



Indian Climate Leadership

Harnessing the Blue Economy

BLUE ECONOMY
WHITE PAPER



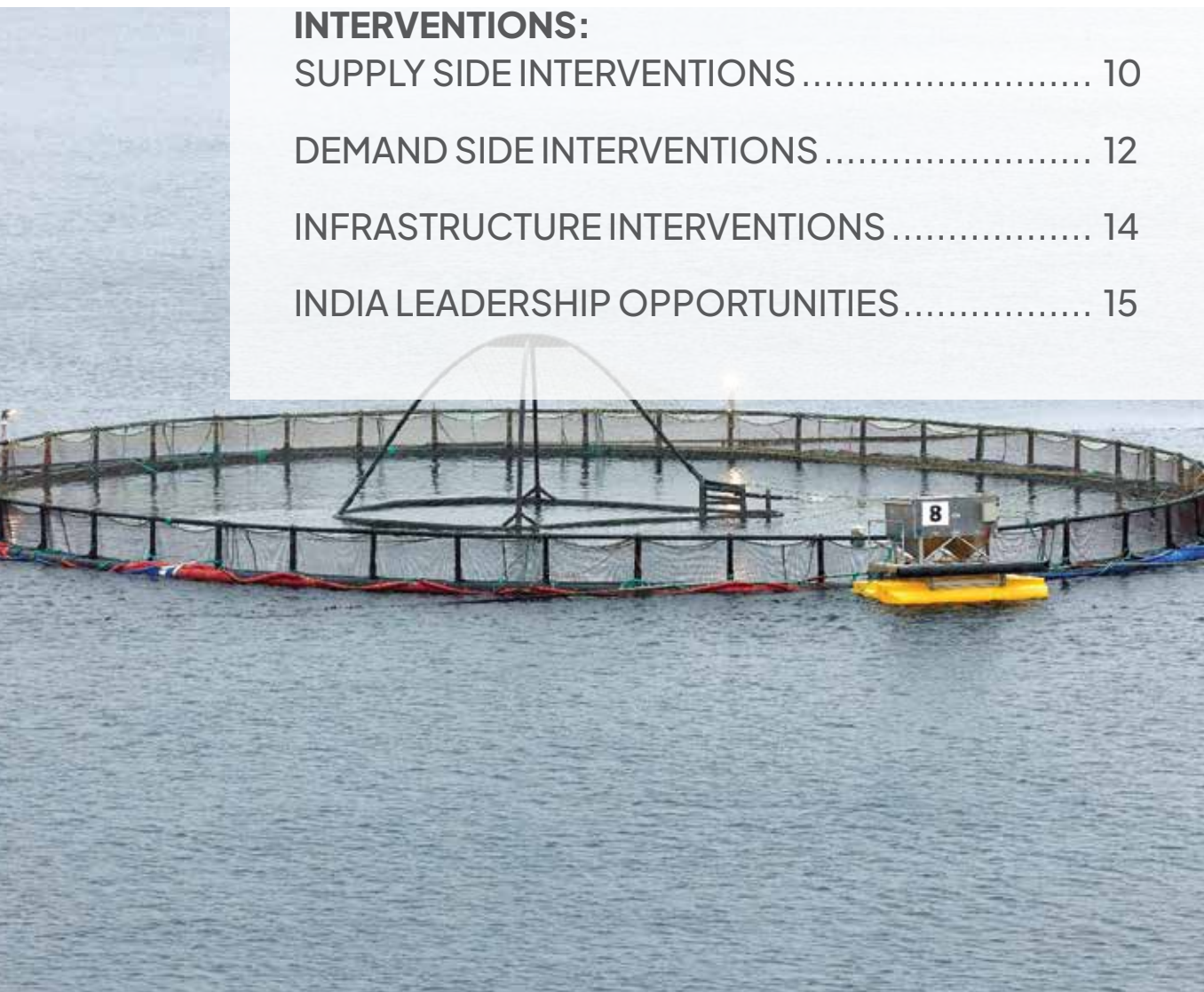


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EXECUTIVE SUMMARY

India is the 3rd largest fish producing country in the world, accounting for 8 percent of global production. Through such fish production, India addresses a significant global and domestic demand for an affordable quality source for fish protein. Further, India's domestic demand for fish produce is likely to grow in the coming years - with a rise in population levels (India's population is projected to grow to 1.66 billion by 2050), and as more people diversify diets away from cereals to proteins and fats. India's fisheries sector has been recognised as a 'sunrise sector' due to its rapid growth in recent years, and its potential for future expansion. The sector employs more than 28 million people and is an important source of income and employment - particularly for marginalised and vulnerable communities across the country.

