

Webinar Report

*Digital Transformation of Fisheries & Aquaculture for Sustainable Blue Economy Growth
Hosted on 10 March 2026*

Executive Summary:

This webinar, hosted by the Maritime Research Centre in collaboration with Nirdhwani Technology Private Limited, focused on the benefits of digital transformation for driving sustainable growth in fisheries and aquaculture in tropical coastal systems. The webinar brought together experts from research, policy, and regional organisations and highlighted the urgent need for data-driven, ecosystem-based approaches to address challenges of declining productivity, nutrient imbalances, climate variability, and disease outbreaks.

A key theme across discussions was the integration of advanced modelling, artificial intelligence, and biogeochemical analysis to shift fisheries management from reactive to proactive. Frameworks such as Underwater Domain Awareness (UDA) and Area Production and Yield (APY) were presented as scalable solutions to enhance productivity, resilience, and decision-making. Speakers emphasised the importance of bridging gaps between research, policy, and implementation by enabling stronger collaboration among national laboratories, academia, industry, and local communities. Regional cooperation, particularly across tropical nations, was identified as a critical enabler for shared learning and resource optimisation.

The webinar further highlighted the need to democratise access to digital tools and translate complex scientific insights into actionable, user-friendly solutions for stakeholders, especially fishermen and coastal communities. Community-led initiatives, including the 'River Warriors' concept, were highlighted as essential to sustainable ecosystem management.

Overall, the session reinforced that a combination of technological innovation, ecosystem-based governance, and inclusive stakeholder engagement is key to building a resilient and future-ready Blue Economy.

Background:

MRC hosted a comprehensive webinar focusing on the digital transformation of fisheries and aquaculture as a key enabler for sustainable blue economy growth. The sessions brought together experts who deliberated on innovative frameworks, including the UDA and APY, emerging technologies, and collaborative strategies to improve productivity, resilience, and sustainability in tropical coastal ecosystems.

The webinar noted that seafood exports from tropical and monsoon-driven coastal economies have grown substantially in recent years, driven by expanding aquaculture production and rising global demand. Aquaculture now contributes a significant share of seafood supply across warm-water coastal systems, supporting food security, livelihoods, and export revenues. However, the sector faces structural and operational challenges, including low productivity,

disease outbreaks, nutrient imbalances, habitat degradation, and limited scientific training in optimal farm management practices.

To address these challenges, MRC has developed a holistic Area Production and Yield (APY) Framework that focuses on productivity optimisation rather than geographical expansion, thereby benefiting sustainable growth in the Indian Ocean Region. The APY approach aims to enhance farm-level performance through:

1. Development of mathematical growth models that simulate aquaculture under varying environmental conditions, enabling optimisation of growth parameters.
2. Integration of seaweeds into shrimp aquaculture systems to improve water quality through nitrate and phosphate absorption, thereby enhancing sustainability and reducing disease vulnerability.

Complementing farm-level productivity enhancement, the webinar presented a Multi-Parameter Biogeochemical and Thermal Habitat Analysis Framework, implemented as a pilot study in the eastern Arabian Sea (16.5°N–17.5°N, 72.0°E–73.5°E), specifically in the regions of Ratnagiri (Maharashtra) and Veraval (Gujarat) along the Konkan coast. While regionally applied, the framework is designed to be scalable across tropical, monsoon-influenced coastal systems. It was also noted that the traditional fisheries advisory systems frequently rely on single-parameter indicators such as Sea Surface Temperature (SST) or chlorophyll concentration. However, fisheries productivity and habitat availability are governed by a complex interaction between physical oceanography, biogeochemical cycles, oxygen constraints associated with Oxygen Minimum Zones, nutrient gradients linked to upwelling intensity, and species-specific thermal physiology.

The proposed framework integrates four environmental domains into a Composite Suitability:

- Biogeochemical productivity (Net Primary Productivity – NPP)
- Oxygen habitat constraints
- Nutrient gradients as proxies for upwelling intensity
- Species-specific thermal preferences

This initiative represented a structured effort towards digital transformation in fisheries and aquaculture by integrating farm-level productivity modelling with ecosystem-scale habitat intelligence. It seeks to democratise the returns of the fisheries economy by ensuring that small-scale farmers, fishers, and marginalised coastal communities are not excluded from technological advancement. With adequate institutional support, the framework can be adapted across tropical coastal systems facing similar oceanographic and climate stressors.

What were the main objectives of the webinar?

The webinar aimed to:

1. Highlight the economic and strategic importance of fisheries and aquaculture.
2. Present the APY framework for yield optimisation without coastal expansion.
3. Demonstration of multi-parameter fisheries advisories beyond conventional SST systems.
4. Framework for habitat compression monitoring under climate change scenarios.
5. Pathways for inclusive and equitable Blue Economy growth.
6. Documentation of methodological and governance insights for further dissemination.

Speaker-wise summary of discussions:

Dr (Cdr) Arnab Das (Founder and Director, Maritime Research Center):

He set the context for the webinar by introducing UDA as a holistic framework for managing marine ecosystems. He further highlighted the complexity of tropical waters, which are characterised by high biodiversity and dynamic environmental conditions. He further emphasised the need for:

- Integrated data-driven approaches combining science, policy and community participation
- Ecosystem-based management rather than fragmented interventions
- Utilising digital tools to enhance decision-making in fisheries and aquaculture.

Dr Das also underlined the importance of aligning sustainability goals with livelihood generation to ensure that technological advancements directly benefit coastal communities.

