summary

In India, the Blue Economy is rapidly ascending as a vital engine for national development, strategically leveraging the nation's extensive 11,098 km coastline and a vast 2.4 million sq. km Exclusive Economic Zone (EEZ). The MoES, as the nodal agency[1], has pioneered the Draft National Policy for Blue Economy defining it as "a subset of the national economy comprising the entire system of ocean resources and man-made economic infrastructure in marine, maritime and onshore coastal zones within India's legal jurisdiction, aiding the production of goods and services with clear linkages to economic growth, environmental sustainability and national security"[2]. At least 24 ministries and departments are also involved. Multiple state-level initiatives are also being undertaken by nine coastal states and four union territories. The Blue Economy is also recognized as a key focus pillar within India's vision of Viksit Bharat 2047. The vision of New India by 2030 lists the Blue Economy as one of 10 core growth areas, with a targeted US$100 billion Blue Economy through its Deep Ocean Mission and ocean resources.

There is a need to restore, protect and sustainably manage the ocean as there is a high cost of inaction on account of habitat damage, overextraction, climate change and pollution. Massive investments are required for a sustainable ocean economy. There is limited private sector investment in the Blue Economy and the current funding from the Government and philanthropies lags far behind. Private sector engagement is critical to scaling up investments in India's Blue Economy. Active private participation offers multiple advantages, including cost efficiencies through operational improvements, stronger workforce engagement, enhanced community and government relations, and greater social legitimacy. It also drives innovation, improves market access, and lowers capital costs while boosting corporate reputation.

Current classification frameworks or taxonomies for Blue Economy are inadequate; there are high risks, especially due to distorted market dynamics on account of factors such as contribution of oceans not comprehensively being reflected in GDP; lack of institutional mechanism to collectively manage large, connected global ocean beyond national jurisdictions (high seas); weak investment project pipeline for Blue Economy; need for a robust innovation and start-up ecosystem; and lack of attractive financing conditions, including an enabling policy and regulatory framework (Ease of Doing Business), among others.

Startups, with their agility, low-risk experimentation, and technological adaptability, are crucial for unlocking the Blue Economy's potential. Some of the areas where startups offer promise include AI, blockchain and data analytics, smart sensors and satellite tracking for real time data. Despite encouraging momentum, encouragement in startups remains limited. Early-stage startups and innovators face persistent challenges that increase the cost of infrastructure, data availability, and complex laws. Their expansion is hindered by the absence of a clear sectoral taxonomy, funding gaps, and the overwhelming influence of established players. Even though limited, investments in this sector remain disproportionately dominated by large corporations leaving innovative startups struggling to scale and access the market.

In addition to the vast and unmet funding requirements, the sector further grapples with complex and multi stakeholder business environment. There exists fragmentation of regulatory authority across multiple ministries and departments resulting in conflicting mandates, lack of policy coherence, and delays in project implementation besides lack of a comprehensive national framework to address Ease of Doing Business (EoDB) in the Blue Economy resulting in duplication of efforts and suboptimal outcomes. Underdeveloped port-related infrastructure, lack of last-mile connectivity, and absence of cold chain and

[1] *https://moes.gov.in/content/draft-blue-economy-policy*
[2] *https://moes.gov.in/content/draft-blue-economy-policy*

logistics infrastructure besides limited data integration hinder operational efficiency. There exist challenges in accessing institutional credit, lack of awareness and capacity; and thus, there is an urgent need for policy harmonization to unlock the sector's full economic and ecological value. EoDB in Blue Economy is essential as it directly impacts investments, both large scale and by startups, reducing bureaucratic hurdles, clarifying legal pathways, and creating stable operating environments - particularly for ocean-based industries where operations span multiple jurisdictions and regulatory bodies.

To overcome these inhibitors, a targeted framework of enablers and corresponding actions are required to ensure thriving trade and investments in Blue Economy. These interventions are designed to build investor confidence, streamline processes and create a transparent, predictable, and supportive ecosystem for Blue Economy. There are multiple leading international practices for instance from Mauritius with the World's first Ministry of Blue Economy and World's first Sovereign Blue Bond in 2018; and from Singapore with its AI enabled smart port technologies. Countries such as Norway, the UK, and Singapore have actively supported start-up ventures through policy frameworks, incubators, and public-private partnerships.

The following key interventions are proposed to build a predictable, supportive, and transparent ecosystem for Blue Economy ventures:

1. **Indian Blue Taxonomy:** To establish a standardized classification system that defines and encourages sustainable investments in the Blue Economy sectors
2. **The Shelf of Investible Projects:** To create a curated, pre-vetted pipeline of bankable projects, reducing risk for investors.
3. **Blue-Tech Innovation Fund and Blue Incubators/ Accelerators:** To bridge the commercialization gap by providing dedicated capital and infrastructure for marine technology startups.
4. **Blue Economy Business Desk:** To provide centralized access to data, market intelligence and government schemes, mitigating information asymmetry.
5. **National Digital Portal and National Single Window System for Blue Economy:** To streamline the complex approvals process by integrating clearances from multiple authorities into a unified Blue Economy Dashboard/ Portal.

India's Blue Economy is fundamental to achieving its vision of becoming a developed nation by 2047. By systematically addressing the critical challenges in investment, innovation, and regulation, India can unleash the immense and sustainable value of its oceans. With decisive leadership, strategic public-private partnerships, and the implementation of this strategic framework, India is poised to secure a prosperous, inclusive, and resilient blue future.

1. Introduction: The imperative for a sustainable Blue Economy

The Blue Economy represents a transformative paradigm shift in managing ocean resources, moving decisively beyond traditional exploitation towards an integrated model that harmonizes sustainable economic growth with environmental stewardship and social equity. It stands in sharp contrast to conventional maritime activities by demanding a deliberate balance between economic development, ecosystem health, and inclusive livelihoods across a diverse spectrum of sectors. This holistic approach encompasses established industries, such as fisheries and shipping, alongside emerging fields such as marine renewable energy, biotechnology and coastal tourism– all fundamentally anchored in sustainable practices.

In India, the Blue Economy is rapidly ascending as a vital engine for national development, strategically leveraging the nation's extensive 11,098 km coastline and a vast 2.4 million sq. km Exclusive Economic Zone (EEZ). The MoES, as the nodal agency[3], has pioneered the drafted a Draft National Policy for Blue Economy defining it as "**a subset of the national economy comprising the entire system of ocean resources and man-made economic infrastructure in marine, maritime and onshore coastal zones within India's legal jurisdiction, aiding the production of goods and services with clear linkages to economic growth, environmental sustainability and national security"[4].** This definition uniquely incorporates both natural assets and man-made infrastructure, explicitly linking economic and environmental goals with national security imperatives.

MoES coordinates a broad spectrum of activities, driving India's leadership in sustainable ocean governance. In addition to the MoES, **24 ministries/departments are involved,** including the **Ministry of Ports, Shipping and Waterways; Ministry of Fisheries; and Ministry of Environment, Forest and Climate Change.** These ministries are undertaking various initiatives, such as the **Pradhan Mantri Matsya Sampada Yojana** unveiled in 2020 on sustainable fisheries, the **Sagarmala Scheme and Deep Ocean Mission,** and various initiatives under the **Maritime India Vision 2030.** Multiple state-level initiatives are also being undertaken by **nine coastal states and four union territories.** During India's G20 Presidency in 2023, world leaders committed to conserving, protecting, restoring and sustainably using the world's oceans and marine ecosystems, thereby mainstreaming the need to build a sustainable and resilient Blue Economy. The **Chennai High Level Principles for Blue/ Ocean-based Economy** were adopted at the G20 Environment and Climate Ministers meeting for sustainable growth of the Blue Economy.

The Blue Economy is also recognized as a key focus pillar within India's vision of **Viksit Bharat 2047.** The vision of **New India by 2030** lists the Blue Economy as one of 10 core growth areas, with a targeted **US$100 billion Blue Economy through its Deep Ocean Mission and ocean resources.** The **Biodiversity Beyond National Jurisdiction Agreement** (BBNJ), adopted in June 2023, is a landmark international treaty aimed at protecting marine biodiversity in areas beyond national borders through conservation, sustainable use, and equitable benefit-sharing of marine genetic resources. This aligns with India's commitments under the United Nations Convention on the Law of the Sea (UNCLOS) to promote sustainable ocean governance and marine conservation.