Fisherfolk in India face a range of challenges. Climate change disproportionately affects the livelihoods of fishing communities – the rise in sea levels and in the temperatures of ocean waters alters the distribution and productivity of marine species. The increasing rates of accidents at sea fuelled by low-quality fishing equipment, poor construction techniques, and changes in the frequency and intensity of storms and weather patterns also discourage younger generations from employment within this sector. Further, India's nearshore marine resources have been under increasing pressure due to the open access nature of fisheries in the country. Most Indian fisherfolk use non-mechanised boats without satellite/GPS tracking - which can travel only up to a radius of 5 kilometres. Thus, most Indian fisherfolk operate within the same range of natural waters/marine resources, causing a

considerable depletion of natural fish stocks in these areas. At the same time, the growth of motorised and mechanised vessels/fleets in the last 50 years has increased fishing pressures on marine resources further offshore, thereby depleting fish stocks in those areas rapidly.

Other elements of the supply side crisis are caused by the environmental destruction due to poor fishing and catching practices. Large trawlers employ widespread nets that sweep the ocean floor, damaging fragile ocean habitats and harvesting marine species indiscriminately. This type of unselective fishing practice causes overfishing - large trawlers also catch juvenile fish before they have a chance to mature and reproduce, thereby affecting fish populations now and in the future. Factors like habitat degradation, and environmental pollution in marine and aquatic ecosystems threaten marine fish stocks. Pollution-related challenges are also present in aquaculture farms, wherein inadequate extension services and improper pond management systems are associated with rising instances of pest outbreaks and diseases affecting fisheries, and the supply of fish produce to domestic and international markets. In addition, post-harvest losses are exacerbated by the lack of adequate infrastructure and cold storage facilities, and gaps in supply chain management. Weak supply chains makes the flow of seafood products from fishers to end consumers less efficient, while exposing fisherfolk to shocks such as reductions in fish availability, increase in fish spoilage and wastage, market fluctuations, and extreme weather.

In order to mitigate these challenges and leverage potential opportunities within India's blue economy, a 'fisher first approach' is required - this means placing the lives and livelihoods of India's fisherfolk at the centre, by ensuring a defined role for fisherfolk in managing water resources, by empowering them through innovation and robust supply chains, and by promoting sustainable and climate-resilient fisheries management. A 'fisher first approach' will focus on building solutions to primarily address the vulnerability experienced by fisherfolk on account of various economic, environmental, and technological challenges. In line with this approach, the following actions are recommended:

- **Fisher community voices should be made more integral to policy discourse and business practice.** It is vital to ensure the participation of coastal communities in all decision-making forums - be it at the Centre, State or local levels. This would help ensure the empowerment of local communities, and the representation of traditional fisherfolk in key platforms for policy and business planning.
- **Policy guidelines should ensure adequate safety nets for small-scale fisherfolk:** Alternative plans for such communities should include training, capacity building, and skill development. Further, all coastal infrastructure projects should ensure minimal costs to the environment and to the socio-economic conditions of fisherfolk to reduce risks and vulnerabilities for coastal communities.
- **Natural asset pricing processes should be employed in India's blue economy:** Given the large-scale carbon sequestration, coastal protection, biodiversity and habitat preservation, water quality improvement, and climate hazard mitigation benefits accruing from mangroves, there is a strong case to protect and restore them through policy natural asset pricing. Natural asset pricing can help adequately recognise their economic benefits (in terms of their impetus to India's fisheries) which are linked to their environmental benefits (including flood protection, soil and coastal protection, climate resilience and biodiversity protection).
- **Financial support solutions should be fostered to build resilient fisherfolk communities:** It would be important to explore private-public partnerships and green financing mechanisms to support sustainable fishing initiatives. Financial support solutions for fisherfolks like micro credit schemes, low-interest loans, insurance coverage (for fishing gear and fishing equipment) and targeted subsidies to increase renewables energy on boats or for fuel can help support the ordinary fisher folks and enhance their resilience at the community level.
- **Technology solutions should be used to translate science into fishing practices:** Coupled with improved fisheries management, providing small scale fishers with affordable GPS navigation systems, and communication tools can enhance their safety and efficiently bridge the technology gaps. While respecting and integrating the traditional knowledge of fisherfolk, it is also important to utilise cutting-edge technological solutions - such as satellite techniques, climate models, electronic data reporting and monitoring, and eDNA - to improve fisheries science and management.
- **An umbrella brand for domestically produced fish should be developed:** It is worth exploring the potential for formalising the presently informal Indian fish market, by creating an umbrella enterprise for fisheries maybe even across the country, but certainly in key states. This will help optimise fish production - by strengthening domestic supply chains and enhancing domestic demand for high-quality and affordable fish protein.