Watch the full video now: <https://youtu.be/ZbyOFigneXk>

Ashwani Singh, MRC Fellow, IIT Kanpur

He presented the Area Production and Yield (APY) framework, a novel approach designed to optimise fisheries productivity using advanced modelling techniques. Key highlights of his presentation included:

- Use of 3D biogeochemical analysis to understand nutrient dynamics
- Predictive modelling to identify Potential Fishing Zones (PFZ)
- Transmission from reactive to proactive fisheries management

The APY Framework enables stakeholders to anticipate changes in marine productivity and make informed decisions, thereby reducing uncertainty and improving yield efficiency. In addition to Ashwani's presentation, our Research Fellow, Shlok Nemani, elaborated on APY and Coastal Management. Besides, he emphasised the importance of Shrimp and Seaweed Farming for enhancing the livelihoods of coastal communities and further elaborated on two field visits by our team members to Ratnagiri and Guhagar in Maharashtra, and to Veraval in Gujarat.

Watch the full video now: <https://youtu.be/ufOvglZVgmw>

Coastal Management Webpage Launch

Ayush Sawadh, Research Engineer, introduced the newly developed MRC digital platform to support coastal management. This would benefit the coastal and riverine communities as well. The platform features:

- Policy papers on AI-driven precision aquaculture
- Tools for monitoring and managing resilient river ecosystems
- Digital resources for enhancing community awareness and engagement

This initiative is a step towards democratising access to knowledge and enabling technology-driven transformation at the grassroots level.

Watch the full video now: <https://youtu.be/eCl8vFDvKIE>

Prof. P.B. Terney Pradeep Kumara (DG, CC&CRMD, Sri Lanka)

He emphasised the importance of regional collaboration in addressing shared marine challenges across tropical nations. Key points from his address included the following:

- There is a need for a common platform among SAARC/BIMSTEC countries
- There is a need for data sharing and synchronisation of Blue Economy strategies
- Integration of seaweed farming and marine resource optimisation

He further noted that collective regional efforts can significantly enhance resilience and sustainability outcomes.

Watch the full video now: <https://youtu.be/zzVWVADkG90>

Dr Kajal Chakroborty (Director, ICAR-NBFGR)

Dr Chakroborty discussed the limitations of existing PFZ models and the need for validation using real-time data. His recommendations included:

- Integration of sensor-based observations
- Use of remotely operated vehicles (ROVs) for deep-sea monitoring
- Continuous validation of predictive models

He further emphasised that robust data validation is essential for ensuring reliability and accuracy in fisheries forecasting.

Dr Poonam Singh (ICAR-NBFGR)

She focused on the sustainable utilisation of aquatic genetic resources. She stressed the importance of biodiversity conservation and community participation. Key insights included:

- Protection and restoration of mangrove ecosystems

- Development of breeding protocols for species like crabs
- Empowerment of coastal women through aquaculture initiatives

Her address highlighted the socio-economic dimension of sustainability.

Watch the full video of the ICAR team now: <https://youtu.be/Un-hmjc4OA>

Rear Admiral Md. Khurshed Alam (Retd) (Director at Centre for Bay of Bengal Studies, Independent University Bangladesh, Dhaka)

During his address, he highlighted the gap between policy formulation and implementation. Key observations from his address are as follows:

- Need to prioritise technology deployment over policy discussions
- Increasing fish production to meet nutritional and economic goals
- Leveraging innovation for export growth and national development

His intervention underscored the urgency of translating ideas into actionable outcomes.

Watch the full video now: <https://youtu.be/IW0d04kdjil>

Ambassador Anup Kumar Mudgal (Retd) (Former Indian Diplomat)

Ambassador Mudgal concluded the session by emphasising the importance of Marine Spatial Planning. Key takeaways from the address are as follows:

- Importance of defining 'red lines' for sustainable ocean resource utilisation
- Translating complex scientific data into user-friendly insights
- Empowering local communities, especially fisherfolk, with actionable information

He further stressed that effective governance must balance development with ecological preservation.

Watch the full video now: <https://youtu.be/Hw8WVynwZ1o>

Conclusion and Key Takeaways:

The webinar successfully highlighted the transformative potential of digital technologies in fisheries and aquaculture. It stated that by combining scientific innovation, policy alignment, and community participation, stakeholders can build a resilient and sustainable blue economy. The discussion reinforced the importance of moving towards proactive, data-driven approaches that not only enhance productivity but also safeguard ecological balance and support livelihoods. Some of the strategic key takeaways from the discussions have been clubbed below:

1. Digital transformation is essential for modernising fisheries and aquaculture
2. Integrated frameworks like UDA and APY can enhance decision-making
3. Regional collaboration is critical for addressing transboundary challenges
4. Community engagement is key to ensuring sustainability and inclusivity

5. Bridging the gap between research and implementation remains a priority for all stakeholders

Media Gallery



Shared Interests between Nations

- Nations within various Regional organisations do share a lot of common vested interests
- ASEAN Blue Economy Framework (ASEAN India Year of Maritime Cooperation during 2025 summit) highlights the importance of sustainable growth in the blue economy system
- BIMReN (BIMSTEC-India Marine Research Network) Launched in 2024 to connect institutions and researchers for **marine research**
- MRC also proposed in the **Bhutan River Warriors** initiative where countries look forward to technological partners cross border

Significance of the Konkan Coast

Economic & Ecological Vitality

- Economic Powerhouse:** Contributes 41% of Maharashtra's GDP with key ports like Mumbai and JNPA.
- Livelihoods:** Supports over 350,000 fisherfolk across Ratnagiri, Sindhudurg, and Ratigad.
- The Crisis:** Fisheries production has declined by 42% (2010-2025).
- Stressors:** Ocean acidification, warming waters, and urban flooding are threatening this fragile ecosystem.