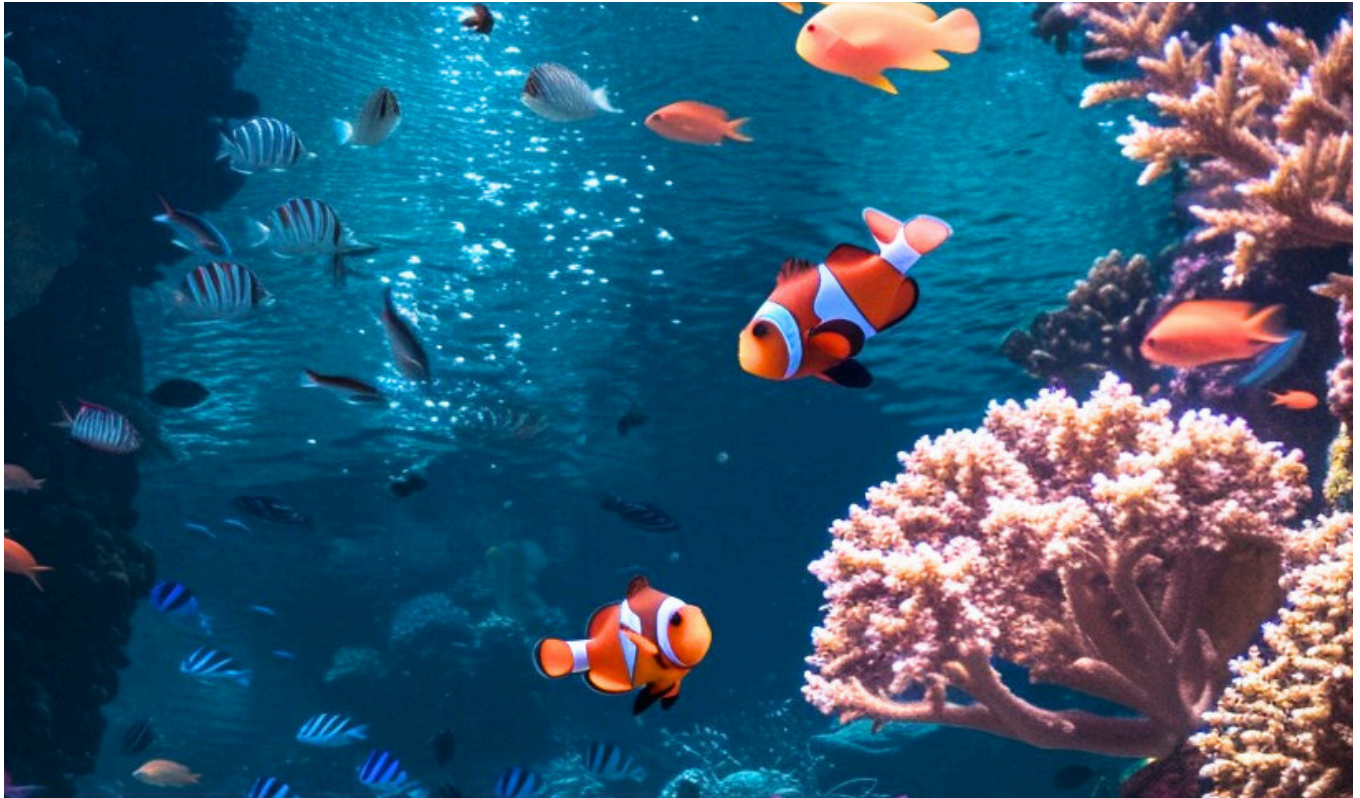


FOUNDATION FOR UNDERWATER DOMAIN AWARENESS



Annual Report 2024



A Letter from the Founder



Dear Esteemed Stakeholders,

As we reflect on the year 2024, it is with great pride and a deep sense of responsibility that we present to you the Annual Report of the Maritime Research Center (MRC). This year has been transformative for us, one in which we have made significant strides in advancing skilling, knowledge, research, innovation, and strategy in the underwater domain for safe, secure, sustainable growth for all in the tropical waters of the Indo-Pacific Strategic Space.

At MRC, our mission has always been to progress the idea of Underwater Domain Awareness (UDA) and to address the complex issues facing the marine and freshwater systems. This year, we have focused our efforts on several key areas, including Marine Spatial Planning, the application of Artificial Intelligence (AI) and Machine Learning (ML) in ensuring strategic security, and the promotion of sustainable blue economy initiatives with a clear focus on climate change risk management. Through our work with academic institutions, government bodies, industry captains, and international partners, we are fostering a deeper understanding of the challenges and opportunities in the tropical waters.

A highlight of 2024 has been our commitment to research & innovation along with capacity building across diverse stakeholders. We are working closely with the armed forces & paramilitary forces, providing targeted training on marines and freshwater systems. Our partnerships extend to the diplomatic community, for progressing the Security And Growth for All in the Region (SAGAR) vision of the Honourable Prime Minister. Furthermore, we have made substantial progress in internship and fellowship programs, fostering engagement across premier institutions like the Indian Institute of Technology (IITs) and many more. Engagement with the coastal communities has been one of our key achievements for this year.

Looking forward to 2025, we are excited to continue this momentum. Our focus will be on the development and deployment of innovative tools designed to support research and practical applications in the underwater domain. We are committed to enhancing our role as a leader in the maritime research sector, offering new opportunities for collaboration and engagement across corporate, academic, governmental sectors and also global institutions.

I would like to express my heartfelt gratitude to all our partners, members, and collaborators for their unwavering support and dedication. Together, we are building a sustainable and secure maritime future, one that will benefit generations to come.

Thank you for your continued trust and we look forward to an even more impactful year ahead.

Sincerely,
Dr. (Cdr) Arnab Das
Founder and Director

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1. Introduction

1.1 About Us:

The Maritime Research Center (MRC) began its journey in February 2017 in Pune, Maharashtra, India, as a not-for-profit research and policy centre to progress the idea of Underwater Domain Awareness and its Framework. This idea requires a concentrated effort to engage stakeholders and foster collaborations through policy interventions, technology interventions, acoustic capacity, and capability building. Simultaneously, we also launched NirDhwani Technologies Pvt. Ltd. (NDT) in 2017 to spearhead and manage innovation, consultancy and field experimental validation. In March 2019, the Foundation for Underwater Domain Awareness (FUDA) was registered as a Section 8 company under the Registrar of Companies, India. Ever since, both organisations have been pioneering forces in developing the Underwater Domain Awareness (UDA) Framework to bolster policy, technology, and capacity building in the underwater domain.

In translating thought into action, we are privileged to receive support from various National and International Missions and partners from Think Tanks, Industry and Academia. MRC catalyses industry-relevant research that solves real-world problems, incubates tech-led innovations, and enables adaptation to various fields related to the UDA Framework. Our engagement with academia and pedagogy further ensures sustained availability of human capital for specified needs. NDT supports MRC as a start-up with niche capabilities in Acoustic Signal Processing Hardware & Software products and solutions. NDT has developed multiple innovative ideas to help the UDA framework comprehensively across all dimensions. It undertakes turnkey solutions with extensive research-based design & development projects and also field experimental support.

In this annual report, we focus on exemplifying the concept of Underwater Domain Awareness by highlighting its crucial role and various projects and initiatives we undertook and delivered in 2024 to foster sustainable growth across strategic security, environmental, economic, policy, technology, geopolitics, and social development goals. This report covers everything from outlining the significance of underwater domain awareness to explaining the major platforms developed to spearhead UDA. The Year in Review section highlights impactful engagements, key milestones, and valuable partnerships that helped shape our steady progress this year. Looking ahead, our Partnerships and CSR sections aim to explore exciting future endeavours and partnerships for the years to come. These chapters collectively underscore our commitment to empowering and informing a diverse network of stakeholders and beneficiaries across industries through unique UDA-driven solutions. We hope you will join us in this exploration of our exciting initiatives, achievements, and aspirations in shaping a safer, more informed underwater world.

1.2 Mission and Vision:

Given the oceans' critical role in national security, food sources, and environmental protection, our efforts are centred on improving our understanding of these marine ecosystems through the Underwater Domain Awareness (UDA) concept. Driven by a deep curiosity and commitment to knowledge, innovation, and policy development, we aim to promote the UDA framework among stakeholders and policymakers. This will help ensure a safe, secure, and sustainable growth model for the tropical coastal waters of the Indo-Pacific region and beyond. In a world facing overpopulation, resource depletion, and the growing threats of climate change, we must focus more on the largely unexplored depths of the oceans-vast areas that cover 70% of the Earth's surface but remain understood to only about 5%. This gap in knowledge calls for a well-organized, specialised approach to ocean research and application.



Over the years, we have remained steadfast in our commitment to our mission and vision: fostering collaboration among a wide array of stakeholders to harness the vast potential of the underwater domain. Our UDA framework has, in turn, become the recognised standard for national discussions on developing acoustic capabilities for tropical waters and riverine environments.

1.3 Overview of Center's Work:

To continue fostering informed collaboration amongst all underwater domain stakeholders in the Indian Ocean Region (IOR), we operate as a think tank, tech tank, and skill tank, with a specialised network of distinguished advisors, subject matter experts, and industry leaders to guide and support our mission.