- **Collectivisation should be promoted to enhance market linkages and technology access:** Fish farmer producer organisations (FFPOs) should be promoted as integrated platforms for the delivery of products, for strengthening market linkages, and for promoting capacity building of fisherfolk. This will also help enhance the bargaining power of fishing communities and ensure greater price discovery – thereby transforming Small Scale Fishers (SSFs) from price takers to price makers.
- **Support 'blue food' sources and aquatic food systems:** Policy, technological and financial support should be provided to resilient aquatic food systems that contribute to health, regenerative ecosystems, and sustain food and nutrition security. This should be coupled with preserving and restoring marine and inland ecosystems, to ensure the flow of economic, nutritional and environmental benefits for communities.
- **Infrastructure interventions should be prioritised to compete at the global level:** Outward-facing infrastructure interventions are required at the port level, especially in enhancing transshipment efficiency to boost sustainability. In addition, inward-facing infrastructure interventions should look at exploring the fish production potential of inland waterways. Infrastructural interventions should also focus on enhancing the connectivity of landing sites with cold storage facilities and processing centres, which are further in-land.
- **Research and development efforts should be promoted within the fisheries sector:** It would be important to leverage India's research capabilities in this sector in the country's immediate neighbourhood – across South and Southeast Asia, similar to how this has been achieved in other sectors like dairy or rice. It is also worth exploring the potential of establishing a global fisheries institute in India – to foster R&D, provide credible technical support, and to lead the way in future technological innovation and research efforts.



FISHER FIRST APPROACH

As the 3rd largest fish producing country in the world, India accounts for 8 percent of global fish production. In 2021-22, India produced 16.24 million tonnes of fish, of which 75 percent was contributed to by aquaculture and 25 percent by marine fisheries¹. India's fish produce accounts for 1.1% of its Gross Value Addition (GVA) and 6.72% of its agricultural GVA². Through such fish production, India addresses a significant global and domestic demand for an affordable quality source for fish protein. The sector is closely tied to Sustainable Development Goal (SDG) 14 - which focusses on life under water. More than 28 million people are employed in India's fisheries sector - which has been recognised as a 'sunrise sector' due to its rapid growth in recent years³. The sector is an important area for income generation and nutrition security - particularly for vulnerable and marginalised communities in different parts of India and has contributed to their socio-economic development.

At the same time, fisherfolk communities face multidimensional challenges that threaten their income security. Notably, the burdens of climate change tend to disproportionately affect fisherfolk communities⁴ - with climatic conditions drastically changing, there has been a progressive increase in sea levels. In addition, factors such as an increase in the temperature of the ocean, alongside extreme weather events (such as cyclones, storms)⁵ alter the distribution and productivity of fish species. Further, the increasing rates of accidents at sea fuelled by low-quality fishing equipment, poor construction techniques, and changes in the frequency and intensity of storms and weather patterns also discourage younger generations from employment within this sector. In addition, supply side challenges and infrastructure gaps within the fisheries sector (outlined in the later sections) are limiting the availability and access to key sources of nutrition and livelihood outcomes for fisherfolk communities.

To mitigate these challenges, a 'fisher first approach' is required - this means placing the lives and livelihoods of India's fisherfolk at the centre, by ensuring a defined role for fisherfolk in managing water resources, by empowering them through innovation and robust supply chains, and by promoting sustainable and climate-resilient fisheries management. To do so it is important to look across India's blue economy, to identify pathways to improve the socio-economic conditions of all fishing communities in India, while enhancing India's GDP and leadership opportunities in global trade and protecting the environment. This is particularly critical since climate-related measures are often absent from fisheries management, and less than 4 percent of climate funding is directed towards food systems⁶. A 'fisher first approach' will focus on building solutions to primarily address the vulnerability experienced by fisherfolk on account of various economic, social, environmental, and technological challenges, while identifying macro-level opportunities for improving India's growth potential. This will therefore necessitate working at national levels and in communities where policies and solutions touch the ground - through the implementation of climate action plans and the delivery of technology, finance, and capacity building⁷.

