

POSITION PAPER: SKILLING FOR ENHANCED BLUE ECONOMY



**BLUE
ECONOMY**

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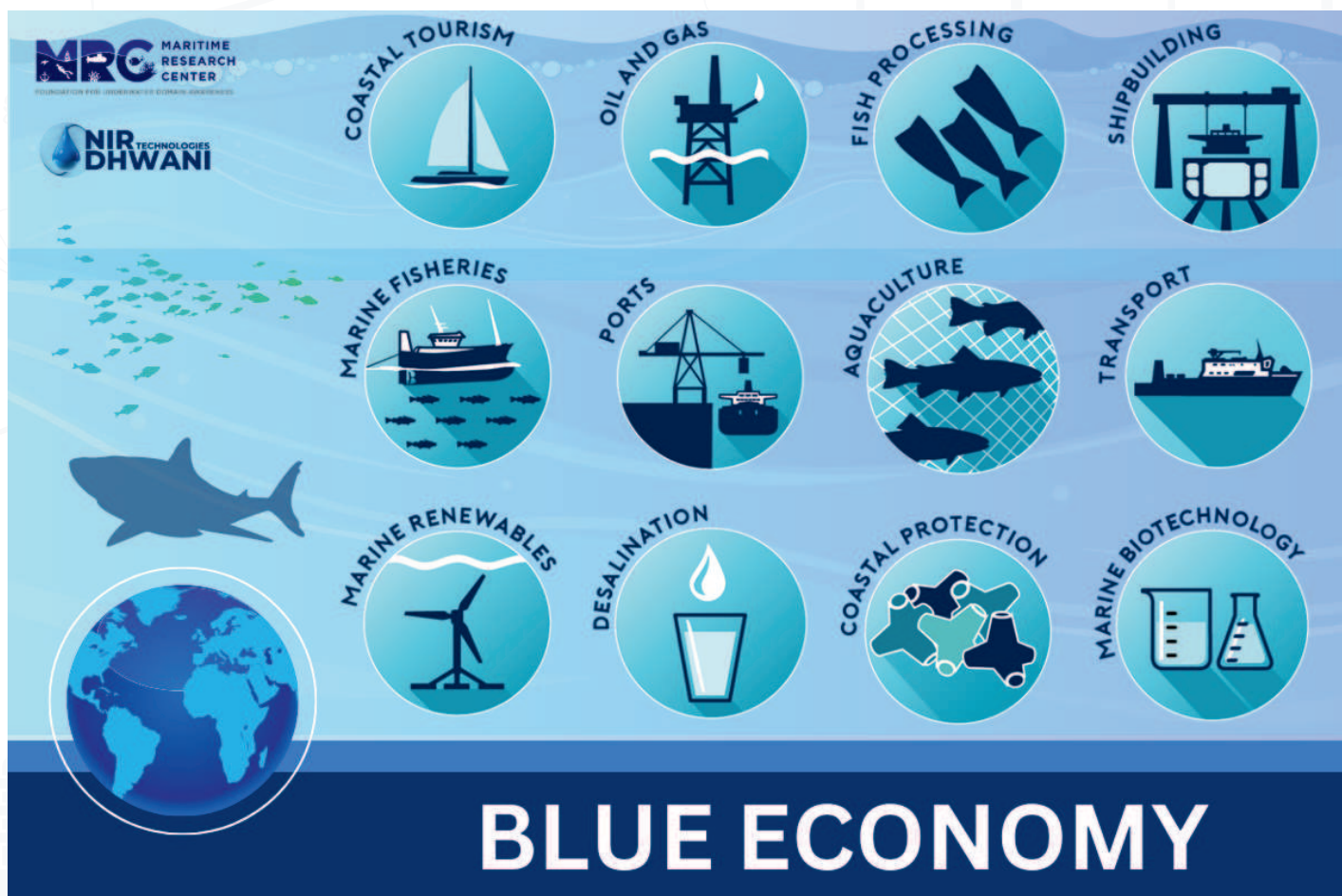
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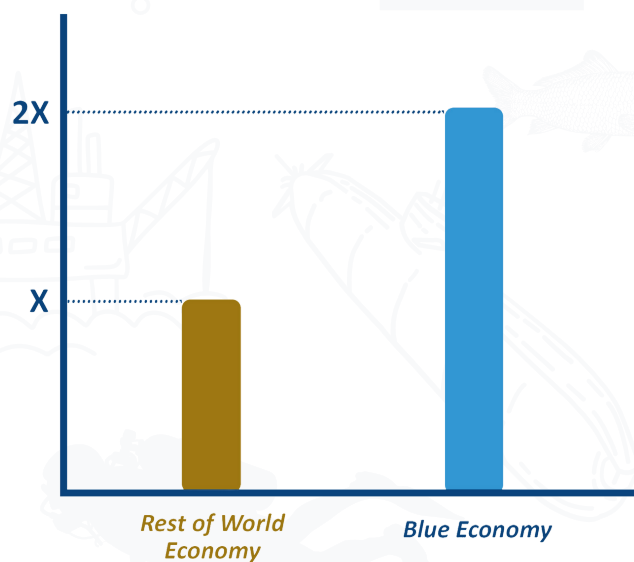
1. Introduction to Blue Economy:

The term "Blue Economy" refers to a sustainable ocean economy achieved by balancing economic activities with the health and resilience of ocean ecosystems. It involves responsible use of ocean resources and innovations to generate inclusive economic and societal advantages while preserving natural ecosystems.