- **Think Tank:** The UDA framework, as proposed by MRC, emphasises the necessity for a conducive policy environment, urging stakeholders and associated entities to harmonise efforts seamlessly to facilitate success.
- **Tech Tank:** Technology intervention in the unique challenges of the tropical littoral waters of the Indo-Pacific region requires a balanced mix of traditional knowledge and state-of-the-art innovation and technology, which our organisation strives to provide.
- **Skill Tank:** The UDA framework's many challenges and opportunities demand a substantial human resource pool to manage a safe, secure, and sustainable growth model. This necessitates the involvement of multi-disciplinary, experienced individuals to handle these responsibilities effectively.



1.4 Organisational Overview:

Governing Council	Dr. (Col) Aswini Kr. Das
	Dr. (Cdr) Arnab Das
	Shri Praful Talera
Strategic Advisory Council	Lt. Gen (Dr.) D B Shekatkar (Retd) PVSM, AVSM, VSM, Chairman, Shekatkar Committee and Strategic Defence Analyst
	Amb. Anup Mudgal (Retd) Member of FICCI's Blue Economy Task Force and a former member of the steering committee under PM-EAC on Blue Economy
	Dr. Ajay Kumar Former Defence Secretary, Government of India
	Vice Admiral AR Karve (Retd) PVSM, AVSM, Former CinC, Indian Navy and Anti-Submarine Specialist
	Vice Admiral DSP Varma (Retd) PVSM, AVSM, VSM, Former DG ATVP (Technology)
	Shri Ashwin Shroff Executive Chairman, Excel Industries Limited
Research & Advisory Board	Dr. Satheesh Shenoi Former Director INCOIS Hyderabad
	Prof. Radhika Seshan Former HOD, Department of History, SPPU
	Dr. R Vijay Kumar Department of Ocean Engineering, IIT Chennai
	Prof. Varsha Kelkar Mane Professor and Head, University Department of Biotechnology, University of Mumbai

Our Team

Core Team

Shridhar Prabhuraman
Deputy Director

Cathrine J
Research and Publications Head

Nishtha Vishwakarma
Head of Communications and Outreach

Divya Nagarajan
Admin Head

Research Fellows

Romit Kanware

Shlok Nemani

Divya Rai

Engineering and Developers Team

Pranil Deshmukh

Ayush Sawadh

Jay Pinjarkar

Shreya Waghmare

Shubham Kalaskar

Aanchala Dhanvijay

Communications and Outreach Team

Ganesh Anekar

Rajeshree Bhagwat

Supported by 'The Cowherd Boy' Team

2. Fundamental Components of the Underwater Domain Awareness

2.1 Significance of the Underwater Domain Awareness:

India's extensive coastline of over 7,500 kilometres and its vast network of ports present significant opportunities for the growth of the blue economy. This sector is poised to play a pivotal role in the country's ambition to become a US\$ 10 trillion economy by 2030, with projections estimating an annual contribution of around US\$ 1 trillion. Additionally, it promises to generate employment and attract substantial investments in industries such as fisheries, aquaculture, renewable energy, and mineral resources. However, to fully realise these prospects, India requires the development of robust infrastructure that aligns with the potential of its underwater resources. From port facilities to renewable energy projects, this infrastructure must be underpinned by careful planning and a deep understanding of marine and underwater environments.

Alongside supporting the economic benefits of the blue economy, the need for comprehensive Underwater Domain Awareness (UDA) is also critical to addressing existing gaps in policy, technology, research, and strategic security. Underwater Domain Awareness (UDA) refers to the knowledge, understanding, and real-time monitoring of underwater environments to ensure maritime operations' safety, security, and sustainability.

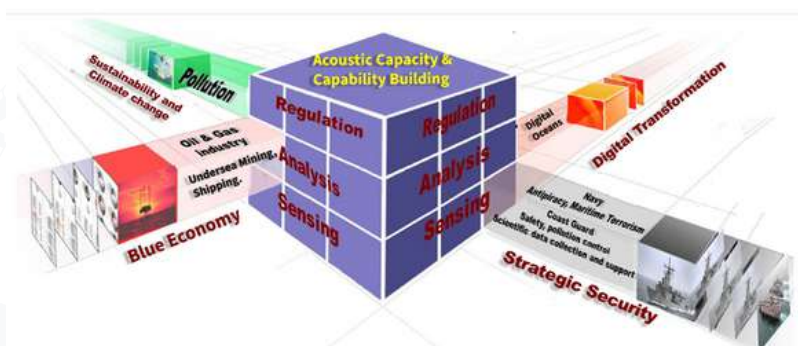


Image credit: MRC team

2.2. UDA Framework has received the Copyright certificate:

In October 2024, under the esteemed leadership of our Founder and Director, Dr (Cdr) Arnab Das, our team officially received the Copyright certificate for the Underwater Domain Awareness (UDA) Framework from the Copyright Office, Government of India. This milestone recognised our innovative effort and reinforced our commitment to enhancing maritime safety and security. The UDA Framework represents a significant step in understanding and protecting our underwater environments.

The UDA Framework provides a comprehensive, structured, and inclusive mechanism to ensure nuanced policy and technology interventions, acoustic capacity, and capability building to prove a safe, secure, and sustainable growth model for all in the tropical waters of the Indian Ocean Region (IOR). The figure below provides the schematic representation of the UDA Framework. It gives a holistic view and encourages the pooling of resources and synergising of efforts to ensure optimum resource deployment for the global south.



UDA Framework

On a comprehensive scale, the UDA needs to be understood in its horizontal and vertical construct. The horizontal construct would be the resource availability in terms of technology, infrastructure, capability and capacity specific to the stakeholders or otherwise. The stakeholders represented by the four faces of the cube will have their specific requirements. However, the core will remain the acoustic capacity and capability. The vertical construct is the hierarchy of establishing a comprehensive UDA. The first level, or the ground level, would be sensing the underwater domain for threats, resources and activities. The second level would be making sense of the data generated to plan security strategies, conservation plans and resource utilisation plans. The next level would be formulating and monitoring the local, national, and global regulatory framework.

There is significant fragmentation among the stakeholders: Strategic Security, Blue Economy, Sustainability & Climate Change Risk Management and Science & Technology (Digital Transformation). The individual cubes represent specific aspects that need to be addressed. The user-academic industry partnership can be seamlessly formulated based on user requirements, academic inputs, and the industry interface represented by the specific cube. It will enable a more focused approach and a well-defined interactive framework. Given the appropriate impetus, the UDA framework can address multiple challenges the global community faces today. Meaningful engagement of the young and aspirational population is the most critical aspect that deserves attention. Multidisciplinary and multi-functional entities can interact and contribute to synergise their efforts towards a larger goal seamlessly.