1. Invest India, Government of India. 2023. www.investindia.gov.in/sector/fisheries-aquaculture

2. Invest India, Government of India. 2023. www.investindia.gov.in/sector/fisheries-aquaculture

3. Press Information Bureau, Government of India. 2021. www.pib.gov.in/PressReleasePage.aspx?PRID=1786303

4. Pulitzer Centre. (2022). <https://pulitzercenter.org/stories/front-line-climate-change-fisherfolk-stare-abys>

5. The Energy and Resources Institute. (2020) <https://shorturl.at/nHKRV>

6. Environmental Defence Fund. (2023). <https://shorturl.at/diylS>

7. Environmental Defence Fund. (2023). <https://shorturl.at/diylS>

At the community level, a key element of the 'fisher first approach' is amplifying the fisher community voices in decision-making to inform policy discourse and business practice-at local, regional and national levels. It is vital to ensure the participation of coastal communities in all decision-making forums - be it at the State level or the Centre. This would help ensure the representation of traditional communities in key platforms for policy and business planning. Presently, a number of developmental projects are being executed along India's coastlines - from the Sagarmala Project to Coastal Highway Development. However, several coastal communities are not adequately involved in discussions for these projects, and going forward, their participation must be ensured to foster inclusive knowledge and benefit sharing. Further, a 'fisher first approach' should be supported by the co-production of knowledge, with the traditional insights and indigenous wisdom of traditional fishing communities flowing into State and National level policy guidelines. Going forward, understanding how the fisherfolk have adapted and are adapting to climate change, or traditionally and currently practise fishing across various water bodies will be crucial for framing policy guidelines or business incentives. In addition, the 'fisher first approach' should focus on identifying and diversifying risks in the fisheries sector - by integrating fisheries management to ensure sustainable fish populations, integrating new technologies and fishing practices to reduce operating costs, improving quality, exploring value-added products, and minimizing waste. Coupled with financial inclusion and community development capacity building approaches, together these will help fisherfolk in enhancing their incomes and in diversifying their livelihoods in the face of climate change and other challenges.

Furthermore, policy guidelines should ensure adequate safety nets for small-scale fisherfolk - particularly women - who may be presently less equipped to directly benefit from large-scale infrastructure projects such as port development and deep-sea exploration. Alternative plans for such communities should include training, capacity building, and skill development. Further, all coastal infrastructure projects should ensure minimal costs to the environment and to the socio-economic conditions of fisherfolk - so as to reduce risks and vulnerabilities for coastal communities, in line with the 'fisher first approach'.

VALUING THE OVERLOOKED

There is value in exploring innovative approaches to enhance the sustainability of wild fish stocks, while optimising existing eco-system services from habitats, using nature-based shoreline infrastructure, and employing sustainable practices to protect communities. Given the complex and dynamic landscape of the blue economy in India, there is a growing need for multidimensional approaches, spanning financial, technological, and partnership solutions. This would include the use of integrated ecosystem planning and marine spatial planning to analyse and allocate the spatial and temporal distribution of human activities in natural/marine areas. Such planning strategies are crucial for considering the trade-offs between different development plans⁸, and for building socio-economic and ecological resilience, while empowering communities and nature to thrive^{9,10}.

8. Convention on Biological Diversity. (2018). www.cbd.int/cepa/cepafair/2018/presentations/cepa-fair-2018-giz-values-pub.pdf

9. Environmental Defence Fund. (2023). <https://shorturl.at/gzSVY>

10. Intergovernmental Oceanographic Commission. (2023). <https://rb.gy/gykzf2>

Natural asset pricing has growing relevance, wherein monetary values are attached to various environmental services - such as food provision, climate regulation, biodiversity conservation, eco-system services etc. There is a vital need to assign value to assets that are not easy to monetise - such as social assets, cultural values, and environmental services. Pricing natural assets or services is a crucial way to regulate, provision and apportion the services and resources provided by nature, while limiting instances of harmful exploitation¹¹. In the context of India's blue economy, natural asset pricing can create awareness on the economic value of and incentive to protect natural resources - imputed from the value of eco-system services - thereby making a strong case for the protection of natural marine reserves, and for the sustainability of the overall sector. So far, natural asset pricing is an untapped avenue, even though it has the potential to enhance the sustainability of India's blue economy - by attaching value to natural resources that are presently perceived as 'free' and 'available for common use'.

Given the large-scale benefits accruing from mangroves, there is a strong case to protect and restore them through policy support and natural asset pricing. Globally, mangroves sequester 22.86 metric gigatons of CO₂, which is about half of the annual CO₂ emissions from the burning of fossil fuels, land-use change and industrial processes¹². With India being the third largest emitter of greenhouse gases, mangroves offer an important solution for mitigating climate change in the country. Further, they act as a buffer against ocean acidification and are a sink for micro-plastics - in addition to harbouring a diverse ecosystem of fish species and marine organisms which are vital for India's blue economy^{13,14}. Mangrove systems also provide natural barriers against floods, cyclones, and storms, by stabilising sediments and mitigating the risk of coastal flooding. In fact, mangrove systems are noted to provide flood protection benefits worth \$7.8 billion (for property), while safeguarding an estimated 2.87 million people from floods¹⁵. Other environmental services provided by mangroves include water quality improvement, erosion control, and land stabilisation. However, mangrove systems in India face growing threats due to deforestation, encroachment, rising sea levels, growing pollution, and extreme weather events^{16,17}.