GROWTH

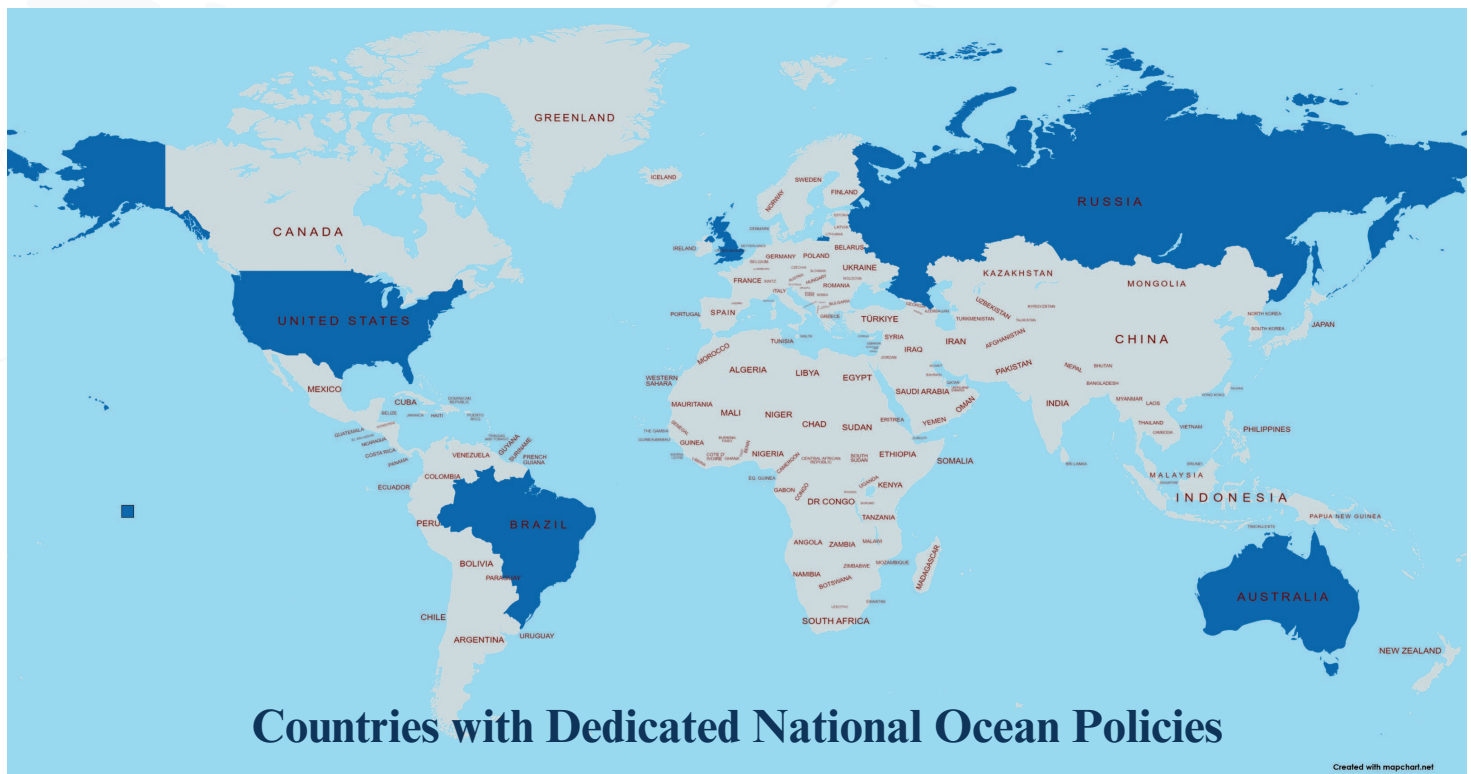
Globally, the Blue Economy was anticipated to expand twice as fast as the rest of the world economy, as projected by pre-pandemic OECD estimates. Notably, the Blue Economy encompasses various sectors such as coastal manufacturing & services, maritime trade, shipping, offshore and coastal energy, deep sea minerals, aquaculture & fisheries, and marine-related technologies.



Source : Pre-Pandemic OECD Estimates

Global Response: Initiatives Driving the Blue Economy Worldwide:

Various national and global initiatives are being undertaken to control the Blue Economy. Countries like Australia, Brazil, U.K., U.S., Russia and Norway have developed dedicated national ocean policies with measurable outcomes and budgetary provisions. Countries like Canada and Australia have enacted legislation and established hierarchal institutions at federal and state levels to ensure progress and monitoring of Blue Economy targets.



India's Unique Maritime Position:

India's extensive coastline of 7517 km spans nine coastal states and 1382 islands. The nation boasts 12 major ports and over 180 non-major ports, handling around 1400 million tons of cargo annually. A striking 95% of India's trade by volume relies on maritime transport. The Exclusive Economic Zone, spanning over two million square kilometers, is abundant in living and non-living resources, including significant recoverable resources of crude oil and natural gas. This marine wealth supports over 4 million fishermen and coastal communities, intricately linking India's economic growth with its Blue Economy.

Recent sustainable development initiatives in the maritime domain have propelled India's maritime interests and Blue Economy. Even amidst the post-COVID-19 global landscape, India is experiencing noteworthy growth in the marine sector by efficiently and sustainably tapping ocean resources. India's objective remains twofold: harness ocean resources effectively while fostering ocean-related capabilities, employment and value addition. All this must be achieved in line with the UN Sustainable Development Goals and environmental preservation.

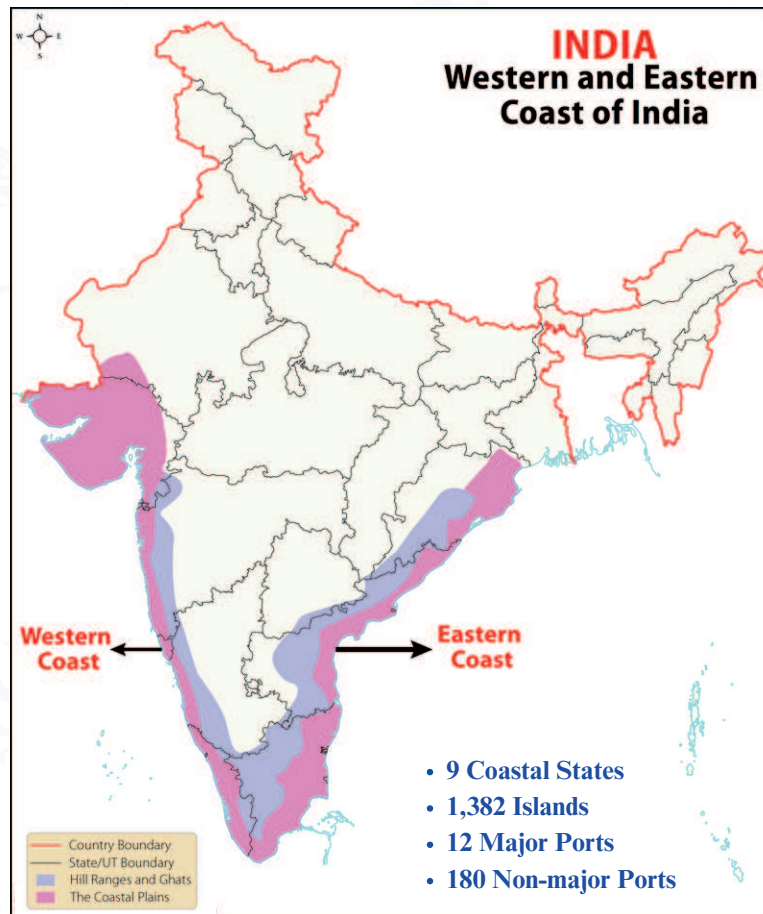


Image Source: <https://www.mapsofindia.com>

India's Vision for the Blue Economy:

- In 1981, India established the Department of Ocean Development, now the Ministry of Earth Sciences (MoES).
- Notable programs like the "Deep Ocean Mission," "Oceanography from Space," and "Launching of the data buoys" have been launched along the Indian coastline.
- These initiatives employ satellites to gather oceanographic data, including weather information, for scientific analysis.
- MoES has joined the United Nations' "Clean Seas Programme," aiming to reduce marine litter/plastic and aligning with SDG-14.
- MoES signed contracts with the International Seabed Authority (ISBA) for deep ocean exploration of minerals like Polymetallic Nodules and Hydrothermal Sulphide in the Indian Ocean.
- India is developing a sustainable policy for both upstream and downstream activities to capitalize on sector growth.
- The Government of India's 2030 vision highlights the Blue Economy as one of the ten core dimensions of growth, emphasizing policy integration for coastal community improvement and development.
- In his 74th Independence Day Speech, Prime Minister Narendra Modi stressed the importance of harmonious relations in a neighbor, beyond just physical borders.
- Experts propose the Seychelles-Singapore-Samoa (SSS) axis as a strategic Blue Economy policy foundation.
- A transparent policy framework is being formulated to elevate India's GDP through sustainable economic growth in the Blue Economy, aligning with national security and international commitments.

2. Exploring Employment Opportunities in the Blue Economy Sector:

- The Food and Agricultural Organization (FAO) data reveals that more than 60 million people globally are employed in fishing and aquaculture, predominantly in developing countries of Asia and Africa.
- The combined sectors of fishing, aquaculture, seaside and marine tourism provide employment for over 350 million individuals.
- The European Union's 2020 report states that the Blue Economy, encompassing ocean-related economic activities, employs over 4 million people directly within the EU and contributes 1.3% to the EU's GDP.
- Worldwide, the Blue Economy sustains livelihoods for over 820 million individuals.
- The blue growth strategy focuses on five key sectors within the Blue Economy: coastal tourism, aquaculture, blue energy, blue biotechnology and seabed mining. These sectors exhibit significant potential for job creation and innovation.
- Coastal tourism stands out as the largest sector in terms of both employment and value added, although it poses environmental and community challenges.



Identifying Gaps and Filling Them: Addressing the Challenges in the Blue Economy:

- Countries, including India, are facing challenges in aquaculture and blue biotechnology due to administrative complexities, opaque licensing processes, difficulties in accessing space and water, and meeting high-quality health and environmental standards.
- The pursuit of blue growth necessitates a workforce of qualified professionals. However, sectors are grappling with hiring issues due to the need for generational renewal in some areas (like fisheries) and the emergence of highly innovative technologies, leading to a greater demand for specialized workers in fields such as aquaculture, shipbuilding and marine biotechnology.
- Despite the significant potential of Blue Economy job expansion for India and other countries, the threat of climate change looms.
- More frequent and severe storms causing coastal erosion have the potential to devastate fisheries, coastal flora and tourist-frequented beaches. The warming and acidification of oceans also imperil species crucial for sustenance and livelihoods in communities.

Aquaculture



**MOST
Critical
Sectors**



**Blue
Biotechnology**

Skilling Gaps in Mega Projects Initiated by the Indian Government:

Within this section, we have outlined key initiatives launched by the Government of India under diverse overarching schemes, alongside identifying skill gaps inherent to each project within the Blue Economy sector.

Sagar-Mala Project:

- Proficiencies encompass efficient port management and operation, involving cargo handling, logistics coordination, port security, vessel operations and maintenance.
- Expertise in supply chain management, warehousing and transportation strategies is vital.
- Skillset demands encompass shipbuilding, repair, marine engineering, maintenance of marine equipment and marine fabrication.
- Mastery in marine safety, executing search and rescue operations, navigation competence, firefighting skills and disaster management expertise are crucial.



Gati Shakti Initiative:

- Navigational expertise and vessel operation proficiency are indispensable for inland waterway navigation. This entails familiarity with navigational charts, vessel handling and maneuvering techniques tailored to waterway conditions.
- Profound skills in vessel operations and maintenance are paramount to ensuring the secure and efficient transportation of cargo along waterways.
- Effective management and upkeep of waterway infrastructure, encompassing locks, dams, jetties and navigation channels demand skills in infrastructure oversight, inspection, and maintenance.
- Proficiency in cargo handling, loading and unloading, strategic stowage planning, along with aptitude in warehousing and inventory management are essential to ensure seamless operations and punctual delivery.



Project Mausam:

- Aptitude in historical research, archival study and precise documentation methods.
- Knowledge of preservation techniques, museum curation practices, comprehension of heritage policies and adeptness in community engagement, all contributing to the protection and promotion of cultural heritage.
- Proficiency in underwater archaeology, encompassing the skills required for submerged archaeological exploration.
- Mastery of GIS software and the ability to conduct spatial analysis, enabling data visualization and the identification of patterns and correlations.



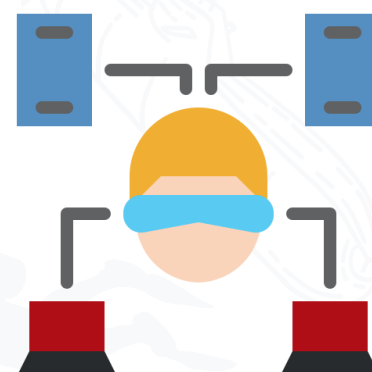
National Offshore Sensor System:

- Aptitude in Sensor Technology, involving the understanding and operation of various sensing devices and instruments.
- Proficiency in Data Analysis, encompassing the ability to process and draw insights from complex data sets.
- Expertise in Remote Sensing, utilizing technology to gather information from a distance, often through satellite imagery or other remote sensing platforms.
- Competence in Communication and Networking, ensuring seamless information exchange in marine environments.
- Knowledge of Data Security and Cybersecurity practices, crucial for safeguarding sensitive information in the digital realm.
- Proficiency in Marine Engineering and Installation, involving the design, construction and installation of structures and systems in marine environments.



National Command Control Communication and Intelligence Network:

- In-depth Maritime Domain Knowledge, encompassing comprehensive understanding of maritime operations, regulations and protocols.
- Proficiency in maritime communication protocols and standards, including mastery of systems like Global Maritime Distress and Safety System (GMDSS) and Automatic Identification System (AIS).
- Skills related to establishing and sustaining maritime domain awareness, involving expertise in surveillance systems, tracking technologies and real-time monitoring solutions.
- Competence in vessel tracking systems, maritime traffic management strategies and collision avoidance technologies, essential for safe and efficient marine navigation.