  Extracts from the Register of Copyrights 	
प्रतिलिप्यधिकार कार्यालय, भारत सरकार Copyright Office, Government Of India fmkaf/Dated:25/09/2024	
1. lathdj.k la[k /Registration Number	A-155676/2024
2. vkosnd dk uke] irk rFkk jk"V"hrk Name, address and nationality of the applicant	ARNAB DAS, AQUAMARINE A3 203 NYSTI ESTEBAN UNDRI PUNE MAHARASHTRA-411060 INDIAN AUTHOR
3. —fr ds (fr)fr/f/kdkj esavkosnd ds fgr dh c—fr Nature of the applicant's interest in the copyright of the work	ARTISTIC WORK THE UDA FRAMEWORK IS A COMPREHENSIVE MODEL FOR MANAGING THE UNDERSEA DOMAIN, OPTIMIZING RESOURCE DEPLOYMENT, AND PROVIDING NUANCED POLICY AND TECHNOLOGY INTERVENTION. IT IS AIMED AT OVERCOMING THE TRO
4. —fr dk oz vkSj o.kZu Class and description of the work	UNDERWATER DOMAIN AWARENESS (UDA) FRAMEWORK ENGLISH, HINDI
5. —fr dk 'kh"kd Title of the work	
6. —fr dh Hkk"kk Language of the work	
7. jpf/rk dk uke] irk vkSj jk"V"hrk rFkk ;fn jpf/rk dh e Rq gks xbZ gS Name, address and nationality of the author and if the author is deceased, date of his decease	ARNAB DAS, AQUAMARINE A3 203 NYSTI ESTEBAN UNDRI PUNE MAHARASHTRA-411060 INDIAN
8. —fr cdk'kr gS ;k vcdk'kr Whether the work is published or unpublished	PUBLISHED
9. cFke cdk'ku dk o"Z vkSj ns'k rFkk cdk'kd dk uke] irk vkSj jk"V"hrk Year and country of first publication and name, address and nationality of the publisher	2016 INDIA ARNAB DAS, AQUAMARINE A3 203 NYSTI ESTEBAN UNDRI PUNE MAHARASHTRA-411060 INDIAN
10. ckn ds cdk'kksads o"Z vkSj ns'k ;fn dksbZ gksa] vkSj cdk'kksads uke] irk vkSj jk"V"hrk Years and countries of subsequent publications, if any, and names, addresses and nationalities of the publishers	2024 INDIA ARNAB DAS, AQUAMARINE A3 203 NYSTI ESTEBAN UNDRI PUNE MAHARASHTRA-411060 INDIAN
11. —fr esagfr/f/kdkj lgr foHkku vi/kdkjksads Lokte;ksads uke] irk vkSj jk"V"hrk, vkSj leqns'ku vkSj vuqf/k;ksads foj'k ds lkFk R;sd ds vi/kdkj dk folr[k] ;fn dksbZ gksa Names, addresses and nationalities of the owners of various rights comprising the copyright in the work and the extent of rights held by each, together with particulars of assignments and licences, if any	ARNAB DAS, AQUAMARINE A3 203 NYSTI ESTEBAN UNDRI PUNE MAHARASHTRA-411060 INDIAN
12. Names, addresses and nationalities of other persons, if any, authorised to assign or licence of rights comprising the copyright	ARNAB DAS, AQUAMARINE A3 203 NYSTI ESTEBAN UNDRI PUNE MAHARASHTRA-411060 INDIAN
13. ;fn —fr, d dykRed —fr gS] rks —fr ij vi/kdkj [kus okys O;fä dk uke] irk vkSj jk"V"hrk lgr ewy —fr dk LFkku ¼/ä d okLrFk —fr ds ekeys esa —fr iwjh gksus dk o"Z Hkh fn[kk tkuk pkfg. ½ If the work is an 'Artistic work', the location of the original work, including name, address and nationality of the person in possession of the work. (In the case of an architectural work, the year of completion of the work should also be shown).	ARNAB DAS, AQUAMARINE A3 203 NYSTI ESTEBAN UNDRI PUNE MAHARASHTRA-411060 INDIAN
14. ;fn —fr, d 'dykRed —fr gS tks fdH Hkh eky ;k Isokvksads laca/ esa mjksx dk tkrh gS ;k mjksx fd, tks esal (ke gS] rks vkosnu esa (fr)fr/f/kdkj vi/kfure] 1957 dh /kkj 45 dh mi/k/kkj ¼vi/ä ds cko/kku ds vuq[kj O;kikj fpa jftLV'kj is ceku.k 'kfr ey gksuk pkfg. If the work is an 'Artistic work' which is used or capable of being used in relation to any goods or services, the application should include a certification from the Registrar of Trade Marks in terms of the provision to Sub-Section (i) of Section 45 of the Copyright Act, 1957.	N.A.
15. ;fn —fr, d 'dykRed —fr gS] rks D;k ;g fMtkbu vi/kfure 2000 ds varZr iath—r gS ;fn gka] rks foj'k nsa If the work is an 'Artistic work', whether it is registered under the Designs Act 2000, if yes give details.	N.A.
16. ;fn —fr, d dykRed —fr gS] tks fMtkbu vi/kfure 2000 ds rgr, d fMtkbu ds i esalath—r gksus esal (ke gS] rks D;k ;g vkS] ksfad cfo'k ds ek/;e is fdH olrq ij cga dh xbZ gS vkSj ;fn gka] rks bls fdruh dk iqu#Rdkm fd;k x;k gS If the work is an 'Artistic work', capable of being registered as a design under the Designs Act 2000, whether it has been applied to an article though an industrial process and, if yes, the number of times it is reproduced.	N.A.
17. fMl.kh] ;fn dksbZ gks/Remarks, if any	THE CURRENT REVELATION OF THE DESIGN NAMED UNDERWATER DOMAIN AWARENESS (UDA) FRAMEWORK WAS FIRST PUBLISHED AT THE PUNE DIALOGUE ON NATIONAL SECURITY (PDNS) ANNUAL CONFERENCE SEPTEMBER 2016. HOWEVER, (i) A COPY OF THE WORK IS ANNEXED WORK. (ii) THE ARTISTIC WORK SHALL NOT BE USED IN RELATION TO ANY GOODS OR SERVICES. (iii) THE COPYRIGHT IN THE ARTISTIC WORK SHALL NOT SUBSIST IF THE WORK HAS BEEN APPLIED TO AN ARTICLE THROUGH INDUSTRIAL PROCESS & REPRODUCED MORE THAN 50 TIMES

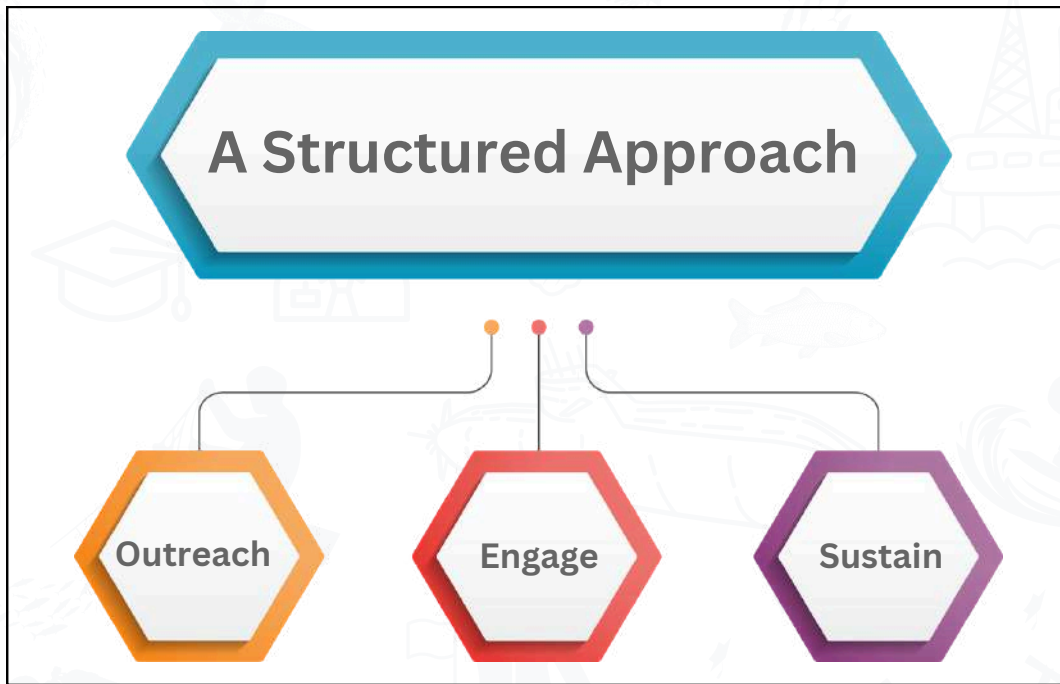
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22858/2024-CO/A

Copyright certificate for the UDA Framework. [View the certificate here](#)

2.3. Outreach, Engage and Sustain:

Since UDA is a unique concept, it requires a highly structured approach to make it implementable at various levels and amongst various stakeholders. This structured approach is called the ‘Outreach, Engage and Sustain’ approach.



- **Outreach:** Through this, we aim to calibrate the cross-section of entities so that they can integrate into our ecosystem. Our team uses webinars, seminars, workshops, symposiums, and many other interaction tools. This year, we hosted an important workshop in April 2024, and later, we held various webinars almost every month to sensitise our diverse stakeholders about the unique concept of UDA and the significance of integrating the same with issues related to maritime security in the Indian Ocean Region (IOR), Indo-Pacific region etc. All major ‘Outreach’ activities have been mentioned in the references section of this Annual Report. This schematic ‘Outreach’ initiative is then followed by Engagement at multiple levels.





Glimpses from some important UDA
webinars and workshops

- **Engage:** Through this approach, we offer internships and fellowships to students and young professionals to consolidate their association with our endeavour for UDA. A deeper understanding of the nuances of underwater domain awareness allows them to be assets for future projects and implementations. This year, we collaborated with prestigious universities and institutes such as the Indian Institute of Technology (IIT) Kharagpur, IIT Bombay and IIT Madras to bolster the ‘Engagement’ part of our three-step approach. Besides offering internships, our research fellows continued their research projects on various topics, including digital transformation, sedimentation management, climate change and maritime security. Similarly, policymakers have found value and partnered with us to pursue larger maritime objectives. The full list of our ‘Engagement’ activities has been listed in the references section of this annual report.



We engaged by participating at the 6th East Asia Summit Conference in Mumbai



We participated at
Pathfinder's
Conference on
Maritime Security
in Colombo, Sri
Lanka

Our team
participated at
the World Ocean
Science Congress
at IIT Madras



- **Sustain:** To sustain, one must translate the ideas into long-term implementation projects. These projects pertain to policy and technology interventions on the ground with complete turnkey implementation. The manpower developed during the internships and fellowships phases is the leader of this phase of the three-fold approach. To sustain our research initiatives, we have designed initiatives such as the '100 Coastal Warriors' and '100 River Warriors' projects. To address the local requirements, the entire Indian Coast needs to be populated with such pilot projects. The full list of activities from our 'Sustain' part has been mentioned in the references part of this annual report.