Against this backdrop, it is vital that the valuation of natural assets like mangroves also involve their economic assessment and evaluation, so as to adequately protect their biodiversity and ecosystem benefits (in terms of their impetus to India's fisheries) which are linked to their environmental benefits (including flood protection, soil and coastal protection, climate resilience and biodiversity protection). Such assessments will also help to better recognise the role of the communities who live in/around mangrove systems, and to empower them to protect their communities. In the context of mangrove conservation, there is also an opportunity to involve corporate institutions in mangrove conservation - as part of their Corporate Social Responsibility (CSR). This offers an opportunity for the private sector to play a more leading role in conservation efforts, while feeding into the blue economy and maximising its outputs in a more balanced and equitable manner. Initiatives like afforestation, sustainable management practices, and community-based conservation projects can contribute to the restoration of mangroves and the sustainable development of India's coastal communities.

11. CFA Institute. 2021. <https://blogs.cfainstitute.org/investor/2021/02/10/the-price-of-nature/>

12. Global Mangrove Alliance. 2022. www.mangrovealliance.org/wp-content/uploads/2022/09/The-State-of-the-Worlds-Mangroves-Report_2022.pdf

13. Environmental Defence Fund. (2023). Blue Carbon. www.edf.org/bluecarbon#about-anchor

14. Environmental Defence Fund. (2022). Coastal Climate Nature Solutions. www.edf.org/sites/default/files/2022-10/Coastal%20Natural%20Climate%20Solutions.pdf

15. Nature. 2020. www.nature.com/articles/s41598-020-61136-6

16. National Maritime Organisation. 2020. <https://rb.gy/gykzf2>

17. Environmental Defence Fund. (2022). Coastal Climate Nature Solutions. www.edf.org/sites/default/files/2022-10/Coastal%20Natural%20Climate%20Solutions.pdf

SUPPLY SIDE INTERVENTIONS

Despite being a rapidly growing sector, the fisheries sector in India faces a range of regulatory and management challenges, which lower the fish supply. For one, India has the largest unmanaged fisheries sector in the world - characterised by open access. This means that anyone can fish in India's water resources, and there are no mechanisms to manage fleet sizes. Most Indian fisherfolk operate non-mechanised boats and modern mechanised boats with GPS/satellite tracking are yet to gain momentum¹⁸. Most non-mechanised boats used can only travel up to 5 kilometres across natural waters and common property resources. Given that the bulk of fisher folk operate in that range, there has been considerable depletion of natural fish reserves. The overexploitation of the nearshore has increased risks for small-scale fishers, who must now go farther offshore, for longer periods of time to catch fish, posing safety concerns that are exacerbated by climate change. At the same time, the growth of motorised and mechanised sectors in the last 50 years has increased fishing pressures on marine resources further offshore, thereby depleting fish stocks rapidly. Estimates are that up to 95 percent of India's marine eco-systems have been exploited – and there are no unexploited sites within India's territorial waters¹⁹. The stresses on the supply chain are not limited to marine fisheries, recirculating aquaculture systems require at least 100 litres of water to produce 1 kilogram of freshwater shrimp - which places immense pressures on freshwater resources in the long run, and also affects water quality²⁰.

Other elements of the supply side crisis are caused by environmental destruction due to poor fishing and catching practices. Since India's fisheries sector is marked by open access, the fisheries management and governance system is not designed in a manner that rewards fisherfolk for utilising sustainable practices. Rather, it promotes an unhealthy 'race to fish' wherein every fisher tries to maximise the fish caught in the shortest time. Smaller fisherfolk often use mesh nets which degrade the biosphere surrounding the fish, which in turn causes loss of marine life and rapid reductions in overall fish supply. Further, there is ample evidence of traditional knowledge systems being ignored, and there is increasing homogenization of practices towards bulk fishing and trawling²¹.

Bottom trawling by large trawlers is a widely harmful fishing practice that has been noted to destroy fish habitats. Large trawlers employ nets that sweep vast tracts of the ocean floor, thereby trapping non-target species in addition to juvenile fish (before they have a chance to mature and reproduce). This in turn harms the breeding cycles, while critically affecting fragile marine ecosystems and levels of fish supply now and in the future²². There is often a tension between the goals and priorities of large-scale industrial fishers and small-scale fishers. Often there is more attention in terms of resources, management, and prioritization of large-scale fisheries, which has resulted in the marginalisation of small-scale fisherfolk, and the exclusion of local communities from the management of coastal ecosystems.