[3] *https://moes.gov.in/content/draft–blue–economy–policy*
[4] *https://moes.gov.in/content/draft–blue–economy–policy*

1.1 India's Blue Economy scenario

This vision for Blue Economy is substantiated by a multi-pronged, whole-of-government approach, with numerous ministries launching targeted initiatives to operationalize the Blue Economy. These schemes and policies collectively form the bedrock of India's blue ambition, providing financial, infrastructural, and regulatory support across a wide spectrum of activities. From deep-sea exploration and port modernization to coastal conservation and startup incubation, these programs are designed to de-risk investment, foster innovation, and build capacity. The following table provides a consolidated overview of the key government initiatives that are actively shaping India's Blue Economy landscape.

Initiative name	Nodal ministry / Agency	Budget / Outlay	Primary objectives	Blue Economy areas covered	Support provided/ key features
Deep Ocean Mission (2021-2026)	Ministry of Earth Sciences (MoES)	INR4,077 crore[5]	To explore deep ocean resources and develop deep-sea technologies for sustainable use	Deep-sea mining, marine biodiversity, ocean climate advisory services, marine biology	Funding for R&D; development of technologies like the 'MATSYA 6000' submersible; ocean surveys
Pradhan Mantri Matsya Sampada Yojana (PMMSY) (2020-2025)	Dept. of Fisheries, Ministry of Fisheries, Animal Husbandry & Dairying	INR20,050 crore[6]	To bring about a 'Blue Revolution' through sustainable and responsible development of the fisheries sector	Fisheries (marine & inland), aquaculture, post-harvest management	Financial assistance for fishing vessels, cold chains, hatcheries, seaweed cultivation, and ornamental fisheries
Sagarmala Programme (2015 onwards)	Ministry of Ports, Shipping and Waterways (MoPSW)	Project-based funding model with an estimated outlay of INR5.97 lakh crore for 839 projects till 2025	To reduce logistics cost for trade by harnessing India's coastline and waterways through port-led development	Port modernization, port connectivity, coastal shipping, coastal community development, industrial clusters	Project-based funding and support for infrastructure development; promoting Coastal Economic Zones (CEZs)

[5] https://www.moes.gov.in/schemes/dom
[6] https://pmmsy.dof.gov.in/

Initiative name	Nodal ministry / Agency	Budget / Outlay	Primary objectives	Blue Economy areas covered	Support provided/ key features
Fisheries and Aquaculture Infrastructure Development Fund (FIDF) (2018-2026)	Dept. of Fisheries	INR7,522 crore[7]	To create and modernize infrastructure for fisheries, both in marine and inland sectors	Fishing harbors, fish landing centers, cold chains, modern fish markets	Provides concessional finance to State Govts, Cooperatives, and private entrepreneurs
Shipbuilding Financial Assistance Policy (2016-2026)	MoPSW	INR18,090 crore [8]	To promote and incentivize domestic shipbuilding and repair industry	Shipbuilding, ship repair	Financial assistance to Indian shipyards for domestic and export orders, encouraging a globally competitive industry
Viability Gap Funding (VGF) Scheme (revamped in 2020)	Ministry of Finance	Scheme-based; financial support depends on project pipeline.	To support infrastructure projects that are economically justified but fall short of financial viability	Can be applied to Blue Economy infrastructure like commercial ports, harbors, and coastal PPP projects	Provides a capital grant of up to 40% of the Total Project Cost (TPC) to make projects bankable for private investment
Swadesh Darshan 2.0 & PRASHAD Schemes	Ministry of Tourism	INR6,079.15 crore[9]	To develop theme-based tourist circuits and pilgrimage sites in a planned and prioritized manner	Coastal tourism, cruise tourism, lighthouse tourism, beach development, island tourism	Central Financial Assistance (CFA) to State Governments for developing tourism infrastructure and amenities

[7] https://www.pib.gov.in/PressReleaseIframePage.aspx?PRID=2004229#:~:text=The%20Union%20Cabinet%20chaired%20by,support%20of%20Rs%20939.48%20crore.
[8] https://www.pib.gov.in/PressReleasePage.aspx?PRID=2098573
[9] https://www.pib.gov.in/PressReleasePage.aspx?PRID=2100363

Initiative name	Nodal ministry / Agency	Budget / Outlay	Primary objectives	Blue Economy areas covered	Support provided/ key features
National Biotechnology Development Strategy (2021-25)	Dept. of Biotechnology	Mission-based funding under the Department's budget	To build a skilled workforce and infrastructure to make India a global biotech hub	Marine biotechnology, bioprospecting, development of marine-derived products	Funding for R&D, establishing centers of excellence, public-private partnerships, and technology transfer
Atal Innovation Mission (AIM)	NITI Aayog	INR2,750 crore[10]	To foster a culture of innovation and entrepreneurship across the country	Supports startups in all sectors, including Blue-Tech, through its various programs	Grants, mentorship, and networking support through Atal Incubation Centers (AICs) and Atal New India Challenges
MISHTI Scheme (2023-2028)	MoEF&CC	INR1,250 crore[11]	To promote mangrove plantation and conservation along the coastline and on salt pan lands	Coastal conservation, shoreline protection, carbon sequestration, mangrove-based livelihoods	Leverages existing funds like CAMPA and MGNREGS for implementation

[10] https://www.pib.gov.in/PressReleaseIframePage.aspx?PRID=2077101
[11] https://nationalcampa.nic.in/dashboard/GuidelinesPDF/665052fa8dd59.pdf