Our sustained effort of empowering Coastal communities

2.4. Important Pillars Driving UDA:

The five core pillars that form the core of the UDA framework align with the blue economy, maritime security, climate change, Marine Spatial Planning, and marine environment conservation. Below are the five pillars of the UDA:

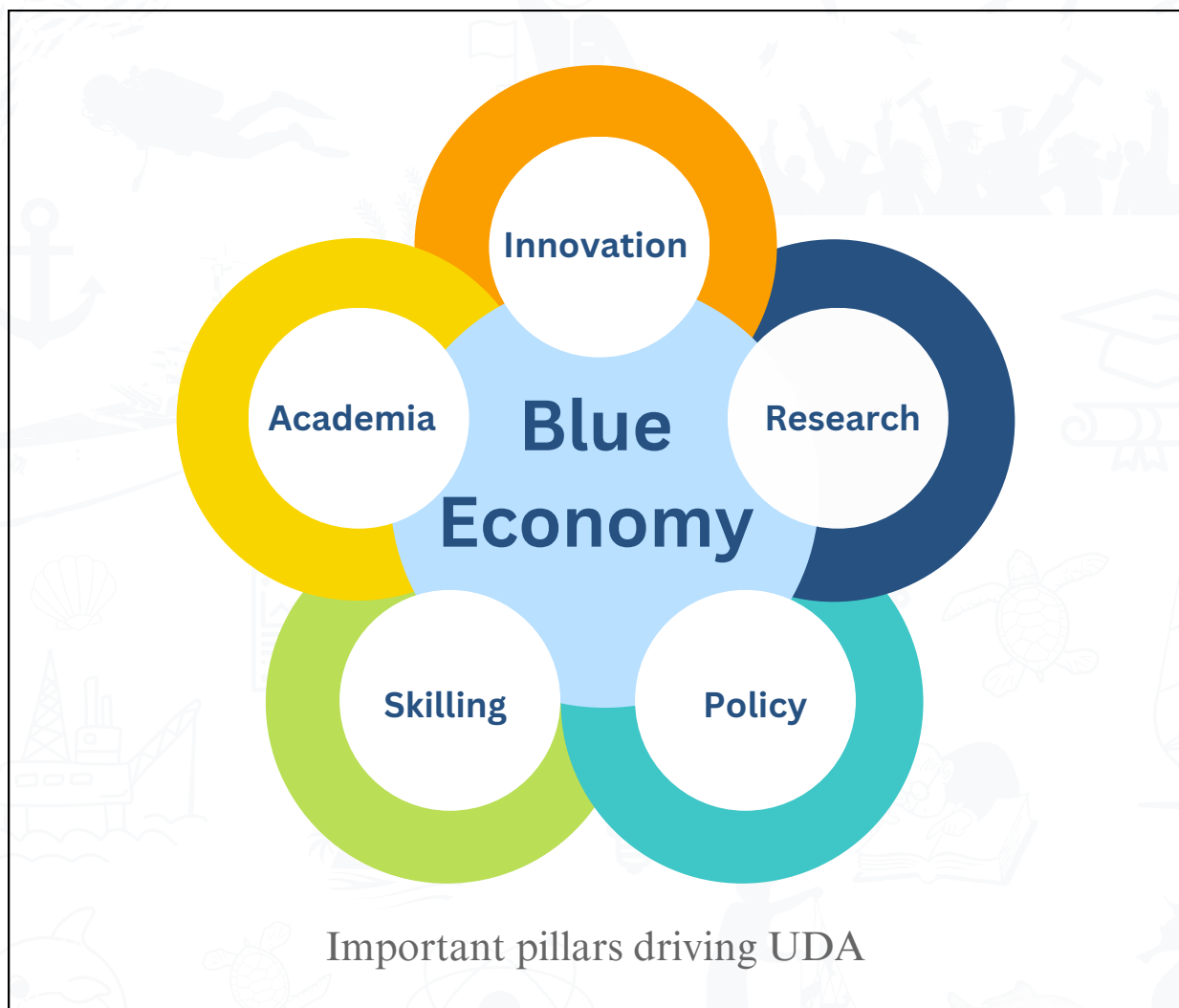
(i) Research: Research is the central pillar, driving all the other four pillars of the UDA Framework. It is because of the findings and observations that we derive from the research that form the basis of the technology we develop or the policy framework formed to help and guide our stakeholders. Throughout the year, our Research Fellows and scholars with backgrounds from prestigious institutions such as the Indian Institute of Technology, The Energy and Resources Institute (TERI), and the Defence Institute of Advanced Technology (DIAT) have contributed groundbreaking research in underwater studies. Our organisation facilitates and conducts multidisciplinary studies on tropical waters, including underwater noise mapping, modelling for aquatic environments, AIS data analytics, and freshwater management. These endeavours foster a comprehensive understanding of crucial underwater aspects, contributing to the science and research potential of the UDA framework.

(ii) Innovation: The complex dynamics of the UDA domain require creative solutions. Our digital tools for monitoring underwater noise and submarine deployment have received worldwide recognition, highlighting the UDA framework's significance across various industries globally. In addition, our team has this year worked on developing a tool for Marine Spatial Planning, which is the follow-up to the MSP handbook being generated in-house by our research team. Further, a digital transformation tool for APY analysis is being developed to provide solutions to seaweed farmers. To foster collaborative innovation and development, we have also launched initiatives like the Innovation Challenge, encouraging active involvement and public-private partnerships to unlock the diverse possibilities of our tropical waters.

(iii) Skilling: We recognise that skilling in specialised domains is crucial to advancing our initiatives on underwater domain awareness. Research and innovation alone are not sufficient to drive our efforts in the blue economy, maritime security, and environmental conservation. Equally important is the development of the right skills to create a meaningful impact. This year, we organised a range of workshops and online webinars with the core objective of equipping stakeholders with the necessary skills. In collaboration with esteemed organisations such as Bharat Electronics Limited and Larsen & Toubro, we conducted a skilling workshop for officials in the strategic security sector. Additionally, we partnered with the Military Institute of Technology (MILIT) to provide training in areas like Artificial Intelligence, Machine Learning, Marine Spatial Planning, Underwater Radiated Noise Management, and Sediment Management for student officers.

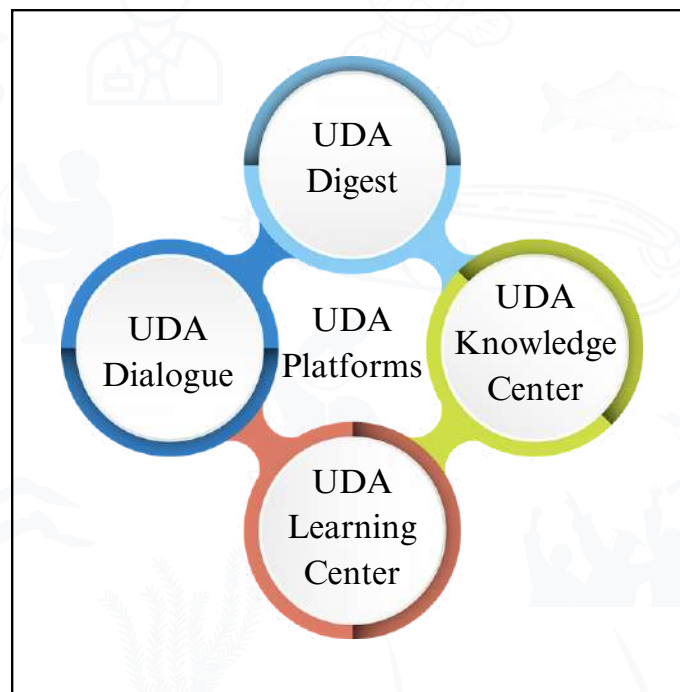
(iv) Academia: Recognising the lack of underwater studies in academic curricula, we have taken proactive steps to integrate acoustic-related courses into technical education. Our strong advocacy for curriculum enhancement has led to the approval of ten courses by the All India Council for Technical Education (AICTE) to date. This milestone has paved the way for the inclusion of underwater studies in educational institutions, effectively bridging the gap between academic learning and the practical demands of underwater domain awareness (UDA). Furthermore, through collaborations with global academic organisations and the expertise shared in our UDA Digest magazine, our organisation has been a leader in addressing key knowledge gaps and promoting the dissemination of critical information.

(v) Policy: It is important to institutionalise technology advancement through targeted policy interventions in the underwater domain. Our ongoing engagements with government bodies, including the Ministry of Earth Sciences, Ministry of Environment, Forest and Climate Change, Ministry of External Affairs, Military Institute of Technology, Capacity Building Commission of India, etc., have effectively highlighted the wide-reaching importance of UDA. By drafting interim reports, policy papers, and contributing important handbooks on Skilling and Marine Spatial Planning, we took significant steps to advance India's leadership in managing underwater noise and strengthening national capacity in UDA.