18. Federation of Indian Chamber of Commerce and Industries. 2022. www.pwc.in/assets/pdfs/grid/agriculture/championing-the-blue-economy-promoting-sustainable-growth-of-the-fisheries-sector-in-india.pdf

19. Small-Scale Fisheries Resource and Collaboration Hub. 2023. <https://ssfhub.org/>

20. Federation of Indian Chamber of Commerce and Industries. 2022. www.pwc.in/assets/pdfs/grid/agriculture/championing-the-blue-economy-promoting-sustainable-growth-of-the-fisheries-sector-in-india.pdf

21. Small-Scale Fisheries Resource and Collaboration Hub. 2023. <https://ssfhub.org/>

22. India Water Portal. 2017. www.indiawaterportal.org/articles/palk-bay-trawled-and-damaged

In addition, there are supply-side challenges associated with pollution and waste disposal. Factors like marine litter are associated with environmental pollution and degradation, which further lower fish stocks. Notably, there is a growing trend of waste fish being directed towards the feed sector. Pollution and over-fishing put immense pressures on coastal oceans and reduce their capacity to trap and store carbon²³. Pollution-related challenges are also observed in aquaculture farms, wherein inadequate extension services and improper pond management systems, are associated with rising instances of pest outbreaks and diseases affecting fisheries, and the supply of fish produce to domestic and international markets. According to estimates, 25 percent of aquaculture production is lost to diseases²⁴. Weak supply chains makes the flow of seafood products from fishers to end consumers less efficient, while exposing fisherfolk to shocks such as reductions in fish availability, increase in fish spoilage and wastage, market fluctuations, and extreme weather. Exploring ways to minimise waste and spoilage - through technological, capacity building and financial support solutions - would help capture more fishery value, while minimising environmental damage.

In this context, it is important to foster financial support solutions to help build resilient fisherfolk communities. Exploring and developing private-public partnerships and green financing mechanisms to support sustainable fishing initiatives would help bring fisherfolk within formal financing mechanisms and reduce the cost of procuring capital. Financial support solutions for fisherfolks like micro credit schemes, financial inclusion, low- interest loans, insurance coverage (for fishing gear and fishing equipment) and targeted subsidies to increase renewable energy on boats or for fuel can help support the ordinary fisher folks and enhance their resilience at the community level. Further, investments in sustainable fishing gear, fishing management technology, and traceability systems will be vital for enhancing resilience of ordinary fisherfolk and will level the playing field in favour of small-scale fishing communities. Throughout these processes, it is vital that financial resources are allocated in a manner that is ethical and sustainable.

Best practices from across the world provide useful examples of financial innovation in the fisheries sector. Notably, the Republic of Seychelles has launched the world's first sovereign blue bond - to raise resources to support sustainable marine and fisheries projects. Through this bond, the government has been able to raise \$15 million from international investors to promote the country's blue economy²⁵ Learning from these approaches to develop best practices that could work in the context of India could help financially empower Matsyafed - the cooperative federation for fisheries development in Kerala - through innovative financing mechanisms, and blue finance models. This would help to ensure that the turnover and working profit of Matsyafed continue to positively impact the fisherfolk communities along India's coastline.

Further, technology solutions can be used to translate science into fishing practices. Notably, providing small scale fishers with affordable GPS navigation systems, and communication tools can enhance their safety and efficiently bridge the technology gaps. While respecting and integrating the traditional knowledge of fisherfolk, it is equally important to utilise cutting-edge technological solutions, such as satellite techniques (that can be used for tracking the movement of fish), climate models (that can be used to predict the future of the impact of climate change on fish population), electronic data collection and reporting (to better assess and manage fisheries), and eDNA (that can be used to understand stock delineation and contribute to better stock assessments).

23. Environmental Defence Fund. (2023). Blue Carbon. www.edf.org/bluecarbon#about-anchor

24. Federation of Indian Chamber of Commerce and Industries. 2022.

www.pwc.in/assets/pdfs/grid/agriculture/championing-the-blue-economy-promoting-sustainable-growth-of-the-fisheries-sector-in-india.pdf

25. World Bank. 2018. www.worldbank.org/en/news/press-release/2018/10/29/seychelles-launches-worlds-first-sovereign-blue-bond

These technology-driven solutions are particularly relevant in the context of rapidly changing weather patterns and increased unpredictability due to climate change, and fisherfolk are increasingly seeking marine weather information from official departments (such as the India Meteorological Department) and scientists. By investing in scientific research, ensuring data-driven resource management, and developing new technology, fisheries can become more resilient to the impacts of climate change, thereby ensuring the secure and continuous flow of income into fisherfolk households. In addition, technological solutions can also increase safety at sea, while reducing wastage and spoilage, and enhancing fish quality and value in a sustainable manner.