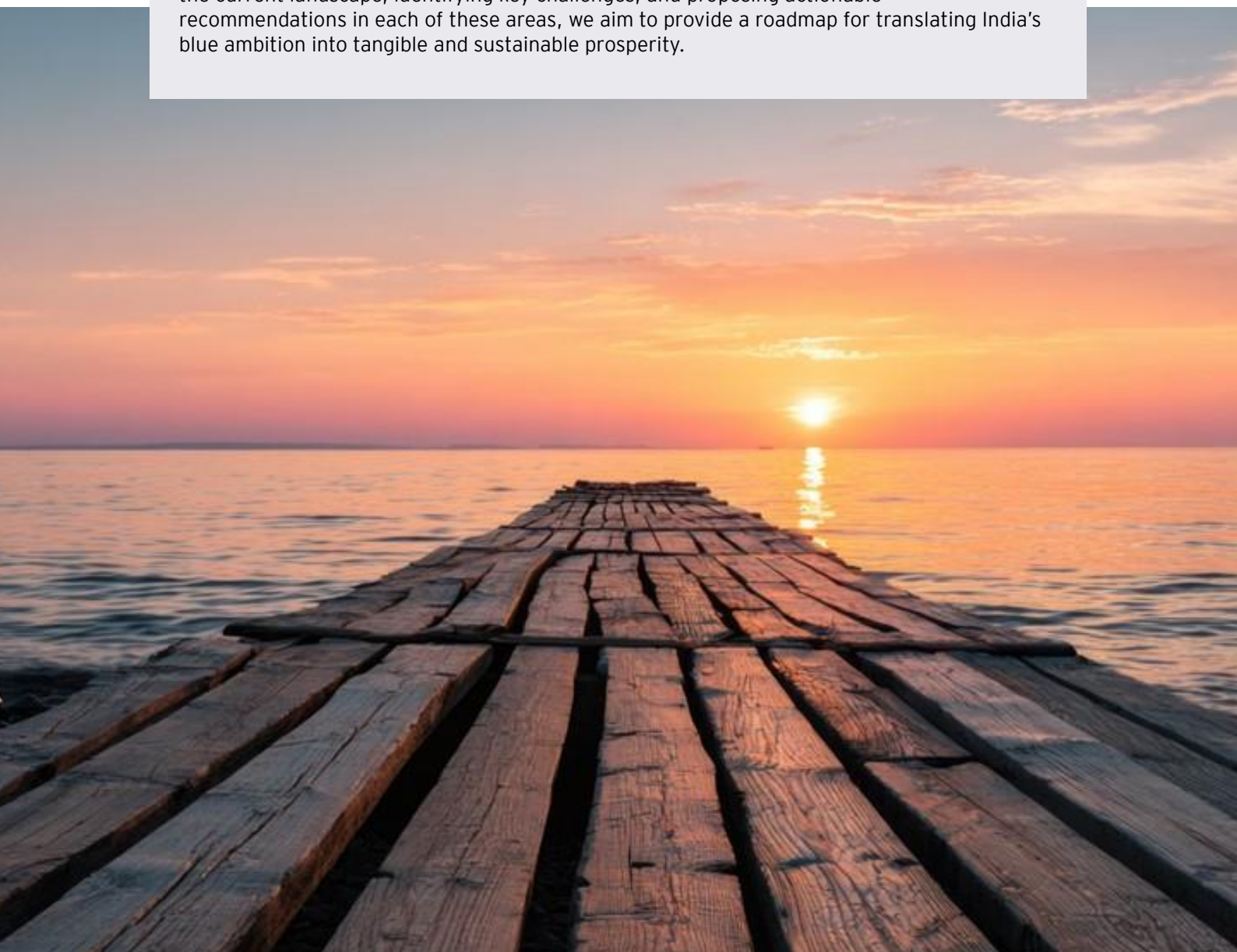
1.2 Challenges and enabling actions

The promising Blue Economy opportunities come with uncertainties which require thorough understanding. Current classification frameworks or taxonomies for Blue Economy are inadequate; there are high risks, especially due to distorted market dynamics on account of factors such as contribution of oceans not comprehensively being reflected in GDP; lack of institutional mechanism to collectively manage large, connected marine areas; weak investment project pipeline for Blue Economy; need for robust innovation and start-up ecosystem; and lack of attractive financing conditions, including an enabling policy and regulatory framework (ease of doing business), among others.

The road ahead

While the robust policy framework and strategic vision provide a powerful foundation, realizing this multi-billion-dollar ambition requires a granular focus on the operational engines of growth. The transition from high-level policy to on-the-ground economic impact hinges on creating a vibrant, competitive, and enabling environment. To unlock the full potential of India's Blue Economy, it is essential to critically analyze and strengthen the core pillars that will attract capital, foster innovation, and ensure efficient operations.

This white paper will dissect three of these critical pillars namely (i) **trade and investment, (ii) startup ecosystem, and (iii) Ease of Doing Business** across Blue Economy. By examining the current landscape, identifying key challenges, and proposing actionable recommendations in each of these areas, we aim to provide a roadmap for translating India's blue ambition into tangible and sustainable prosperity.



2. Harnessing trade and investments for India's Blue Economy

Blue Economy sector driving India's economic development: Globally, the Blue Economy is valued at over **US$1.5 trillion** and supports the livelihoods of over **30 million people**[12]. India's Blue Economy contributes around **4% to national GDP**, provides livelihood to **14 million** people and accounts for **95% trade** by volume through maritime routes [13]. India's Blue Economy is rapidly gaining prominence as a strategic driver of national growth, anchored in the vision of sustainable and inclusive development. From maritime logistics and fisheries to offshore energy and marine biotechnology, key sectors are witnessing accelerated activity, supported by enabling policy shifts and rising investor interest.

India's blue economy needs urgent investment to combat habitat loss, overexploitation, and pollution. Current public and philanthropic funding falls short. Private sector participation is vital—bringing efficiency, innovation, and capital while enhancing sustainability, market access, and corporate reputation through scalable marine conservation and sustainable business models.

Investment serves as the pivotal driver shaping India's Blue Economy future: Research by the Worldwide Fund for Nature (WWF) estimates the total **value of ocean-based assets at US$24 trillion**, generating an annual economic output of around US$2.4 trillion. Furthermore, the Organisation for Economic Co-operation and Development (OECD) predicts that by 2030, ocean-based industries could outperform their land-based counterparts in terms of both economic value addition and employment generation. These projections underscore the immense potential of the Blue Economy as a driver of sustainable development and global prosperity. Key sectors with significant potential in India include **maritime shipping (encompassing vessel capacity expansion, shipbuilding, repair, and recycling), coastal shipping operations, ship chartering/brokerage services, port logistics (warehousing, freight forwarding, bunkering), and specialized coastal infrastructure development.**

India's Blue Economy is also witnessing transformative opportunities in **deep-sea fisheries, ocean renewable energy, and marine biotechnology.** The Deep Ocean Mission (DOM) aims to explore and harness deep-sea minerals and biodiversity, positioning India as a leader in sustainable seabed resource utilization. In ocean renewable energy, India is advancing **in offshore wind, tidal, and wave energy,** with projects like the 1 GW offshore wind farm in Gujarat and Tamil Nadu paving the way for clean energy transition. **Marine biotechnology** is another frontier, with startups developing **seaweed-based bioplastics, nutraceuticals, and anti-cancer compounds from marine organisms,** contributing to both economic growth and environmental sustainability. Additionally, coastal and marine tourism, desalination technologies, and blue carbon initiatives (such as mangrove restoration for carbon sequestration) are gaining traction, offering scalable models for climate resilience and livelihood generation. These sectors, backed by innovation and policy support, can unlock billions in investments while ensuring ecological balance.

[12] NITI Aayog, World Bank
[13] RIS; report on 'Harnessing the Potential of India's Blue Economy: Opportunities, Challenges, and Pathways for Sustainable Growth', https://ris.org.in/cmec/pdf/Harnessing.pdf

Investments and trade: Navigating structural headwinds

Despite encouraging momentum, private sector engagement remains limited. Investors, manufacturers and exporters face persistent challenges that increase costs, cause delays and create uncertainty. In terms of investments, there are three pertinent issues:

Absence of investible projects in Blue Economy

Investors are unable to identify or find potential Blue Economy business opportunities/ investible projects due to the absence of a **centralized information repository or a dedicated shelf of investible projects.** A national shelf of investible projects can offer granular, state-wise project insights and business opportunities which are readily available for investors to evaluate and fund. This helps **enhance investor confidence** by streamlining the investment process, reducing perceived risks, saving time and cost of searching projects from scratch and helps investors focus on due diligence and financial structuring. The presence of a ready project pipeline further signals government commitment to boost investments in the sector and is particularly attractive if pre-vetted with prior approvals and compliances in place.

Nascent 'Blue Finance' ecosystem

Blue Finance refers to specialized financial products and expertise tailored to the ocean economy. In India, this ecosystem is nascent and struggles to finance projects at both ends of the spectrum, creating a critical "project size dilemma". This mismatch leaves a "missing middle" in the financial landscape, where both transformative large projects and disruptive small innovations struggle to secure appropriate funding. As investment in the Blue Economy increases, new financial instruments are critical to fund Blue Economy projects. Traditional venture capital and private equity remain key players, but innovative financing models such as **blue bonds, blended finance, and debt-for-nature swaps** are expanding access to capital and attracting new investors to the sector.

There is a need for a **Blue Taxonomy** to classify and encourage investments in sustainable and climate-friendly projects, aligning with India's commitment to **SDG 6 (Clean water and sanitation)** and **SDG 14 (Life below water)** besides being aligned with other SDGs including **SDG 2 (No Hunger), SDG 7 (Affordable and Clean Energy), SDG 13 (Climate Action) and SDG 12 (Responsible production and consumption)** as Blue Economy directly impacts coastal and island communities. While there exists a comprehensive, land-based green taxonomy, given the unique sustainability criteria for blue and green taxonomy, it is difficult to integrate the two. Thus, there is a need for different, clear and detailed definitions and dedicated frameworks for both land and sea. Complementing the green taxonomy, the blue taxonomy would further help strengthen India's focus on economic growth while balancing environmental priorities with sustainable use of marine and coastal resources.