National Automatic Identification System:

- Proficiency in AIS system design, involving the capability to develop and configure Automatic Identification System setups.
- Expertise in analyzing and interpreting AIS data, enabling meaningful insights and actionable conclusions.
- Skills essential for the effective management and maintenance of the AIS network, ensuring its continuous operation and accuracy.
- Proficiency in understanding and implementing regulations, particularly those stipulated by the International Maritime Organization (IMO), ensuring adherence to international maritime standards and guidelines.



National Maritime Domain Awareness Project:

- Proficiency in designing, executing and managing maritime surveillance systems, involving the ability to create and oversee advanced monitoring setups.
- Expertise in maritime law enforcement, encompassing comprehensive knowledge of maritime laws, regulations and international conventions.
- Skills related to interagency collaboration, coordination and information sharing, crucial for fostering effective cooperation and conducting successful joint operations between various maritime entities.



Make in India:

- Shipbuilding and Repair: Expertise in constructing and restoring vessels, encompassing a wide range of shipbuilding and repair techniques.
- Naval Architecture: Proficiency in designing and engineering maritime vessels, ensuring their functionality, safety, and efficiency.
- Maritime Safety and Quality Assurance: Skills relevant to maintaining high safety standards and quality control measures within the maritime domain.
- Maritime Supply Chain Management: Competence in managing the complex network of processes and resources involved in the maritime supply chain, ensuring smooth operations and efficient logistics.



Digital India:

- Proficiency in leveraging digital platforms and collaborative tools, including project management software, communication platforms and tools for seamless teamwork.
- Skills in data analytics involving the ability to extract insights and patterns from complex data sets to make informed decisions.
- Proficiency in cybersecurity, encompassing knowledge of cybersecurity best practices, threat identification, incident response strategies and secure coding techniques. These skills are vital to safeguard digital infrastructure and systems.
- Expertise in IoT (Internet of Things) and sensor technologies, valuable for effectively integrating and leveraging digital systems for enhanced functionality and data-driven insights.



3. Blue Economy and Underwater Domain Awareness (UDA):

Dr. (Cdr) Arnab Das, the Director and Founder of the Maritime Research Centre (MRC), presented five key points derived from the concept of UDA during a workshop titled 'Blue Economy in the Bay of Bengal,' hosted by The Bridge Tank in 2022. These five points are as follows:

- **Industrial Partnership User Guide:** In India, achieving the right ecosystem balance is a challenge, often influenced by either excessive politics or business influence.
- **Private Sector-Backed Blue Economy:** The public struggles to manage budgets, making private sector involvement crucial for advocating solutions. In order to improve public sector coordination within the blue economy sector, Dr. Das underlined the role of private sector as a leader in partnership.
- **Embrace Diversity:** The Bay of Bengal's uniqueness necessitates customized approaches. Foreign technologies might not be suitable, highlighting the importance of inclusive partnerships. For instance, foreign support should be managed by local organizations.
- **Address Financing Challenges:** The consistent challenge of financing was a central theme, shared by Dr. Das and fellow participants. MRC is exploring blue loans and acknowledges the need to raise funds independently, without relying solely on government support.
- **Developing Sustainable Entrepreneurship:** A pivotal focus for the blue economy sector should be creating attractive and innovative pathways for sustainable entrepreneurship.



4. Requirement of UDA Framework for an Enhanced Blue Economy:

Why is establishing a Sector Skill Council based on the Underwater Domain Awareness (UDA) Framework essential for enhancing the Blue Economy?

With global attention shifting towards maritime domains and oceans for economic growth and climate stability, the maritime commons are becoming the preferred trade routes, responsible for nearly 90% of global trade. Efficient and sustainable transportation becomes a priority, while undersea resources present significant economic and strategic prospects. These resources include both living and non-living elements, bearing substantial economic and strategic importance. Addressing global challenges like food and energy security can be accomplished by emphasizing ocean resources. Abundant rare earth elements lie beneath the sea, carrying significant strategic potential. However, access and control over these resources often lead to conflicts among global powers, necessitating increased maritime security. Nations are increasingly maintaining naval presence in maritime commons, mirroring similar stakes in freshwater systems.

To institute effective governance, situational awareness is paramount. The Underwater Domain Awareness (UDA) becomes a prerequisite for expanding understanding and application across various fields. UDA's four key stakeholders are maritime security, the blue economy, environment and disaster management and science and technology. Utilizing acoustic surveys via sonar becomes the primary method for generating comprehensive UDA. However, the unique characteristics of tropical waters in the Indo-Pacific region pose challenges, rendering conventional imported technology insignificant. Indigenous efforts are necessary to bolster acoustic capacity in these waters. Furthermore, sharing underwater data should be done judiciously to prevent unauthorized access.

Geopolitical dynamics have shifted towards the tropical littoral waters of the Indo-Pacific region. Off shore powers maintain strategic presence by deploying military and research assets for UDA. The Indian Ocean Region (IOR) is particularly vulnerable due to its socio-political and socio-economic landscape, including security concerns like maritime terrorism and piracy. Regional maritime frameworks often lack coherence with long-term national interests. The Government of India (GoI) has displayed a proactive stance towards maritime opportunities, exemplified by the Security And Growth for All in the Region (SAGAR) vision of the Indian Prime Minister in 2015. A number of megaprojects have been announced by the GoI to support the SAGAR vision. It is important to note that these missions are independent efforts of the Indian government. Sagarmala, Bharatmala, Gati Shakti, Jal Shakti Abhiyan, Start-up India, Skill India, Digital India and many others are some of the initiatives which support the SAGAR vision. However, these endeavors need skilled manpower on a larger scale.

Furthermore, a historic agreement was reached to protect the world's oceans, placing 30% of seas into protected areas by 2030 under the UN's High Seas Treaty. In addition, deep sea mining, which is the practice of obtaining minerals from the ocean floor, is one of the potential effects that the treaty seeks to guard against. Environmental organizations are concerned about the potential consequences of mining, including the disruption of sediments, noise pollution and the harm to spawning sites. After 38 hours of discussions, the agreement was reached on March 4, 2023, in the evening, at UN headquarters in New York. Years of negotiations have been stalled due to divergent views on funding and fishing rights. According to environmental organizations, it will support sustainable development and help stop the loss of biodiversity.