3. Four Major Platforms of UDA

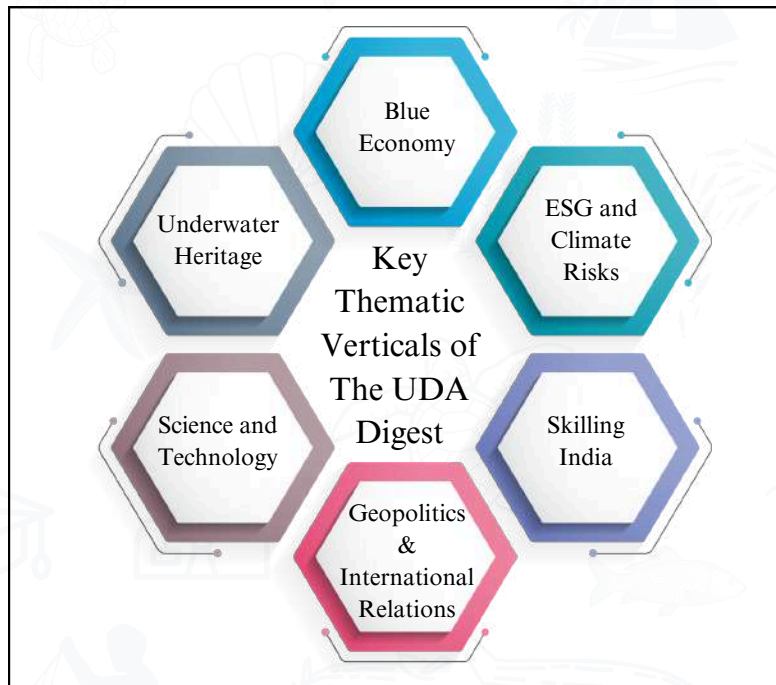
The concept of Underwater Domain Awareness (UDA) is nuanced and requires a one-stop platform where all research material related to it can be placed. It was with this vision in mind that we launched its dedicated UDA Website (<https://udafoundation.in/>), which serves as a one-stop platform for all things related to Underwater Domain Awareness. The website houses key information, research findings, short reports, articles and collaborative efforts from our in-house team. The UDA website contains the four major UDA platforms: UDA Digest, UDA Knowledge Center, UDA Learning Center, and UDA Dialogue.



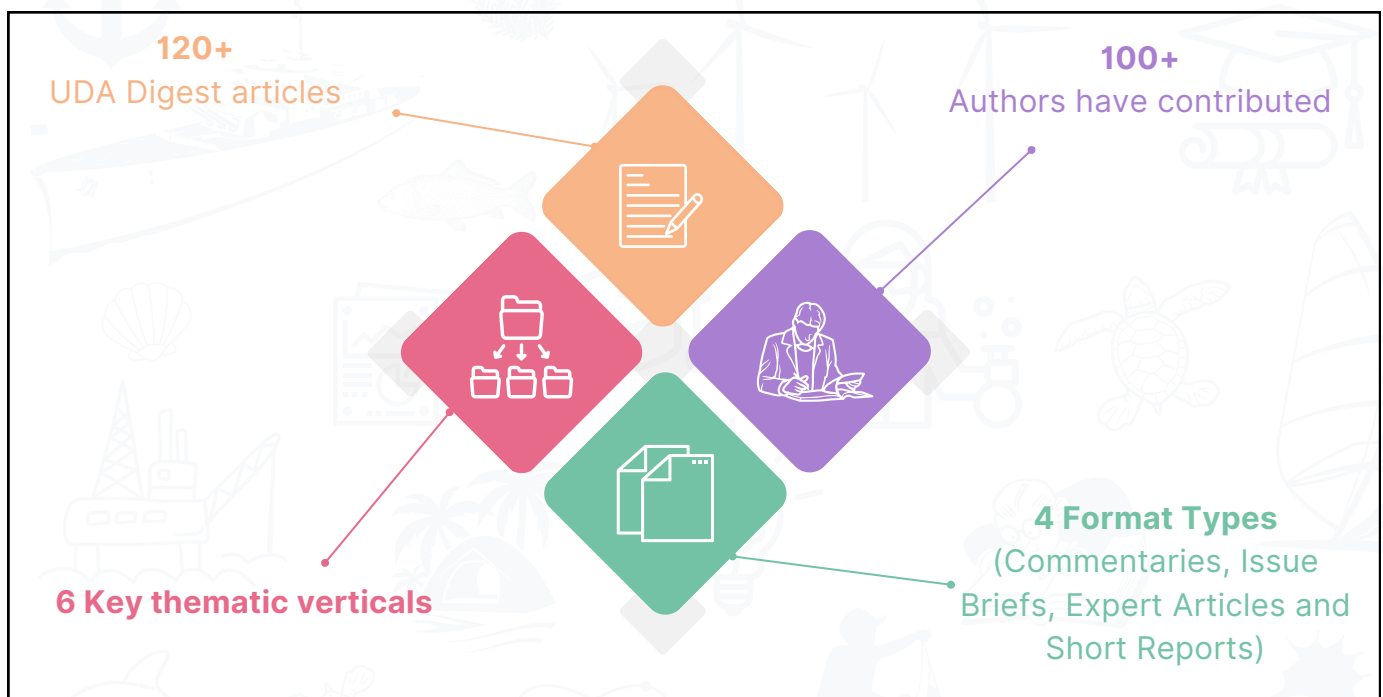
3.1. UDA Digest:

The UDA Digest e-magazine serves as a comprehensive platform for disseminating valuable insights, research, and developments related to Underwater Domain Awareness (UDA). It brings together contributions from experts, academics, students, research fellows, research scholars, and professionals in the field, offering a curated collection of Commentaries, Issue Briefs, Expert articles and Short reports.

Through its engaging content, the magazine aims to bridge the gap between theory and practice, fostering a deeper understanding of the critical issues surrounding underwater security, environmental conservation, and technological advancements. With its national and international reach, the UDA Digest is pivotal in shaping discussions, promoting knowledge exchange, and advancing UDA initiatives worldwide. The four formats of articles under which the publications are organised for a wide range of readers interested in various aspects of monitoring and managing activities in the underwater regions are– commentaries, issue briefs, expert articles, and short reports. Each submission is carefully reviewed and organised across a range of four accessible formats. This is then further sectioned across specialised thematic verticals.

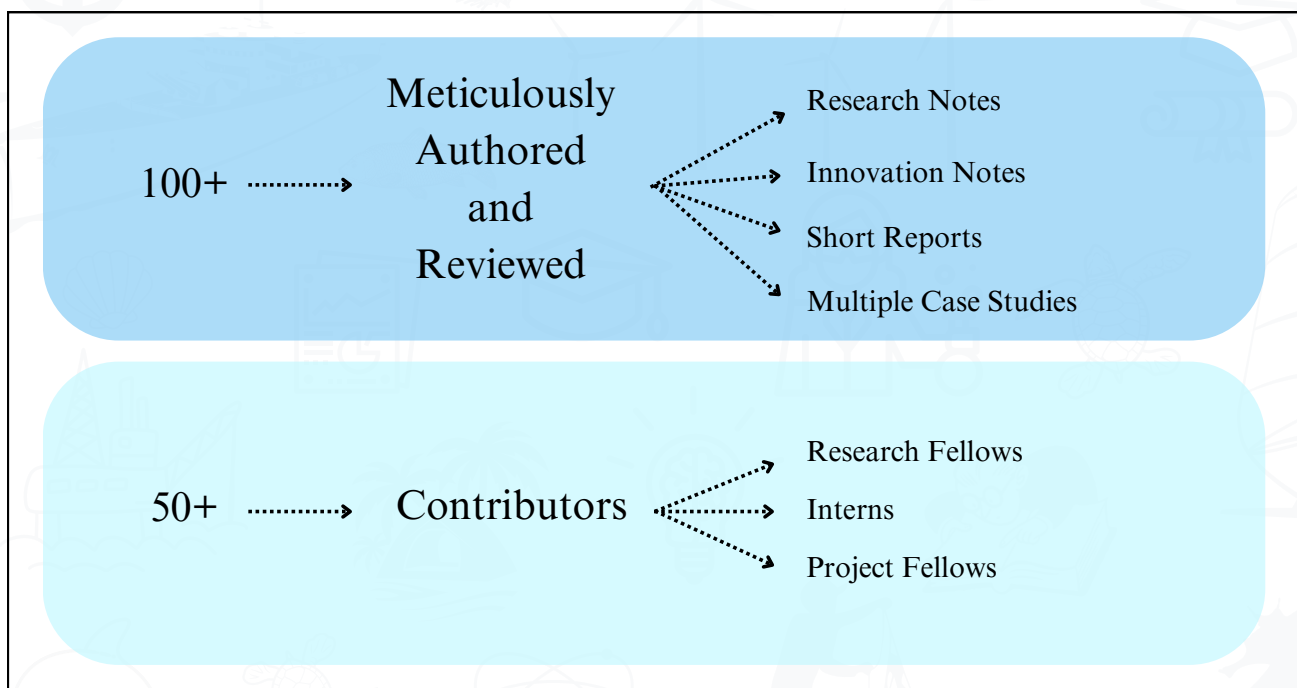
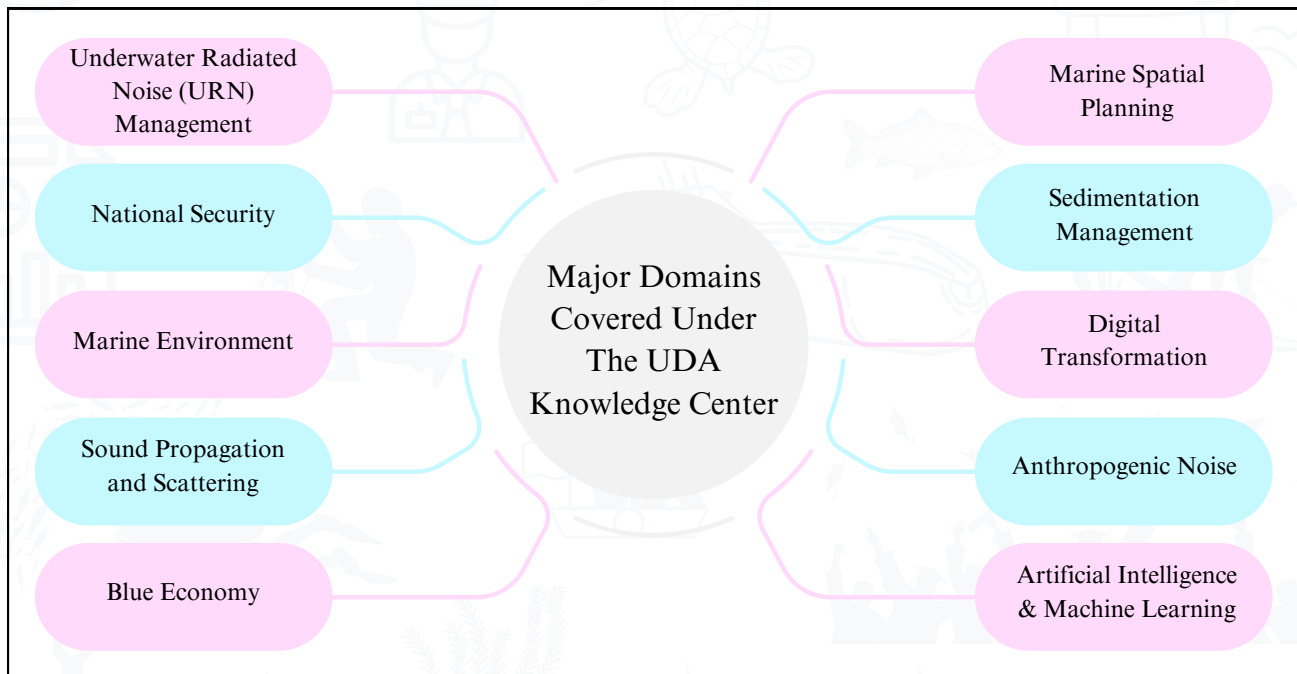