Limited investor interest and risk appetite

There are typically two types of projects (i) complex, high-risk, and capital-intensive large-scale projects with long gestation periods (e.g., offshore wind farms) that frequently fall outside the risk appetite of traditional project financing offered by commercial banks and (ii) smaller projects, often driven by startups, that play a critical role in innovation, but are often termed "unbankable" or not feasible for large-scale investment, thereby struggling to find early-stage venture capital that understands the unique techno-commercial challenges of the blue-tech space.

The culmination of these factors creates a challenging risk-return profile that limits broader investor interest. The perceived risk of investing in the Blue Economy often outweighs the potential rewards for mainstream capital. This reluctance is driven by several factors rooted in the complex nature of the oceans:

- **High perceived risk:** The "uncharted" nature of the marine environment, coupled with climate-related uncertainties, elevates the perception of risk compared to land-based sectors.
- **Policy and regulatory ambiguity:** Inconsistent or slow regulatory processes

across states and ministries may create an unpredictable operating environment, making it difficult to model long-term returns.

- **Information asymmetry:** A general lack of reliable, long-term data on marine resources, ecosystem health, and market potential makes it difficult for investors to build confidence and commit capital.

Overcoming this **investor inertia** requires a concerted effort to de-risk the sector through clear policies, transparent data, innovative financial structures, and a robust pipeline of well-vetted projects.

Comparative currents: How global pioneers are shaping India's Blue Economy playbook

As India navigates these challenges, the paths forged by global pioneers offer a valuable playbook.

Mauritius: A Blue Economy trailblazer

Mauritius has established itself as a global leader in sustainable ocean governance through its innovative Blue Economy model. The island nation's transformative approach began with groundbreaking institutional reforms, including the establishment of the **world's first Ministry of Blue Economy** in 2020. Financial innovation has been equally remarkable. Mauritius pioneered the world's **first Sovereign Blue Bond** in 2018, raising US$15 million to fund marine conservation and sustainable fisheries.

The country's circular ocean economy initiatives showcase its technical ingenuity. The Deep Ocean Water Applications (DOWA) system harnesses cold deep seawater for multiple uses - from district cooling (reducing energy consumption by 40%) to high-value algae cultivation. Fisheries modernization introduced blockchain traceability and smart gear subsidies, cutting bycatch by 50% while creating 5,000 new jobs.

The Mauritian model demonstrates the potential of innovative financing instruments such as blue bonds and blended finance, which India could adapt through IFSCA-GIFT City to fund sustainable fisheries and coastal infrastructure. Mauritius' circular economy approaches offer replicable solutions for India's island territories. The successful development of the **Trade Intelligence platform** provides actionable templates for modernizing India's exports and resolving ocean-use conflicts while balancing ecological and economic priorities.

Singapore's Blue Economy transformation: A global game changer

Singapore's Blue Economy transformation offers a compelling model for India's maritime development, demonstrating how technological innovation, environmental sustainability, and economic growth can be strategically aligned. The city-state's US$20 billion Tuas Mega Port sets global benchmarks with its AI-powered logistics and all-electric operations, reducing vessel turnaround time by 40% while cutting emissions.

India may adopt smart port technologies at major hubs such as Jawaharlal Nehru Port (JNPT) and Mundra, develop a robust blue finance ecosystem through GIFT City, and foster marine tech innovation through dedicated startup funds. Singapore's experience demonstrates that every dollar invested in **port modernization** can generate US$3 in technological spillovers - a multiplier effect India could replicate given its scale advantages.

By implementing a phased roadmap beginning with pilot projects and scaling successful models, India can adapt Singapore's lessons to its context, accelerating progress toward its **US$100 billion Blue Economy vision** while positioning itself as a leader in sustainable maritime development. The Singapore case proves that with the right policy framework and technological deployment, developing nations can achieve both global competitiveness and climate resilience in their maritime sectors.

Framework for action: Key enablers and recommended actions

To translate the vision for India's Blue Economy into reality, a series of concrete, sequential steps must be undertaken. The following framework provides a clear roadmap, directly aligning the key inhibitors

identified previously with the specific, high-impact initiatives required to overcome them. Each recommended action is detailed with the key steps necessary for its successful implementation.

Inhibitor	Recommended action	Key implementation steps (Illustrative)
1. Limited Blue Economy Taxonomy	Develop and notify an **'Indian Blue Taxonomy'**	**A standardized taxonomy is the foundational layer for attracting credible, long-term capital.** ▪ Establish a **Multi-Stakeholder** Committee/National Task Force co-chaired by MoES and the Ministry of Finance, with representation from multiple Ministries and organizations such as the MoEF&CC, RBI, SEBI, financial institutions, and scientific bodies ▪ **Benchmark global standards**: Analyze existing frameworks (e.g., EU & ASEAN Taxonomies) to adapt best practices for the Indian context. ▪ Define **technical screening criteria**: For each key blue sector, define clear, science-based metrics and thresholds for what constitutes a "sustainable" "blue" investment. ▪ **Public and industry consultation**: Draft for 90-day public feedback to ensure market buy-in and acceptance. ▪ Finalize and notify: Incorporate feedback and formally notify the taxonomy ▪ Promote adoption: Work with **SEBI on "Blue Bond" guidelines** and with RBI to encourage its use in credit appraisal.
2. Absence of a Shelf of Investible Projects	Create a **National 'Shelf of Investible Projects'**	**This initiative will create a ready pipeline of bankable projects to present to potential investors.** ▪ Develop a **Standardized Project Template**: Comprehensive "**Project Information Memorandum**" covering project scope, location, land status, utility rates, preliminary EIA, capex, and projected returns. ▪ **State-level project sourcing**: Mandate the proposed **Blue Economy Business Desks** to work with state governments to identify and collate a list of potential projects from each coastal state/UT. ▪ **Centralized vetting and profiling**: Establish a technical committee within the Desk to conduct pre-feasibility assessments and create detailed profiles for the most viable projects. ▪ **Digital integration**: Digitize and host the complete project profiles on a secure section of the National Blue Economy Digital Portal for access by registered investors and interlink with various national portals such as India Investment Grid (IIG).

Inhibitor	Recommended action	Key implementation steps (Illustrative)
3. Nascent 'Blue Finance' Ecosystem & Project Size Dilemma	Credible and supportive ecosystem	This combined action addresses the financial mismatch by building a credible and supportive ecosystem. ▪ **Enable Blue financial products**: Use the new Blue Taxonomy as a foundation for SEBI to create clear guidelines for issuing listed Blue Bonds and other green-blue financial instruments. ▪ **Build a bankable pipeline**: Address the "project size dilemma" by using the Shelf of Projects to showcase both large-scale infrastructure projects and aggregated bundles of smaller, high-impact MSME/startup projects. ▪ Provide institutional support: Empower the **Blue Economy Business Desk** to act as an intermediary, helping to structure projects to meet investor requirements and connecting entrepreneurs with specialized funds, VCs, and multilateral development banks.
4. Limited Investor Interest & Unfavorable Risk-Return Profile	Improved investor experience	This comprehensive suite of actions directly de-risks the sector and builds investor confidence. ▪ **Investor handholding**: Utilize the Blue Economy Business Desk as a single point of contact to ensure timely information dissemination, project pitch, time-bound clearances. ▪ Mitigate information risk: Launch a **National Digital Portal** to provide 24/7 access to verified data, policies, and market intelligence, reducing information asymmetry. Implement the AI Query System for instant, transparent query resolution. ▪ Lower operational risk: Roll out the **Blue-Skill Capacity Programme** to ensure a steady pipeline of skilled talent, giving investors' confidence in the long-term operational viability of their projects. The combined effect of these initiatives creates a predictable, transparent, and supportive ecosystem that improves the overall risk-return profile for blue investments.

As the global narrative shifts towards sustainable ocean-based economies, India finds itself at a defining crossroads. The country has the resources, capacity, and ambition to lead, but this potential must be unlocked through cohesive institutional frameworks, digital platforms, blue financing solutions, and coordinated trade strategies. With strategic interventions and global collaborations, India can not only overcome current bottlenecks but also emerge as a global hub for trade, investment, and innovation in the Blue Economy sector.