On February 11, 2022, Prime Minister Narendra Modi pledged support for a binding international treaty under the UN Convention on the Law of the Sea for the conservation of marine biological diversity beyond national jurisdictions. At the One Ocean Summit, a coalition on BBNJ was formally created with the support of world leaders such as UK Prime Minister Boris Johnson, Canadian Prime Minister Justin Trudeau, and Japanese Prime Minister Fumio Kishida, among others. PM Modi stressed New Delhi's commitment to ending the use of single-use plastic during the international conference and invited France to start a global initiative for the cause. In addition, PM Modi discussed India's dedication to protecting marine resources, using the Indo-Pacific Oceans Initiative (IPOI) as an illustration.

It is worth noting that Government of India has set up a Steering Committee on Blue Economy under PM-EAC and it has produced a national policy framework on Blue Economy, based on which the Ministry of Earth Sciences is now preparing a formal policy on Blue Economy.

The Underwater Domain Awareness (UDA) Framework proposed by the Maritime Research Center (MRC) complements the SAGAR vision, fostering collaboration and resource sharing among stakeholders. This framework holds the potential to manage challenges and opportunities in tropical littoral waters amidst current geopolitical realities. Enclosure-1 provides more details on the MRC's UDA framework proposal.

5. MRC's Proposal for Establishing a Sector Skill Council on UDA Framework to Enhance the Blue Economy Sector:

The proposition entails the formation of a sector skill council based on the UDA framework, with a focus on addressing the following concerns:

(a) **Identification of Skilling Requirements:** The council will determine the skilling necessities essential for propelling the UDA framework, ensuring the realization of the SAGAR vision. Challenges and opportunities essential to marine and freshwater systems require forward-looking skills, fortified by scientific advancements. This comprehensive strategy will unify stakeholders. MRC identifies three pivotal domains: Acoustic Survey, Artificial Intelligence (AI) & Robotics and Bio-technology & Bio-Sciences, collectively catering to the UDA framework.

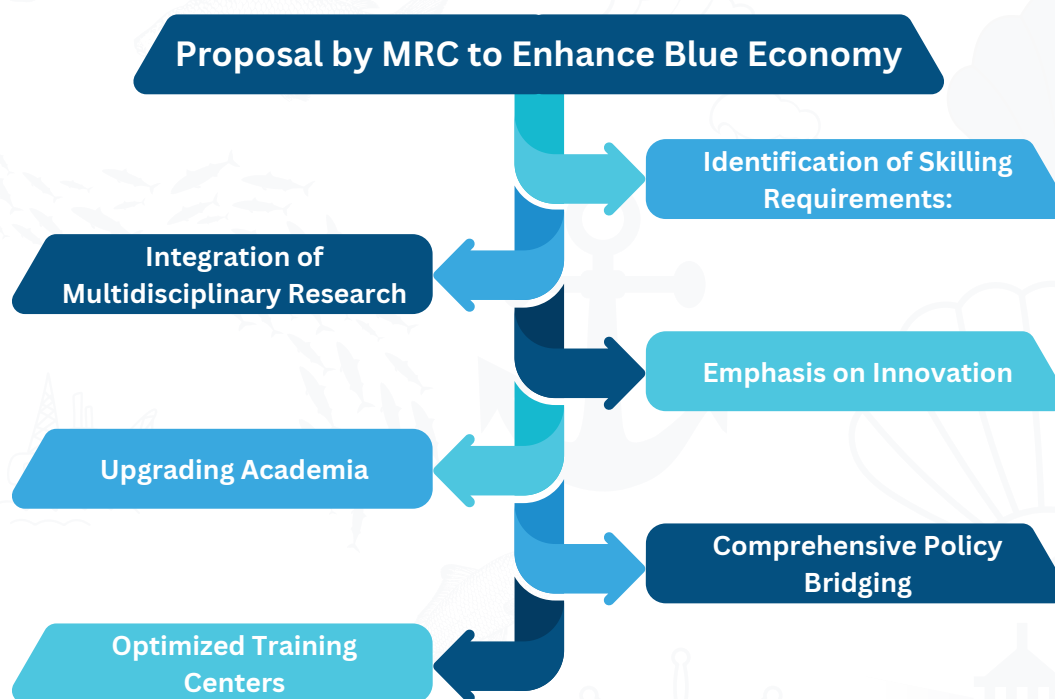
(b) **Integration of Multidisciplinary Research:** Effective skilling necessitates linking multi-disciplinary research with traditional practices and local specificities. Establishing a Centre of Excellence (CoE) will tackle emerging challenges and opportunities while maintaining deep-rooted connections to ground realities.

(c) **Emphasis on Innovation:** Vital to the broad-scale implementation of any concept is innovation. Recognizing India's vastness and SAGAR's diversity, innovation becomes the primary driver. An incubation center, bridging start-ups with new ideas, will catalyze growth. Encouraging entrepreneurship among the youth is prioritized over job-seeking.

(d) **Upgrading Academia:** Aligning academic courses with evolving global dynamics and contemporary knowledge and skills is paramount. Coordinating with universities to manage this transition is a role the sector skill council will assume. The New Education Policy (NEP) provisions support this transition, necessitating a well-structured approach.

(e) **Comprehensive Policy Bridging:** Addressing policy gaps holistically requires a closed-loop mechanism that incorporates stakeholders, policymakers and supporting entities like universities. The sector skill council should unite industries, youth and the start-up ecosystem to bridge policy gaps, thereby reconciling skilling deficiencies and disconnects in career opportunities.

(f) **Optimized Training Centers:** Streamlining and enhancing the quality of individual training centers maintained by stakeholders and other entities are crucial. The sector skill council's role is to consolidate these efforts, establishing regional centers tailored to stakeholders' specific needs while guiding future strategies.



6. Moving Forward: Action Steps:

To fully realize the SAGAR vision, a substantial National Capacity & Capability Building initiative is imperative. MRC has submitted a comprehensive report to NITI Aayog, which serves as the foundation for formulating the national policy.

The proposed course of action for establishing the Sector Skill Council on the UDA framework not only aims to address India's skilling needs but also serves as a diplomatic tool to engage neighboring countries in the IOR and the broader Indo-Pacific region.

(a) **Awareness Building:** Primarily, sensitizing stakeholders and decision-makers across the spectrum about the importance and potential of the sector skill council is crucial. This will involve conducting seminars, workshops and round-table interactions. A structured plan for these engagements will be developed, with MRC making detailed presentations to convey the initiative's significance. The Ministry of Skilling & Entrepreneurship, in collaboration with NITI Aayog and relevant line ministries, will drive this proposal. The awareness campaign will be initiated immediately.