DEMAND SIDE INTERVENTIONS

India's fisheries sector has immense potential for growth - however, it is important that financial and policy support is provided on the demand-side to help this sector grow in a responsible, equitable and sustainable manner. This will help enhance the value of the fish caught, reduce waste and spoilage, and improve the income levels and socio-economic conditions of millions of fishing families, many of whom presently operate in economically limited areas of the country²⁶.

There is a growing need for improving the management and monitoring of Indian fisheries to ensure the sustainability of products in national and international markets. It is important to note that India's blue economy presently offers a space for both domestic and global consumers. Notably, demand for fish and fish-based products are often location specific and seasonal across the country. Looking at internal demand patterns - with increasing urbanisation and fast-paced lifestyles, there is a preference for easy-to-prepare healthy meals comprising fish protein. Furthermore, with rising income levels, there is growing purchasing power and affordability of high-value species like shrimp, pomfrets, and crabs - in addition to common species like 'catla' and 'rohu'²⁷. Looking at external demand - frozen shrimps and prawns are the most commonly exported aqua products, with destination markets located in the United States, China, and the European Union²⁸.

Against this backdrop, it is vital to understand how Indian markets can better incentivise sustainable fish production - particularly by promoting traceability, encouraging better data on supply chains, and giving greater impetus to standards and certifications. It is also worth exploring the potential for formalising the presently informal Indian fish market, by creating an umbrella enterprise for fisheries maybe even across the country, but certainly in key States. This will help optimise fish production by strengthening domestic supply chains and enhancing domestic demand for high-quality and affordable fish protein. In particular, government support in developing domestic Indian labelling will also enhance efficiency and sustainability in fish production across India - by creating an umbrella brand and gaining greater trust and buy-in from customers, in domestic and international markets. Further, with India emerging as a 'fish surplus' country and with fish export volumes rising steadily in the last 15 years, there is a growing need to have more Indian fisheries certified under global certifications/standards such as the Marine Stewardship Council (MSC) or Fair Trade. Being globally certified will help Indian fisherfolk access global markets on an equal footing and afford them legitimacy.

26. Press Information Bureau, Government of India. 2021. www.pib.gov.in/PressReleasePage.aspx?PRID=1786303

27. Federation of Indian Chamber of Commerce and Industries. 2022.

www.pwc.in/assets/pdfs/grid/agriculture/championing-the-blue-economy-promoting-sustainable-growth-of-the-fisheries-sector-in-india.pdf

28. Federation of Indian Chamber of Commerce and Industries. 2022.

www.pwc.in/assets/pdfs/grid/agriculture/championing-the-blue-economy-promoting-sustainable-growth-of-the-fisheries-sector-in-india.pdf

In addition, collectivisation can play an important role in addressing the gaps in the fisheries value chain (for both wild fisheries and aquaculture farms) and in strengthening stakeholder participation. It is crucial to recognise that fish trading in India still follows traditional patterns, with a significant proportion of ordinary fisherfolk lacking access to adequate bargaining power and price discovery mechanisms. Fisher-people often lack access to markets and extension services, and realise non-remunerative prices for their produce, thereby contributing to a downward income spiral²⁹. Against this context, there is a growing need to promote the collectivisation of fisherfolk, to consolidate their negotiating power and to offer greater price stability and income security to their fish production activities. The growth cooperatives would be an important step in this direction and would help to make the fish production playing field more equitable in favour of the small-scale fishers (SSFs).

Fish farmer producer organisations (FFPOs) comprising fish farmers and fishers are the fulcrum of collectivisation efforts in the fisheries sector³⁰. They serve as an integrated platform for the delivery of products, for strengthening market linkages, and for promoting capacity building of fisherfolk. This would empower SSFs to transition from being 'price takers' to becoming 'price makers.' Collectivisation - particularly of small and marginal fish farmers - is associated with improved access to investments, technology, capital, and markets. In Kerala, Matsyafed is the apex federation of primary level welfare societies, aimed at promoting sustainable development of marine and inland fisheries in the State³¹. Lessons from the Kerala model of collectivisation in the fisheries sector should be applied with suitable adaptation to other States, thereby creating an apex body (like Matsyafed) at the State level and a federation at the Central level. Further, in order to fund the cooperative movement in the fisheries sector, resources from the National Fisheries Development Board (NFDB) should be allocated judiciously to the primary cooperative society or State cooperative society (such as Matsyafed) as per the projects submitted.