3. Pathway to startups, innovation and technology

3.1 Startups driving innovation amid structural barriers

The Blue Economy—encompassing sustainable use of ocean resources for economic growth, livelihoods, and ecosystem health—is gaining global traction as nations recognize its potential to address climate change, food security, and energy needs. **Startups, with their agility, low-risk experimentation, and technological adaptability, are crucial for unlocking the Blue Economy's potential.** Some of the areas where startups offer promise include AI, blockchain and data analytics across solutions for instance, smart sensors and satellite tracking for real time data on illegal fishing or predictive analysis for optimizing feed. Globally, Blue Economy startups are pioneering solutions across marine renewable energy, sustainable fisheries, aquaculture, and ocean conservation. Countries such as **Norway, the UK, and Singapore** have actively supported these ventures through policy frameworks, incubators, and public-private partnerships. For instance, **Norway's Ocean Startup** Initiative has accelerated innovations in offshore wind and autonomous vessels, while the **UK's Marine-i program** provides funding and testing infrastructure for marine tech entrepreneurs. Similarly, **Singapore's Maritime and Port Authority (MPA)** fosters smart port technologies through blockchain and AI, reducing emissions and improving efficiency. **EcoWave Power (Israel)** commercialized wave energy technology through government-backed pilot projects, while **SafetyNet Technologies (UK)** uses AI to reduce bycatch in fisheries, attracting impact investors. The **Ocean Startup Project in Canada has funded over 50 ventures,** proving that targeted support can derisk early-stage innovation.

3.2. Inhibitors to startup and innovation

A comparative analysis of the global and Indian startup ecosystems reveals both challenges and opportunities for fostering growth in this nascent but critical sector. Despite encouraging momentum, encouragement in startups remains limited. Early-stage startups and innovators face persistent challenges that increase the cost of infrastructure, data availability, and complex laws. Their expansion is hindered by the absence of a clear sectoral taxonomy, funding gaps, and the overwhelming influence of established players. Even though limited, **investments in this sector remain disproportionately** dominated by large corporations, particularly in oil & gas, leaving innovative startups struggling to scale and access the market. Large corporations control key infrastructure (ports, drilling rigs, shipping lanes), making market entry difficult for smaller players. For example, startups developing **bio-based alternatives to plastics** or low-impact aquaculture systems struggle to compete with petrochemical and industrial fishing giants.

3.2.1 Funding gaps and investor hesitation

Blue Economy startups in India face a gap between R&D and commercialization. A 2023 NITI Aayog report[14] notes that less than 5% of Indian climate-tech funding targets ocean solutions, as investors perceive high risks in unproven marine technologies. Unlike IT or fintech, Blue Economy ventures require longer gestation periods and specialized infrastructure (e.g., testing tidal energy devices). While global funds like Ocean 14

[14] NITI Aayog (2023). *India's Blue Economy: Roadmap for Sustainable Growth*.

Capital (focused on aquaculture) actively invest in Europe and North America, India lacks equivalent domestic capital pools.

3.2.2 Regulatory and market access hurdles

Complex permitting processes delay pilot deployments. For instance, startups developing offshore renewable energy must navigate approvals from 10+ agencies, discouraging experimentation. Meanwhile, industrial fishing and port logistics remain dominated by incumbents resistant to disruptive technologies. Sea6 Energy, an Indian startup producing seaweed-based biofuels, struggled for years to secure large-scale farming rights due to unclear coastal zoning laws.

3.2.3 Absence of sectoral taxonomy and data

India lacks a unified classification system for Blue Economy activities, leading to misaligned policies. The FICCI-UNDP 2022 report[15] highlights that overlapping definitions for "marine biotechnology" and "coastal tourism" confuse investors. Open-data platforms like INCOIS (for oceanographic data) are underutilized, limiting startups' ability to leverage AI for predictive analytics.

3.2.4 Talent and skill gaps

The rapid pace of technological change outpaces workforce readiness. Startups competing with tech giants struggle to attract experts in AI, blockchain, and IoT due to high salary demands. Founders often lack technical expertise, relying on outsourced talent, which increases costs and reduces control. Educational systems lag in producing industry-ready professionals, forcing startups to invest heavily in training. This talent crunch slows product development and innovation, putting startups at a disadvantage.``

3.3 Comparative international and national stories: Pioneers shaping India's Blue Economy

As India navigates these challenges, the paths forged by global pioneers offer a valuable playbook.

3.3.1 Global success stories

UK-based AI startup for sustainable fishing

A London-based AI startup[16] is revolutionizing commercial fishing with its AI-powered LED lighting systems (Pisces) that reduce bycatch by up to 90%. By emitting specific light frequencies, the devices selectively attract target species while repelling endangered marine life. Supported by the UK Seafood Innovation Fund, the startup has partnered with fisheries across Europe, addressing the global problem of overfishing and ecosystem damage. Their success highlights how startups can bridge the gap between profitability and sustainability—key to attracting ESG-focused investors.

[15] FICCI-UNDP (2022). Accelerating India's Blue Economy·
[16] Cutting-Edge Safety Solutions

Israel-based wave energy firm

This became the world's first grid-connected wave energy company[17], deploying floating devices that convert ocean waves into clean electricity. After piloting in Gibraltar and Israel, the startup secured contracts in California and Brazil, proving the scalability of marine renewables. Their patented "float-on-top" technology reduces infrastructure costs by 70% compared to traditional offshore wind, showcasing how startups can overcome the high-capital barrier of Blue Energy projects.

3.3.2 India success stories

Chennai-based firm in underwater robotics for infrastructure inspection

The Chennai-based company[18] develops autonomous underwater vehicles (AUVs) and AI-powered inspection systems for ports, dams, and offshore oil rigs. Their solutions cut inspection costs by 50% and time by 80%, attracting clients like ONGC and Adani Ports. With funding from Tidal-X (Singapore) and IIT Madras, the company exemplifies how Indian startups can leverage deep-tech to solve industrial challenges while reducing the environmental footprint of maritime operations.

AI startup for sustainable aquaculture

The AI-startup[19], backed by larger players, uses satellite imagery and AI to help shrimp farmers optimize feed, monitor water quality, and predict disease outbreaks. By reducing feed waste and antibiotic use, the startup has improved yields for 10,000+ farmers while promoting eco-friendly practices. Their partnership with UNDP and the Indian government underscores the role of startups in aligning livelihoods with ocean conservation.[20]

3.4 Framework for action: Key enablers and recommended actions

To translate the vision for India's Blue Economy into reality, a series of concrete, sequential steps must be undertaken. The following framework provides a clear roadmap, directly aligning the key inhibitors identified previously with the specific, high-impact initiatives required to overcome them. Each recommended action is detailed with the key steps necessary for its successful implementation.

Inhibitor	Recommended action	Key implementation steps
Policy and governance enablers	Integrated, inter-departmental effort and coordination.	▪ Marine Innovation Hubs ▪ Marine Startup Index and innovation performance dashboard by MoES. ▪ Focused government-led procurement for Blue-tech startups

[17] Eco Wave Power - Wave Energy Company
[18] Underwater Visual Inspection Services | Planys Technologies
[19] South Asia's Largest Aquaculture Network
[20] Government of India – UNDP Partnership on Biodiversity Conservation

Inhibitor	Recommended action	Key implementation steps
Infrastructure and financing	Infrastructure for catalyzing innovation and adequate funding for sustaining them at the early stage is critical for long-term growth.	▪ While the existing funding programs and challenge-based grants through programs such as **TIDE 2.0** may be enhanced specifically for Blue-tech cases, dedicated incubators, prototyping facilities and funding mechanisms (Fund of funds) are necessary. Some of the other suggestions are as follows: - ▪ 'Marine Venture Catalyst' fund: To de-risk early-stage Blue Economy startups with focus on marine robotics, algae biotech, and offshore renewables. Offers seed grants, mentorship & pilot-testing support to facilitate ocean innovators. ▪ Seed support and mentorship via sector-specific innovation cohorts ▪ International funding and region-sector-stakeholders collaboration through international networks such as 1000 Ocean Startups to facilitate global exposure.
Skill development and capacity building	Mainstreaming Blue Economy in curriculum, focus on upskilling and re-skilling	▪ Due to its niche nature, developing and supporting the talent base in the Blue Economy sectors is extremely important. ▪ Embedding Blue Economy curriculum in technical universities ▪ 'Ocean Innovation Fellowships' for young scientists and engineers. ▪ Bootcamps and hackathons on themes such as marine robotics, blue AI, smart fishing. ▪ Sponsorship for coastal youth and fishers for skilling programs in marine tech

Startups are pioneering disruptive solutions—from AI-driven fisheries to wave energy—that demonstrate the viability of sustainable ocean industries. However, structural barriers like **funding gaps, regulatory complexities**, and **talent shortages** hinder scaling. If we work towards, more active startup network it will prove that with targeted support, startups can derisk innovations for larger investors. For startups to attract capital, streamlined EoDB frameworks are critical. In the subsequent chapter we will be understanding bridging gap.