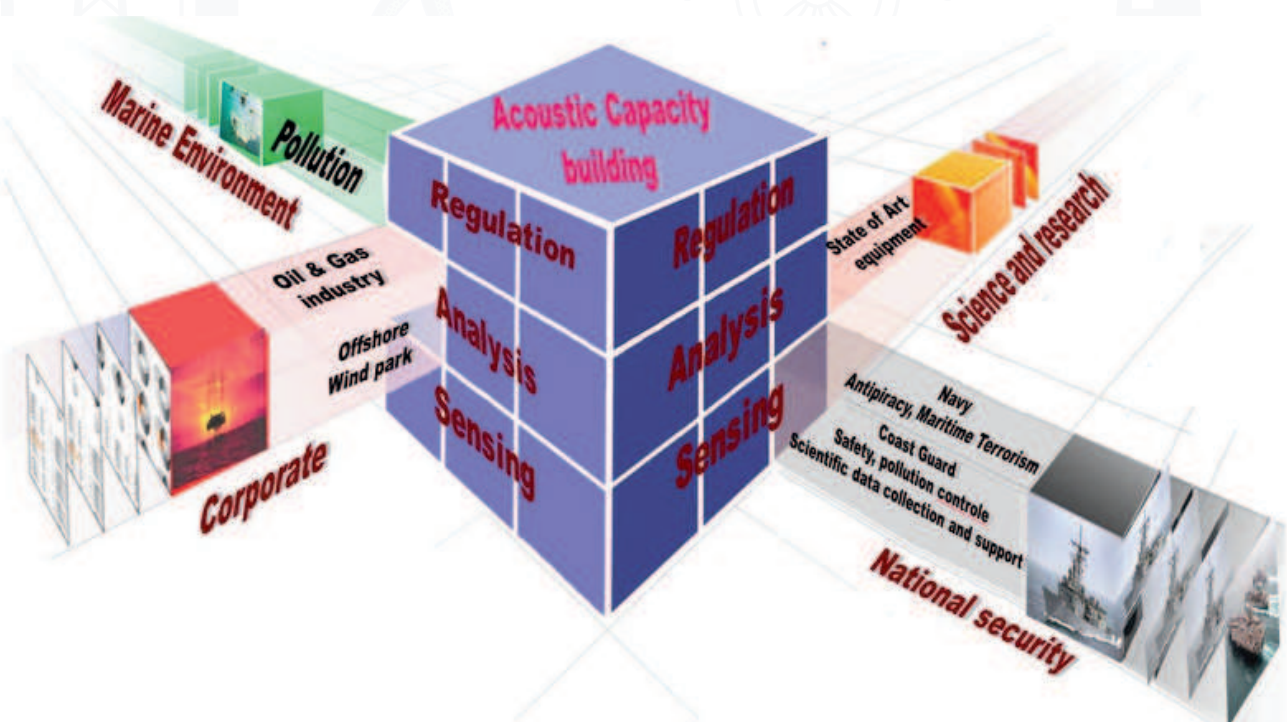
(b) **Involvement:** Engagement must span various levels and entities. Initially, the Government might award fellowships to students and young professionals to bolster the initiative's manpower for sustained growth.

These fellows will be instrumental from the outset, facilitating accelerated expansion. Following initial outreach, stakeholders and policymakers will be encouraged to sign MoUs with the core driving entity, establishing the sector skill council. These MoUs will tailor to specific requirements and ensure the initiative's longevity. They will enable structured interactions and resource allocation, fostering expertise. Engagement will commence within six months of the awareness phase.

(c) **Sustainability:** The engagement phase's conclusion will witness the establishment of the Sector Skill Council. This stage will formalize the foundational framework and craft a strategic vision document. Approval of projects and action plans will ensure a steady influx of resources and manpower. The sustainability phase will guarantee policy structuring, infrastructure development and consistent financial and human resource inflows, thereby ensuring the initiative's enduring continuity. Policy adaptations and seamless interplay among entities will manifest by the sustainability phase's conclusion.

7. Enclosure 1: Underwater Domain Awareness (UDA) Framework:

The Underwater Domain Awareness (UDA) Framework revolves around the notion of gaining insights into the undersea environment within our maritime areas. From a security standpoint, this entails safeguarding Sea Lines of Communication (SLOC), coastal waters, and diverse maritime assets against submarine proliferation and mine capabilities designed to restrict sea and littoral access. However, the impetus for UDA extends beyond military requirements. Understanding undersea geophysical activities bears relevance for humanity's well-being, offering crucial clues to mitigate the impact of catastrophic natural disasters. Commercial ventures in the undersea sphere demand precise information on resource availability for effective and efficient exploration and exploitation, while regulators need data to manage sustainable plans. Given the magnitude of both commercial and military activities, environmental repercussions are substantial. Conservation initiatives necessitate accurate assessments of habitat degradation, species vulnerability, and ecosystem status. Simultaneously, the scientific and research community must continuously engage to enhance our understanding of the undersea realm. Figure 1 provides a comprehensive view of the UDA concept. For all stakeholders, comprehending undersea developments, interpreting their significance, and responding promptly is pivotal to preventing their transformation into events.



The comprehensive perspective of UDA involves both horizontal and vertical dimensions. The horizontal dimension encompasses technology, infrastructure, capacity and capability, tailored to stakeholder needs. These stakeholders, illustrated by the four faces of the cube, possess distinct requirements while sharing the core acoustic capacity and capability. Meanwhile, the vertical dimension signifies a hierarchical UDA establishment. The foundational level involves sensing undersea threats, resources and activities. The subsequent level interprets generated data to formulate security strategies, conservation plans and resource utilization schemes. The subsequent level focuses on developing and overseeing regulatory frameworks at local, national and global levels.

The above figure presents a comprehensive path for stakeholder engagement and interaction. Individual cubes signify specific aspects warranting attention.

By configuring a User-Academia-Industry partnership that aligns with user needs, academic input and industry involvement, a targeted and well-defined interactive framework emerges. This approach can empower the UDA framework to tackle numerous contemporary national challenges. An essential element is engaging Young India in Nation Building, offering a critical avenue for attention. Collaboration among multi-disciplinary and multifunctional entities facilitates streamlined coordination towards overarching objectives.

The UDA Framework, as jointly formulated by the Maritime Research Centre (MRC) and M/S NirDhwani Technology Pvt Ltd (NDT), encompasses Policy, Technology & Innovation and Human Resource Development. Further details are accessible on the MRC website at <https://mrc.foundationforuda.in>.

Enclosure 2: Key Stakeholders of the UDA Framework:

The UDA framework reaches out to a wide spectrum of Stakeholders across the marine and freshwater systems.