This year, we received articles from experts in the strategic security and maritime domains and interns who hail from engineering and science backgrounds. Some of the best articles from this year have been on topics such as - People, Economy and Nature- Coastal Management in India, The ground situation of Underwater Domain Awareness (UDA), Tackling Water Quality Issues, Averting Disaster: Navigating the Perilous Seas of Maritime etc. Each intern who joined us from various IITs submitted one/two articles each at the culmination of their internship. Some of the topics on which these interns worked on their research and UDA Digest issue brief were sediment classification, climate change in the Indian Ocean Region (IOR), collision avoidance of ships in maritime, underwater radiated noise management, sediment management, digital transformation, etc.



3.2. UDA Knowledge Center:

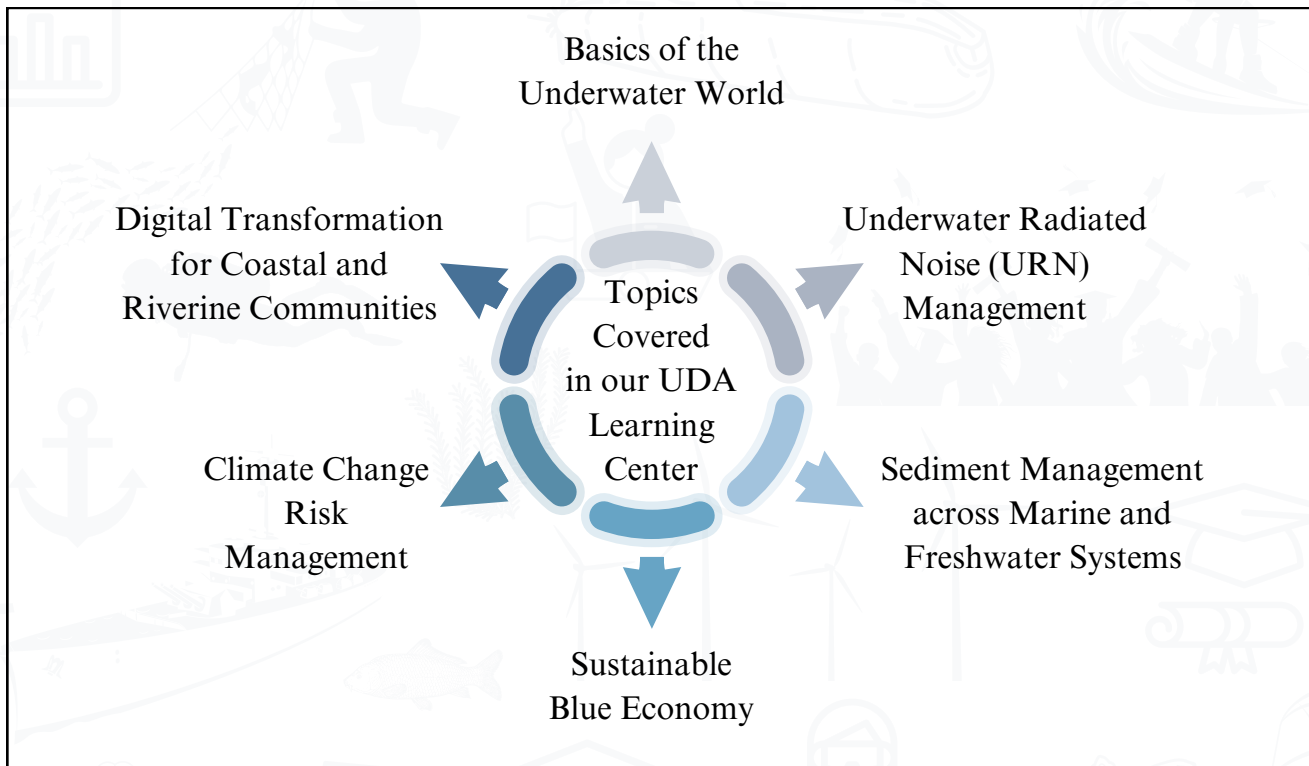
This UDA platform contains a significant body of work generated to support the objective of knowledge creation for the niche subject of underwater domain awareness (UDA). The UDA Knowledge Center has been developed to provide a comprehensive repository supporting our major initiatives to foster a nuanced understanding of the UDA. This serves as a dedicated gateway for researchers, scholars, maritime enthusiasts, professionals, strategic security professionals, local communities, research fellows, and interns (including students) to explore, contribute and learn within the following underwater domains.



The UDA Knowledge Center endows extensive research notes, innovation notes and other lengthy research publications that our Research Fellows, Summer Interns and other Researchers have authored. We publish research on multidisciplinary topics that cover various dimensions of the UDA framework. Our research papers address critical issues such as acoustic habitat degradation, underwater search and recovery, and the effective deployment of passive sonar systems, showcasing our commitment to advancing UDA technology and strategies.

3.3. UDA Learning Center:

The UDA Learning Center is an emerging repository designed to provide comprehensive e-learning modules focused on enhancing knowledge and understanding of Underwater Domain Awareness (UDA). This initiative aims to bridge the knowledge gap by offering accessible, high-quality educational resources on various topics related to underwater operations, marine technology, and maritime security.



These meticulously curated modules span the vast spectrum of UDA-related subjects. From providing a foundational understanding of stakeholders and freshwater management to delving into digital transformations for coastal communities, each module aims to deepen understanding across critical UDA dimensions. Led by our founder, Dr. (Cdr) Arnab Das, these modules serve as a gateway to comprehensive UDA insights, from tackling geopolitical challenges and sustainability concerns to the broader-scale practicability of the UDA framework. Completing these modules offers extensive knowledge and provides our learners with a certified demonstration of their UDA proficiency, significantly enhancing employability within the maritime sector.