4. Navigating business reforms: Streamlining India's Blue Economy ecosystem

Streamlining complex, multi-stakeholder business landscape

Ease of Doing Business (EoDB) in Blue Economy is essential as it directly impacts investments, both large scale and by startups, reducing bureaucratic hurdles, clarifying legal pathways, and creating stable operating environments — particularly for ocean-based industries where operations span multiple jurisdictions and regulatory bodies. EoDB indicators — measuring factors such as permit processing times, contract enforcement, and tax compliance — become magnified in marine sectors due to their complex spatial governance. Where terrestrial businesses might interact with one or two agencies, ocean enterprises often require approvals from maritime, environmental, fisheries, and coastal authorities simultaneously.

Streamlined EoDB frameworks help mitigate the following critical investment barriers:

a) **Regulatory fragmentation:** A significant constraint to business facilitation in the Blue Economy is the fragmentation of regulatory authority across **multiple ministries and departments.** These **institutional overlaps** often result in conflicting mandates, lack of policy coherence, and delays in project implementation. The absence of a centralized, integrated clearance mechanism adds to the **procedural burden** faced by stakeholders operating in coastal and marine sectors.

b) **Clearance and licensing delays:** Delays in obtaining critical clearances—such as those under the Coastal Regulation Zone (CRZ) norms, Environmental Impact Assessments (EIAs), and permits for port development—act as **deterrents for investment and project execution.** Licensing procedures for marine activities such as fishing, aquaculture, and coastal tourism remain complex, and time-consuming, further limiting private sector participation.

c) **Infrastructure and connectivity gaps:** The underdevelopment of port-related infrastructure, lack of last-mile connectivity, and absence of cold chain and logistics infrastructure hinder **operational efficiency**. Moreover, there is **limited digital integration** in port operations, cargo handling, and customs processing, which affects turnaround times and increases transaction costs.

d) **Financial and technological barriers:** Marine-based micro, small, and medium enterprises (MSMEs) face challenges in **accessing institutional credit** due to high perceived risk and inadequate collateral. There is also a **lack of awareness and capacity** to adopt modern technologies that can enhance sustainability, productivity, and value addition across the blue value chain.

e) **Lack of Blue Economy-specific policies:** India currently lacks a comprehensive national framework to address EoDB in the Blue Economy in an integrated manner. Most interventions are sectoral and implemented in silos, resulting in duplication of efforts and suboptimal outcomes. There is an urgent need for policy harmonization to unlock the sector's full economic and ecological value.

- **Limited investor facilitation:** Investors are required to apply for business approvals or take clearances from across different ministries (MoES, MoPSW, MoEFCC, MoAHD) that often leads to significant delays. A **dedicated Blue Economy Business Desk** can streamline such interactions.

- **Limited market intelligence and awareness campaigns:** Exporters and MSMEs require real-time data/ information on market insights, recent developments, incentives, and applicable schemes for critical business decision making. In Andhra Pradesh, a seafood exporter was unaware of PMMSY's cold-chain subsidy. Therefore, funding for critical infrastructure was lost.

Comparative currents: How global pioneers are shaping India's Blue Economy

This table highlights international best practices in ocean governance, technology, and infrastructure that India can adapt to strengthen its Blue Economy framework, foster ease of doing business, and attract sustainable investments.

Countries leading in Blue Economy growth have intentionally designed EoDB reforms targeting marine sectors:

1. **Singapore's Maritime Single Window**
   By digitizing and consolidating 16 separate port clearances into one platform, Singapore reduced ship turnaround time by 60,000 hours annually (MPA, 2022). This efficiency helped attract US$700 million in maritime tech investments between 2020 and2023, including startups like Wavelink (AI for port logistics).[21]
2. **Chile's Aquaculture Licensing Reform**
   Facing 34-month wait times for aquaculture permits, Chile implemented risk-based zoning and parallel processing in 2018. Approval times dropped to 8 months, triggering US$1.2 billion in new salmon farming investments (UNDP, 2021).[22]
3. **European Union's Blue Economy Observatory**
   The EU's centralized data platform standardizes ocean industry metrics across 22 countries, reducing due diligence costs by an estimated 30% for marine investors (EC, 2022).[23]

[21] Maritime and Port Authority of Singapore (2022) https://www.mpa.gov.sg
[22] UNDP Chile (2021) https://www.cl.undp.org
[23] European Commission (2022) https://ec.europa.eu/oceans-and-fisheries

Beyond the shoreline with next frontiers for India's Blue Economy

a) **Institutional and regulatory streamlining:** To overcome departmental silos, a centralized **Inter-Ministerial Coordination Committee (IMCCBE)** is essential for aligning policies and timelines across ministries. Introducing a **Blue Economy Single Window System (BESWS)** would allow businesses to seek permissions related to aquaculture, shipping, tourism, and ports through a single, unified digital interface—reducing redundancy and approval delays. In addition to this, a Blue Economy Business **Desk** through MoES in collaboration with line ministries and states could act as a one-stop-shop with key responsibilities, including (i) providing knowledge transfer, research, and thought leadership, (ii) conducting stakeholder consultations and investor roadshows, (iii) driving the formulation and implementation of a new Blue Economy Policy and (iv) formulation of a **National Coastal and Inland Shipping Strategic Plan** and establishing a **National Database for Coastal Shipping** to seek information, issue directions, and enforce compliance, while empowering the Central Government to provide exemptions and regulatory oversight, ensuring streamlined and efficient coastal shipping operations in India.

b) **Digitization and time-bound services:** Following the Business Reform Action Plans (BRAP), regulatory approvals such as CRZ, EIA, and port licenses could move to **time-bound, digital systems with automated tracking and escalation.** Linking these with platforms such as Customs ICEGATE, DG Shipping, and SEZ Portals would create transparency and faster turnaround. Deadlines could be enforced under state-level Public Service Guarantee Acts wherever applicable.

c) **Transparent and risk-based inspection systems:** Regulations must protect resources without creating procedural bottlenecks. Adopting **risk-based inspections** may reduce compliance burden. Inspection systems for aquaculture farms and port facilities can include features like digital scheduling, auto-generated reports, and geo-tagging to enable both ease and accountability. Integration of these with **Blue Economy Single Window System** could help prevent duplication of checks across agencies.

5. Way ahead

India's Blue Economy stands at an inflection point, offering tremendous potential to drive sustainable economic growth while preserving marine ecosystems. Drawing inspiration from global leaders, India must adopt a holistic approach that combines policy innovation, technological advancement, and strategic investments. The establishment of a dedicated **Blue Economy Authority** could streamline currently fragmented governance structures, while a **digital single-window clearance system** would significantly improve ease of doing business for maritime enterprises. Financial innovation through **blue bonds and blended finance mechanisms** can unlock capital for critical sectors such as offshore renewables, sustainable fisheries, and marine biotechnology.