(a) Sediment Classification

- (i) Ensuring effective dredging for innumerable applications like maintaining navigable waterways, water resource management in freshwater systems like lakes & reservoirs, and more
- (ii) Study of siltation process for prevention
- (iii) Disposal plan for the removed silt

(b) Port Management

- (i) Security from underwater intrusion
- (ii) Marine environmental monitoring
- (iii) Ensuring navigational safety at all times
- (iv) Marine eco-system monitoring for the formulation of the sustainable growth model

(c) Oil & Gas Industry

- (i) Seismic survey
- (ii) Security of offshore assets
- (iii) Environmental impact assessment due to their activities
- (iv) Aid to R&D

(d) Inland Water Transport

- (i) Navigational safety
- (ii) Environmental impact assessment
- (iii) Security
- (iv) Surveys to optimally pack multiple activities

(e) Water Resource Management.

- (i) Capacity building for storage dams
- (ii) Ensuring the effectiveness of recharge systems
- (iii) Effective de-siltation plan
- (iv) Prevention of siltation

(f) Underwater Search and Recovery

(g) Shipping Industry has excessive use of acoustic surveys for almost every activity at sea.

(h) Undersea Mining has become very critical and acoustic survey is the first step.

(i) Hydrographic Surveys are critical for multiple applications in the maritime domain and the freshwater systems.

(j) Acoustic Habitat Degradation could become the next big blue economic concern and needs effective monitoring and mitigation.

The government today has announced multiple initiatives to support the SAGAR vision, including Sagarmala, Bharatmala, Inland Water Transport, and more. These are all mega projects with massive fund allocation. Adequately skilled human resources will be the key.

Role of Industry Connects:

Multiple industries will be relevant to take this domain forward. Technicians to data loggers, data analysts, and research staff are multiple levels of opportunities that will be open to the participants. The following are the clear job opportunities:

- (a) Oil & Gas Industries and the supporting agencies will have a huge requirement for such trained people
- (b) Undersea survey companies for mining and undersea mapping
- (c) Governmental regulators in the maritime sector
- (d) NGOs involved in marine environmental monitoring
- (e) Consultants involved in Environmental Impact Assessment
- (f) Irrigation departments across states and the supporting agencies
- (g) Flood control department and supporting agencies
- (h) Shipping industry and port authorities
- (i) Scientific organizations and R&D groups
- (j) Policymakers, think tanks, and more
- (k) Maritime security agencies

Job Description:

The domain is huge with substantial hierarchical opportunities. The entire program has been divided into five levels:

- (a) Technicians
- (b) Deployment Crew
- (c) Data Logger and Sample Handler
- (d) Data Analyst and Sample Interpretation
- (e) Research Staff and Policy Formulation

Enclosure 3: MRC's Contribution Towards Digital Transformation for the Coastal Communities and the Riverine Communities:

Key details on Khadakwasla Lake Experiment:

- October 2017: Workshop on Modeling and Simulation (M&S) at Khadakwasla Lake for freshwater management exercise.
- Comprehensive approach showcasing policy, technical intervention and acoustic capacity development.
- Participants: Ph.D. research scholars, postgraduates, undergraduates, and young professionals from diverse stakeholders and research organizations.
- Three-year study on Khadakwasla Lake involving underwater parameter mapping and model creation by a Ph.D. scholar.
- Field experiments validating work with four sonar types deployed (Side Scan Sonar, Single Beam Sonar, Sub-Bottom Profiler and CTD Probe).
- Opportunity for participants to deploy sonars, grasp operating mechanisms and perform data collection and analysis.
- Workshop funded by Bajaj Group's CSR activities, Maharashtra Government's research fund and support from National Defence Academy and supplies and deployment of sonar almost free of cost by The Unique Group.
- All aspects of the workshop organised and carried out by MRC and NDT.
- Attended by 25+ researchers from multiple academic and research institutes.
- Part of field experimental validation for Ph.D. scholar's research and contributions from PG students and interns at MRC over two years.
- Data used by multiple scholars, students and interns for research purposes at MRC, setting a benchmark in academic research.
- Valuable insights from the experiment contributing to MRC's freshwater management research and policy efforts.
- Inputs serve to advance research for Digital Transformation and improved governance.

Enclosure 4: MRC's Milestones in UDA Journey:

Policy Intervention:

- **Collaboration with the IMO:** Presented innovative digital tool for monitoring underwater noise to IMO's MEPC-76 in 2021. IMO designated India as IOR lead for underwater noise management, allocating \$2 million.
- **Collaboration with UNESCO India:** Proposed CoE for marine and freshwater biosphere reserve capacity building, benefiting Africa and South Asia. Collaborated in events promoting UDA for sustainable tropical water growth. The Ministry of Education & Skilling is processing the case and MRC has briefed the UNESCO HQ in Paris and India's permanent delegate for UNESCO in Paris on the same.
- **Collaboration with ISA:** Partnered with ISA for global deep ocean mining capacity and capability building. MRC/NDT has been recognized for promoting sustainable blue economy and digital governance tools.
- **NITI Aayog Collaboration:** Presented policy paper proposing nationwide acoustic capacity enhancement to NITI Aayog. Tasked to provide roadmap and details, submitted report, now under circulation among ministries.
- **Indian Navy Collaboration:** Indian Navy discussed UDA framework in their Commander's Conference. Embarked on UDA implementation for strategic and tactical deployments.
- **The NSCS Collaboration:** NSCS accepted policy paper on underwater security roadmap based on UDA framework. MRC now recognized as domain expert and consulted on strategic security matters.
- **CBC Collaboration under PMO:** Collaborating with Capacity Building Commission (CBC) under PMO (Prime Minister's Office) to design e-learning modules and outreach program for UDA framework operationalization.
- **MEA Collaboration:** MEA submitting proposal for UDA workshop in Indian Ocean Region (IOR). UDA framework recognized as diplomatic tool for realizing SAGAR vision.
- **INCOIS Collaboration under MoES:** Signed MoU with INCOIS, MoES, for progressing Digital Ocean initiative. Recognizing data analytics abilities and supporting UNESCO Center of Excellence at INCOIS.
- **Sector Skill Council Proposal:** Proposed sector skill council on underwater domain to enhance User-Academia-Industry partnership, under deliberation at National Skill Development Council (NSDC). MCCIA forwarded proposal, backed by FICCI.
- **Outreach to Key Stakeholders:** Reached out to various stakeholders including state maritime boards, Sagar Mala project stakeholders (Jawaharlal Nehru Port Authority, Cochin Port Authority, etc.), Ministry of Water Resources, Indian Institute of Water Management, National Cyclone Risk Management Board, etc. Building strong stakeholder community for underwater domain awareness skilling.
- **Guidance from Union Ministry:** Union Ministry of Ports, Shipping and Waterways (Sagarmala) reached out to guide MRC on skilling center proposal for Underwater Studies, aligning with SAGAR vision. Ministry directed MRC to contact Nodal Ministry on Sector Skill Council.