**URN
Management
e-learning
Modules**

Introduction to URN Management

URN Management in Freshwater Systems

Ambient Noise in the Oceans

Natural Vs Anthropogenic Noise

Basics of the URN and its manifestations

Digital Transformation & Marine Spatial Planning

To See, To Understand and To Share

Seaweed Farming

Shrimp Farming

APY Tool

**Digital
Transformation
e-learning
Modules**

**Sediment
Management
e-learning
Modules**

Basics of Sediment Management

Sediment Transport Studies

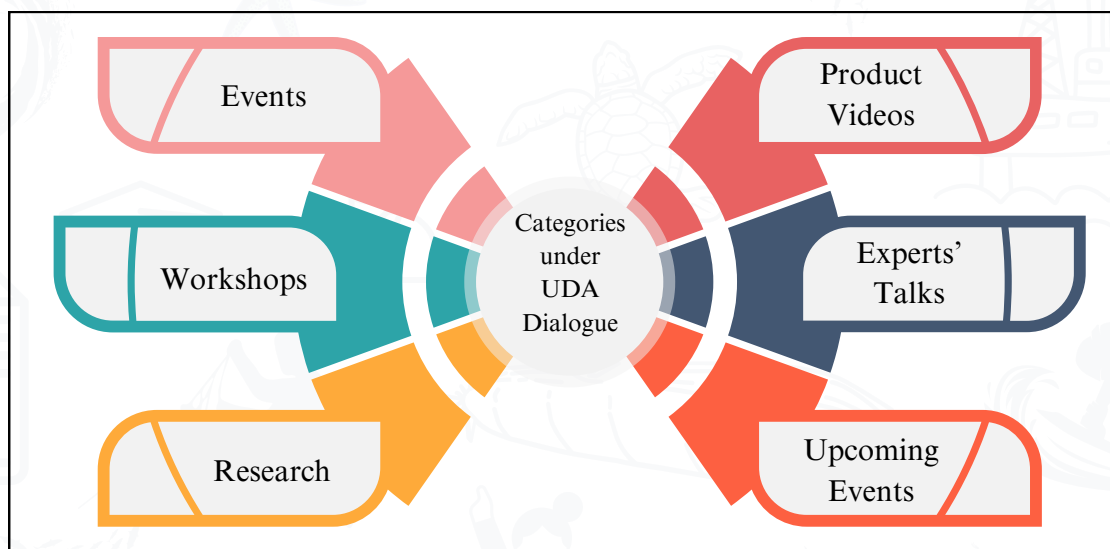
Sediment Classification

Sediment Bearing Pressure

Benthic Ecosystem Management

3.4. UDA Dialogue:

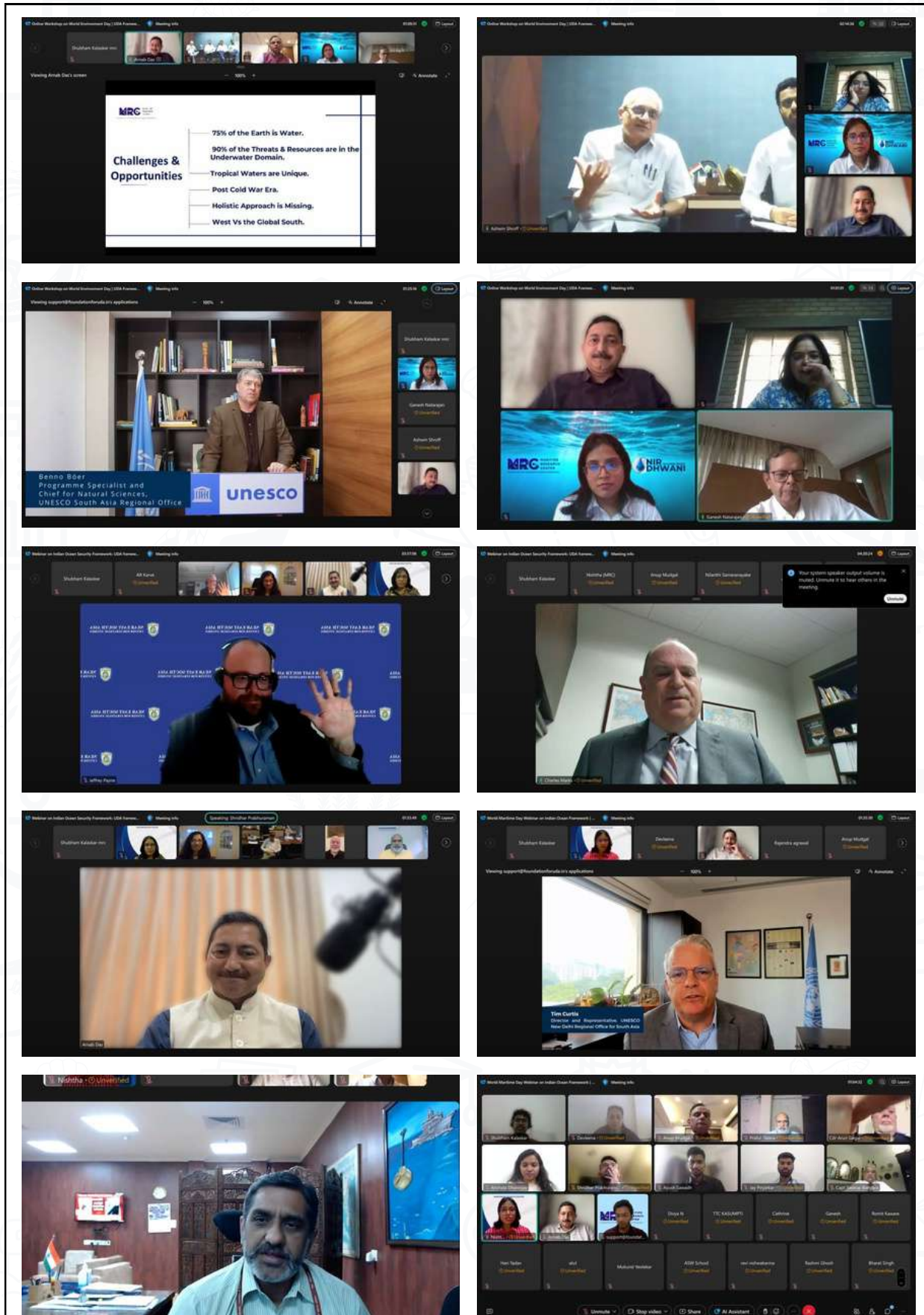
The UDA platform serves as a comprehensive hub for our research, key insights, and perspectives, offering a diverse range of content in audiovisual format. It acts as a central repository for our past events, webinars, workshops, and expert talks and also provides information on upcoming events and webinars.



With the creation of this platform, our goal is to present the complexities of our research, findings, opinions, and advocacy through engaging and accessible audio-visual content. The platform allows us to upload and share various videos, including recordings of online workshops, events, and webinars. As a one-stop solution, it caters to individuals interested in gaining valuable insights from experts within the maritime domain. Topics covered on the platform include but are not limited to, underwater domain awareness, the blue economy, marine spatial planning, maritime security in the Indian Ocean Region, sediment management, and underwater resource navigation (URN) management. This initiative aims to facilitate widespread access to cutting-edge discussions and thought leadership in the maritime field, making expert knowledge easily accessible to all.

In 2024, we organised a series of impactful events and workshops aimed at educating our stakeholders about the intricate details of Underwater Domain Awareness (UDA) and its growing relevance in today's rapidly changing world. These events provided valuable opportunities for engagement and knowledge-sharing, and some of the most highly anticipated webinars we hosted were in celebration of World Environment Day, World Oceans Day, and World Maritime Day. These webinars not only marked key global observances but also served as platforms for in-depth discussions on critical issues related to maritime environmental sustainability and the responsible use of ocean resources.

Through these webinars, we fostered successful collaborations with a diverse range of stakeholders, including industry experts, policymakers, and academia. This collective effort created a dynamic platform where thought leaders could come together to share their insights, exchange ideas, and collaborate on innovative solutions for the challenges facing our oceans. The discussions from these sessions addressed a wide array of topics, from the protection of marine ecosystems to the sustainable management of underwater resources.



UDA Dialogue contains details of all our conducted and upcoming webinars and workshops

4. Projects and Initiatives

This section is broadly divided into three parts, wherein we discuss our initiatives through three types of interventions and our recent field interactions. The three types of interventions that will be discussed in this segment are (1) Policy Intervention, (2) Technology intervention, and (3) Acoustic Capacity and Capability Building.

4.1. Policy Intervention:

The Maritime Research Center, as an organisation dedicated to maritime studies, typically implements a range of policy intervention initiatives to address issues affecting the maritime industry, including maritime safety, security, environmental sustainability, trade facilitation, and regulatory compliance. These initiatives can vary by the specific objectives of the centre, the country or region in which it operates, and the prevailing maritime challenges. Some of our major activities and collaborations for policy intervention have been listed and explained below.

4.1.1. We Collaborated with the Capacity Building Commission of India to Foster Knowledge-sharing on Underwater Domain Awareness:

In January 2024, the Maritime Research Center (MRC) formed a strategic partnership with the Capacity Building Commission of India to enhance the knowledge and awareness of government officials about the maritime and underwater environment. As part of this collaboration, the MRC developed and provided a series of e-learning modules titled 'Basics of the Underwater World'. These modules are designed to serve as comprehensive resource materials for government officials across India.

The modules are hosted on the Karmayogi iGot platform, a government initiative aimed at promoting continuous learning and capacity building among Indian civil servants. The iGot platform, with its digital learning environment, provides an opportunity for public servants to acquire new skills and enhance their understanding of various subjects critical for governance, public administration, and policy-making. Our e-learning modules have become the top-rated modules available on the CBC Karmayogi i-Got Platform.

This partnership with the Capacity Building Commission reflects a growing recognition of the importance of maritime and marine-related education in policy and governance. As India continues to focus on blue economy initiatives, marine conservation, and enhancing its maritime security, it is crucial that government officials possess a basic understanding of the underwater world. The e-learning modules serve as a foundation for further exploration into specialised maritime topics, helping officials to become more adept in managing and promoting policies that impact the country's vast maritime resources.

Through this collaboration, the Maritime Research Center and the Capacity Building Commission of India aim to create a more informed and skilled government workforce that can effectively address the challenges and opportunities in the maritime and underwater domains.