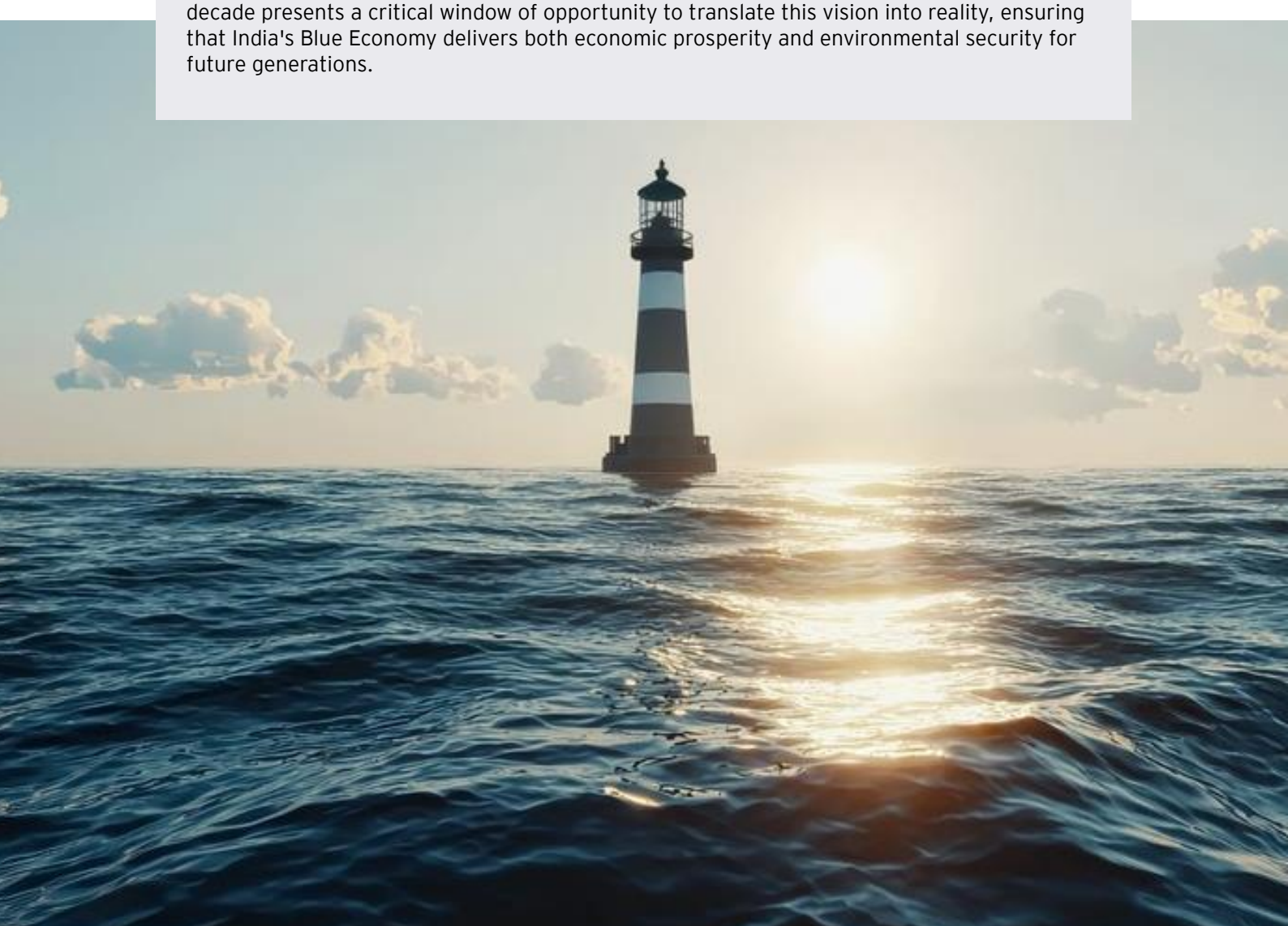
Technology adoption will be crucial to India's Blue Economy transformation. Implementing blockchain for fisheries traceability, AI-powered port logistics, and IoT-enabled aquaculture systems can enhance efficiency and sustainability. The development of specialized **blue tech hubs** along India's coastline, modelled after Portugal's successful clusters, could foster innovation and entrepreneurship. Simultaneously, India must consider investing in marine spatial planning to balance economic activities with ecological conservation, learning from Indonesia's integrated approach.

For long-term success, India could focus on **building capacity and fostering international collaborations. Skill development programs for coastal communities,** coupled with knowledge exchange initiatives such as the India-Norway partnership, would create a skilled workforce ready to capitalize on emerging opportunities. The integration of climate-smart solutions—such as mangrove restoration for carbon credits and floating solar installations—would ensure environmental sustainability remains central to Blue Economy growth.

Pillar	Inhibitor	Key enabler	Recommended action
Trade and investment	**Lack of a Standardized Blue Taxonomy**	Standardized classification and metrics	Develop and notify an official **Indian Blue Taxonomy** in consultation with industry and financial institutions, aligning with global best practices and India's SDG commitments.
	Absence of investible projects	Curated Blue Economy project pipeline	Create and maintain a national **Shelf of Investible Projects** including PPP opportunities.
Startup and innovation	**Innovation-to-commercialization gap**	Integrated R&D and incubation support	Establish a dedicated **Blue-Tech Innovation Fund** and a network of coastal incubators to support startups from ideation to market entry, fostering deep-tech R&D.
	Sector-specific incubation and infrastructure deficit	Thematic prototyping facilities and cohorts	Create **sector-specific innovation cohorts** and physical infrastructure for startups in areas like blue biotech, sustainable aquaculture, and renewable marine energy (e.g., offshore tech testing sites).
	Niche talent gap for high-tech marine roles	Innovation-focused human capital development	Launch prestigious **Ocean Innovation Fellowships** for young scientists and engineers; sponsor thematic bootcamps, hackathons, and skilling programs for coastal youth in emerging marine technologies.

	Limited capacity of MSMEs	Targeted skill development	Roll out a national **Blue-Skill Capacity Building Programme** for MSMEs, focusing on technical know-how, international market access, and sustainability certifications.
Ease of Doing Business	**Fragmented policy and regulatory hurdles**	Unified governance and single-window clearance	Establish the **Blue Economy Business Desk** to act as a one-stop shop for all approvals and formulate a single, overarching **National Blue Economy Policy**.
	Archaic and complex maritime trade laws	Modernized, pro-trade legislation and procedures	Enact and implement future-ready legal framework and digitize port entry clearances to boost maritime trade and cruise tourism.
	Lack of centralized query resolution	Harmonized Stakeholder Engagement	Implement an **AI-powered Digital Query Management System** within the Blue Economy Digital Portal.

The path forward requires coordinated action across government, private sector, and research institutions. By implementing these strategic interventions, India can position itself as a global leader in sustainable ocean-based development, achieving its ambitious targets while setting new benchmarks for responsible marine resource utilization. The coming decade presents a critical window of opportunity to translate this vision into reality, ensuring that India's Blue Economy delivers both economic prosperity and environmental security for future generations.