29. Federation of Indian Chamber of Commerce and Industries. 2022. www.pwc.in/assets/pdfs/grid/agriculture/championing-the-blue-economy-promoting-sustainable-growth-of-the-fisheries-sector-in-india.pdf

30. Federation of Indian Chamber of Commerce and Industries. 2022. www.pwc.in/assets/pdfs/grid/agriculture/championing-the-blue-economy-promoting-sustainable-growth-of-the-fisheries-sector-in-india.pdf

31. Government of Kerala. 2023. <https://fisheries.kerala.gov.in/index.php/vision>

INFRASTRUCTURE INTERVENTIONS

To foster India's blue economy, it is vital to continue investing in infrastructural interventions. Further, in order to compete with highly mechanised fish production and capture processes in developed countries, leveraging technology to build infrastructure will be crucial. This is particularly important in the context of the new post-pandemic global order, wherein SSFs are even more marginalised and larger producers, with better access to technology and infrastructure, are dominating the sector. Infrastructural interventions can be multifaceted - ranging from faster production techniques to efficient end-to-end supply chain methods.

Outward-facing infrastructure interventions are required at the port level, especially in enhancing transshipment efficiency to boost sustainability. In particular, there is an opportunity to create a 'green shipping corridor' (a Special Economic Zone at sea supporting the uptake of clean fossil fuels and sustainable technologies) linking the US West Coast, Latin America, US East Coast, Europe, UAE, India, Singapore/Hong Kong, China, Japan, and Australia. Given that the bulk of India's fish export destinations are in the US, China, and the European Union, such a corridor would help to transport larger quantities of aqua products to existing markets, while benefitting from savings in time and resources. At the same time, it is vital to ensure that infrastructural development takes place in an environmentally sustainable manner, with a clear prioritisation of low-carbon footprint infrastructure and supply chain options. Further, in order to foster port development or port-induced development activities, skill development must take place - particularly for women who account for approximately 80 percent of employment in sectors that are allied to India's blue economy.

In addition, inward-facing infrastructure interventions should look at exploring the fish production potential of inland waterways. The opening of inland waterways should be accompanied by impact assessments that critically forecast or measure the socio-economic and environmental consequences of utilising inland water resources³². Presently, the bulk of India's fish production comes from inland water resources - and future policy should look to enhance the productivity of these natural assets, by developing cold chain facilities and retail markets in nearby areas. Further, the bulk of India's fish landings (both marine and inland) happens near the beach/shore. Infrastructural interventions should focus on enhancing the connectivity of these landing sites with cold storage facilities and processing centres, which are further in-land. Such infrastructural interventions can range from enhancing transportation facilities (including investing in insulated boxes, rotomoulded ice boxes, small cold storage units and freezer vehicles trucks/freight trains) and developing specific routes for the transport of fresh fish produce. This will help reduce post-harvest losses while ensuring the quality of the aqua produce.



32. Invest India, Government of India. 2023. www.investindia.gov.in/sector/fisheries-aquaculture

INDIA LEADERSHIP OPPORTUNITIES

India's blue economy represents burgeoning socio-economic growth potential. Globally, India ranks first in inland capture fish production and second in aquaculture fish production - and is clearly a global leader in the fisheries and blue economy space. At this juncture, it is vital to discuss the specific areas wherein India could show leadership - such as by developing niche expertise in managing in-land fisheries, or in exporting certain varieties of fish under a national label/brand. It is also important to recognise that effective fisheries management must happen in tandem with the increased provision of environmental services, thereby benefitting both nature and society. In this context, there is merit in exploring if greener fuels could help in making fishery operations more energy-efficient and less polluting. Alongside other robust practices for fisheries management and governance of open waters, using greener fuels for shipping should be promoted.

There are various opportunities that India could potentially leverage to emerge as a leader in global aquatic products trade, while adopting a 'fisher first approach'. From a financial perspective, it is crucial to explore the potential for better risk assessment, forecasting models and economic analytical models - to predict future prices, operational costs, and demand trends in fish produce. Disseminating such information to ordinary fisherfolk is key for last-mile delivery of information - in line with our 'fisher first approach'. Moreover, from a policy implementation perspective, it is important to discuss whether India can develop a unique small-fisher approach that works and can be a lighthouse for other countries. This would include the ways through solutions can be built at the intersection of technology and governance - to empower low-income, unorganised fisherfolk from marginalised coastal communities. In addition, from an education and capacity building perspective, it is vital that that capacity building and training be provided for fisherfolk - to develop technical knowledge bases on fish stocks and species, marine and inland fishing practices, earth and ocean sciences, in addition to evidence-based climate resilience strategies. Such formal training should be adapted to local contexts, translated to local languages, and be disseminated across fisherfolk communities. Finally, from a science and research perspective, it is important to leverage India's research capabilities in this sector in the country's immediate neighbourhood - across South and Southeast Asia, similar to how this has been achieved in other sectors like dairy or rice. It is also worth exploring the potential of establishing a global fisheries institute in India - to foster R&D, provide credible technical support, and to lead the way in future technological innovation and research efforts.





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