At the Level of Technology Intervention:

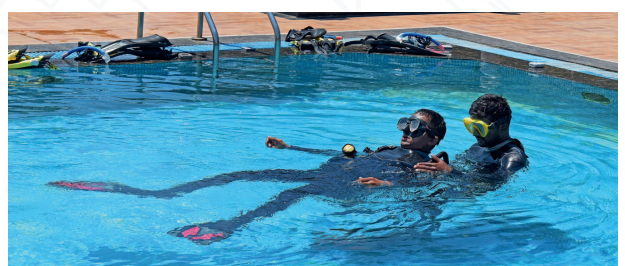
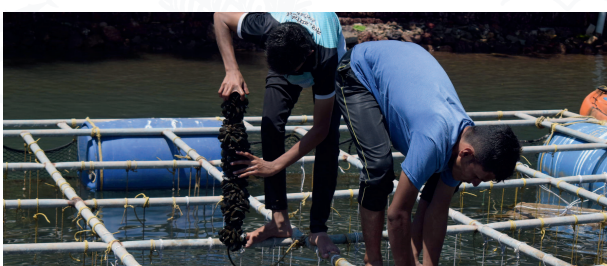
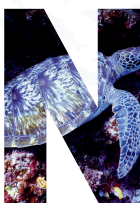
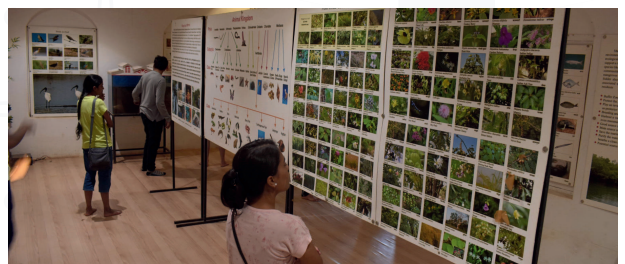
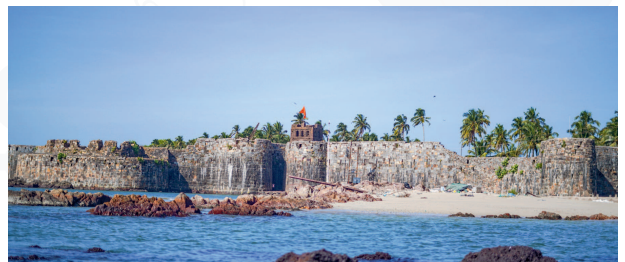
- **Narwhal Challenge 2019:** NDT won the Narwhal Challenge 2019 in France for their innovation in real-time monitoring of underwater noise from shipping. Selected among four global teams.
- **Defence Technology Innovation Challenge 2021:** NDT succeeded in the 2021 challenge, developing a versatile digital technology tool for real-time submarine deployment in tropical waters, catering to various platform requirements.
- **Spatiotemporal Noise Map:** Collaborated with MoES for a research project to create a spatiotemporal noise map, monitoring low-frequency underwater noise in IOR's tropical waters, aligning with India's digital ocean initiative.
- **Startups and Educational Institutions:** NDT generated 50 innovative ideas, nurtured by over 200 students from IITs, BITS Pilani, etc., reaching proof-of-concept stage, ready to integrate into the startup ecosystem.
- **Collaboration with BEL:** Research partner with Bharat Electronics Ltd (BEL) for developing advanced solutions in the defence sector, contributing to strategic security initiatives.
- **Indian Navy Collaboration:** Evaluated and accepted three NDT projects for maritime surveillance, coastal security and sub-surface target intelligence. Projects passed technical and operational assessments for their innovative contributions.

Acoustic Capacity and Capability Building:

- **UDA Summer School:** Since 2017, MRC/NDT's UDA Summer School offers a six-week project-based internship. It's become a nationwide event with over 200 participants, including students, faculty, young professionals and more. Participants engage in content-rich practical problem-solving. (Report: UDA Summer School 2018)
- **Internship Programs:** MRC/NDT also runs parallel Internship Programs for premier institute students (IITs, BITS Pilani, etc.). Over 200 interns have participated, producing high-quality results. Ten have transitioned to research fellows for extended periods.
- **AICTE Collaboration:** Approached AICTE (All-India Council for Technical Education) for academic recognition of capacity building efforts. In 2020, AICTE approved ten acoustic survey modules for execution in affiliated institutions.
- **PMKVY Scheme Collaboration:** Partnered with PMKVY (Pradhan Mantri Kaushal Vikas Yojna) for recognition of skilling programs. Ten modules approved under PMKVY.
- **ISCE Collaboration:** Collaborating with Indo-Swiss Center of Excellence (ISCE) for Skilling to roll out underwater studies skilling programs. ISCE provides infrastructure and financial support.
- **Excel Industries Collaboration:** Excel Industries Ltd supports the establishment of a Center of Excellence on Blue Economy, backing UDA Research Fellows and sustainable blue economy field validation.
- **UDA Digest Platform:** MRC/NDT established UDA Digest, a digital platform with 70+ articles to sensitize a broader community to UDA's dimensions.
- **Research Repository:** Over 100 research notes and reports contributed by interns and research scholars cover various UDA aspects, representing policy, technology and interdisciplinary research.
- **Outreach Events:** Conducted 100+ webinars, seminars, workshops, lecture series and interactions over five years, sensitizing stakeholders, policymakers, students and researchers.
- **Regular Publications:** Regularly publish on scientific and strategic platforms to raise UDA awareness. Featured in Geopolitics Magazine, Sunday Guardian, National Dailies and local media outlets.

Enclosure 5: MRC's Recent Trip to Malvan for Understanding the Significance of Blue Economy:

As part of the four-workshop series which was organized by the Maritime Research Centre (MRC) in March 2023, a trip to Malvan in Maharashtra was planned to understand nuances of Underwater Domain Awareness and its significance in enhancing the Blue Economy. Some of the images can be viewed as below.



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**Think
Blue**

The Maritime Research Center (MRC) is a think tank dedicated to Underwater Domain Awareness* (UDA).

Focused on acoustic capacity and capability building for the tropical and littoral waters in the Indian Ocean Region, MRC collaborates with stakeholders from Blue Economy, National Security, Marine Environment to Science and Technology.

MRC's Centers of Underwater Excellence molds tangible products, policies and human skills. Towards this, MRC is guided by its holistic UDA framework which has been embraced by stakeholders nationally and globally.

Join us to contribute in making our blue planet more safe, secure, sustainable and effectively explored.

Lets collaborate !!

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