6. Abbreviations

Abbreviations	Full Form
AI/ML	Artificial Intelligence/Machine Learning
AIC	Atal Innovation Centres
AIM	Atal Innovation Mission
ASEAN	Association of Southeast Asian Nations
AUV/ROV	Autonomous Underwater Vehicle/Remotely Operated Vehicle
BBNJ	Biodiversity Beyond National Jurisdiction Agreement
BE	Blue Economy
BESWS	Blue Economy Single Window System
BIMSTEC	Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation
BRAP	Business Reform Action Plan
CAA	Coastal Aquaculture Authority
CAMPA	Compensatory Afforestation Fund Management and Planning Authority
CEZ	Coastal Economic Zones
CFA	Central Finance Assistance
CIFRI	Central Inland Fisheries Research Institute
CIFT	Central Institute of Fisheries Technology
CMFRI	Central Marine Fisheries Research Institute
CRZ	Coastal Regulation Zone
CSIR-OMEGA	Council of Scientific & Industrial Research - Ocean Monitoring and Environmental Applications
CSR	Corporate Social Responsibility
DBT	Direct Benefit Transfer
DG Shipping	Directorate General of Shipping
DOM	Deep Ocean Mission
DOWA	Deep Ocean Water Application
EEZ	Exclusive Economic Zone

Abbreviations	Full Form
EIAs	Environmental Impact Assessments
EoDB	Ease of Doing Business
EU	European Union
FDI	Foreign Direct Investment
FIDF	Fisheries Infrastructure Development Fund
FICCI	Federation of Indian Chambers of Commerce and Industry
FPO	Farmer Producer Organization
GDP	Gross Domestic Product
GIS	Geographic information system
GoI	Government of India
GRIP	Graduate Research Innovation Programme
ICEGATE	Indian Customs Electronic Gateway
IFSCA	International Financial Services Centres Authority
IIG	India Investment Grid
IIT	Indian Institute of Technology
IMCCBE	Inter-Ministerial Coordination Committee
INCOIS	Indian National Centre for Ocean Information Services
IORA	Indian Ocean Rim Association
IoT	Internet of Things
IPOI	Indo-Pacific Oceans Initiative
ITI	Industrial Training Institute
IWAI	Inland Waterways Authority of India
JMVP	Jal Marg Vikas Project
JNPT	Jawaharlal Nehru Port
KG	Krishna Godavari
KSUM	Kerala Startup Mission
MBARI	Monterey Bay Aquarium Research Institute

Abbreviations	Full Form
MDE	Marine Data Exchange
MFRA	Marine Fisheries Regulation Acts
MGNREGS	Mahatma Gandhi National Rural Employment Guarantee Scheme
MISHTI	Mangrove Initiative for Shoreline Habitats & Tangible Incomes
MNRE	Ministry of New and Renewable Energy
MoA&FW	Ministry of Agriculture and Farmer's Welfare
MoEF&CC	Ministry of Environment, Forest and Climate Change.
MoES	Ministry of Earth Sciences
MoFAH&D	Ministry of Fisheries, Animal Husbandry and Dairying
MoPSW	Ministry of Ports, Shipping and Waterways
MPEDA	Marine Products Export Development Authority
MSMEs	Micro, small, and medium enterprises
MSP	Marine Spatial Planning
NCSCM	National Centre for Sustainable Coastal Management
NFDP	National Fisheries Development Program
NGHP	National Gas Hydrate Programme
NGO	Non-Government Organisation
NIFPHATT	National Institute of Fisheries Post Harvest Technology and Training
NIOT	National Institute of Ocean Technology
OECD	Organisation for Economic Co-operation and Development
ONGC	Oil and Natural Gas Corporation Limited
O-SMART	Ocean Services, Modelling, Applications, Resources & Technology
OTEC	Ocean Thermal Energy Conversion
PE/VC	Private equity / Venture capital
PLI	Production Linked Incentive
PMKVY	Pradhan Mantri Kaushal Vikas Yojana
PMMSY	Pradhan Mantri Matsya Sampada Yojana

Abbreviations	Full Form
PPPs	Public-Private Partnerships
R&D	Research and Development
S2I2	Sagarmala Startup and Innovation Initiative
SDG	Sustainable Development Goals
SEBI	Securities and Exchange Board of India
SEZ	Special Economic Zones
SHG	Self-Harm Groups
SIDBI	Small Industries Development Bank of India
STRIVE	Skills Strengthening for Industrial Value Enhancement
TANSIM	Tamil Nadu Startup and Innovation Mission
TBT	Technical Barriers to Trade
TIDE	Technology Incubation and Development of Entrepreneurs
UNCLOS	United Nations Convention on the Law of the Sea
UNU	United Nations University
UT	Union Territory
VC	Venture Capital
VGF	Viability Gap Funding
WTO	World Trade Organisation

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8. Annexure

A. Literature review of Blue Economy contribution in India's GDP

Blue Economy contribution fact	Name of study/report	% of contribution	Assessment model used	Source	Year	Industry standard
"The fisheries and aquaculture sectors contribute around 4% to the national GDP."	*"Economic Contribution of Fisheries"*	4%	Output Method	Ministry of Fisheries, India	2019	ISIC
"The maritime sector's contribution to GDP is estimated at 4%."	*"Maritime Sector and its Contribution to GDP"*	4%	Output Method	Ministry of Shipping, India	2020	ISIC
"The blue economy contributes significantly to GDP, with estimates around 4%."	*"The Ocean Economy: A Global Perspective"*	4%	Input-Output Table	United Nations Environnent Programme (UNEP)	2020	NACE
"Coastal and marine resources contribute about 4% to the GDP."	*"State of the Marine Economy"*	4%	Input-Output Table	World Bank	2021	ISIC
"The blue economy is projected to contribute 4% to India's GDP."	*"Blue Economy: A Study of India's Potential"*	4%	Input-Output Table	Research and Information System (RIS)	2021	ISIC
"The sustainable development of coastal areas can enhance the blue economy's	*"Sustainable Coastal Development in India"*	4%	Input-Output Table	National Institute of Oceanography (NIO)	2022	ISIC

Blue Economy contribution fact	Name of study/report	% of contribution	Assessment model used	Source	Year	Industry standard
contribution to 4% of GDP."						
"The blue economy's contribution to GDP is assessed at 4%."	*"National Accounts Statistics"*	4%	Input-Output Table	Ministry of Statistics and Programme Implementation (MoSPI)	2022	ISIC

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8th Floor, O-Hub, Tower A
Chandaka SEZ, Bhubaneswar
Odisha – 751024
Tel: + 91 674 274 4490

Chandigarh

Elante offices, Unit No. B-613 & 614
6th Floor, Plot No- 178-178A
Industrial & Business Park, Phase-I
Chandigarh - 160 002
Tel: + 91 172 6717800

Chennai

6th & 7th Floor, A Block,
Tidel Park, No.4, Rajiv Gandhi Salai
Taramani, Chennai - 600 113
Tel: + 91 44 6654 8100

Delhi NCR

Aikyam
Ground Floor
67, Institutional Area
Sector 44, Gurugram - 122 003
Haryana
Tel: +91 124 443 4000

3rd & 6th Floor, Worldmark-1
IGI Airport Hospitality District
Aerocity, New Delhi - 110 037
Tel: + 91 11 4731 8000

4th & 5th Floor, Plot No 2B
Tower 2, Sector 126
Gautam Budh Nagar, U.P.
Noida - 201 304
Tel: + 91 120 671 7000

Hyderabad

THE SKYVIEW 10
18th Floor, "SOUTH LOBBY"
Survey No 83/1, Raidurgam
Hyderabad - 500 032
Tel: + 91 40 6736 2000

Jaipur

9th floor, Jewel of India
Horizon Tower, JLN Marg
Opp Jaipur Stock Exchange
Jaipur, Rajasthan – 302018

Kochi

9th Floor, ABAD Nucleus
NH-49, Maradu PO
Kochi - 682 304
Tel: + 91 484 433 4000

Kolkata

22 Camac Street
3rd Floor, Block 'C'
Kolkata - 700 016
Tel: + 91 33 6615 3400

Mumbai

14th Floor, The Ruby
29 Senapati Bapat Marg
Dadar (W), Mumbai - 400 028
Tel: + 91 22 6192 0000

5th Floor, Block B-2
Nirlon Knowledge Park
Off. Western Express Highway
Goregaon (E)
Mumbai - 400 063
Tel: + 91 22 6192 0000

3rd Floor, Unit No.301
Building No.1, Mindspace-Gigaplex
IT Park, MIDC, Plot No. IT-5
Airoli Knowledge Park
Airoli West, Navi Mumbai - 400 708
Tel: + 91 22 6192 0003

Altimus, 18th Floor
Pandurang Budhkar Marg
Worli, Mumbai - 400 018
Tel: +91 22 6192 0503

Pune

C-401, 4th Floor
Panchshil Tech Park, Yerwada
(Near Don Bosco School)
Pune - 411 006
Tel: + 91 20 4912 6000

10th Floor, Smartworks
M-Agile, Pan Card Club Road
Baner, Taluka Haveli
Pune - 411 045
Tel: + 91 20 4912 6800

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