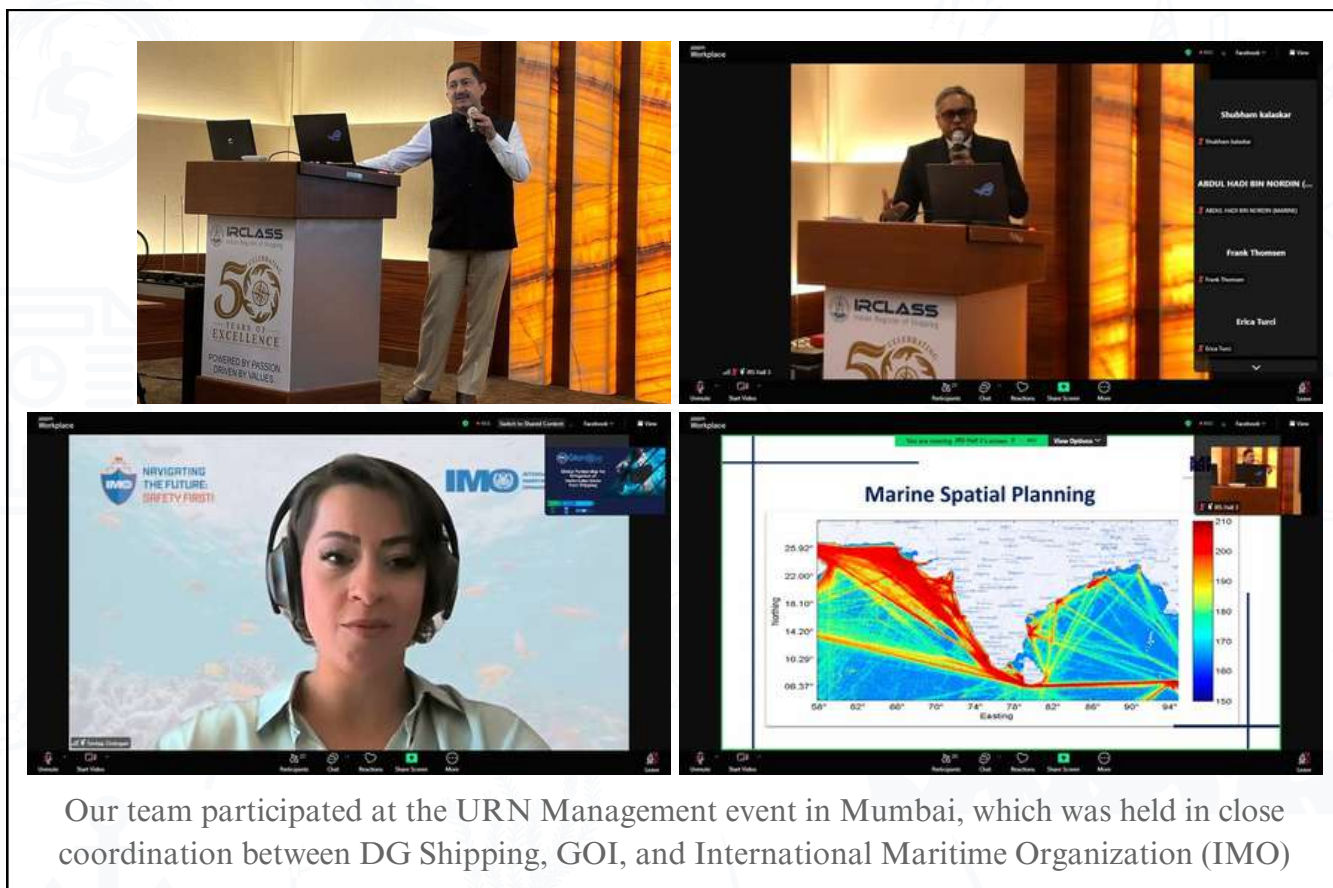
We collaborated with the Capacity Building Commission of India to provide them with e-learning modules on the 'Basics of the Underwater World'

4.1.2. We are Part of The National Task Force for IMO's 'Global Partnership for Mitigation of Underwater Noise from Shipping' Project:

The Director General (DG) of Shipping, Government of India, has established a National Task Force for a project led by the International Maritime Organization (IMO) on the Global Partnership for Mitigation of Underwater Noise from Shipping. This year, we had the privilege of participating in the project's introductory meeting as part of the Indian National Task Force. This vital initiative is focused on addressing the environmental impacts of underwater noise and enhancing the protection of marine life.

In August 2024, our team participated in an event in Mumbai, hosted in collaboration with the IMO and the Ministry of Ports, Shipping and Waterways. During the event, we presented on 'Underwater Radiated Noise (URN) Management in the Indian Ocean Region (IOR)'. Our presentation emphasised a holistic approach to managing URN, focusing on 'Outreach, Engage, and Sustain' through seminars, stakeholder engagement, and ongoing projects.

As part of this event, Shri Shyam Jagannathan, DG Shipping, GOI, launched our ‘Underwater Radiated Noise (URN) Management’ webpage. This platform offers valuable resources for managing URN in the Indian Ocean Region (IOR) and beyond, furthering our commitment to sustainable maritime practices and marine conservation.



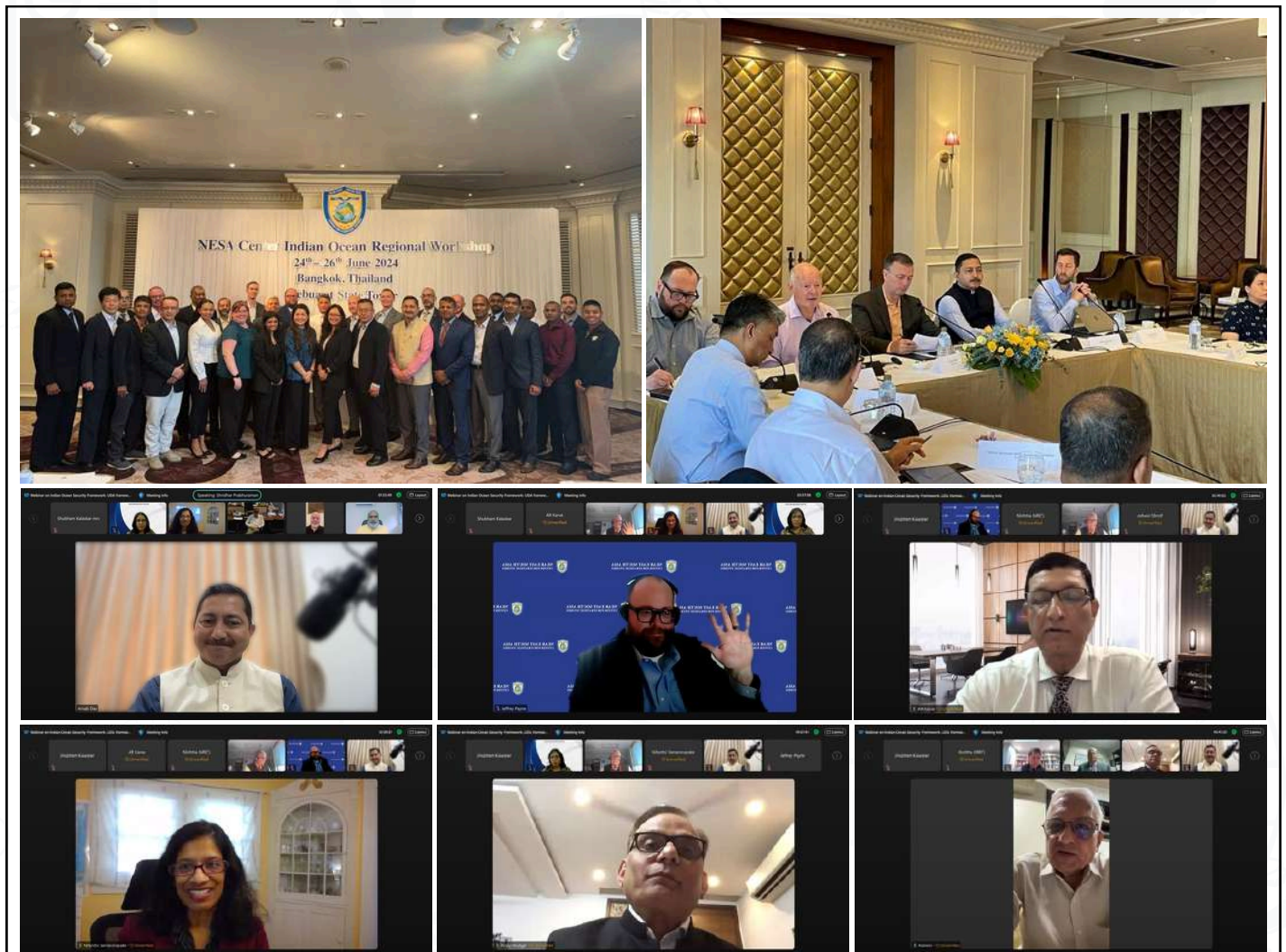
4.1.3. Spearheading Discussions on the Indian Ocean Security Framework in Collaboration with the Near East South Asia Centre for Strategic Studies (NESA), USA:

The Near East South Asia Centre for Strategic Studies (NESA), a prominent research institution under the U.S. Department of Defense, has collaborated with the Maritime Research Center (MRC) on various occasions, working together on strategic initiatives in the maritime domain. One of the most significant collaborations took place in October 2024, when both entities co-hosted a highly impactful webinar on the Indian Ocean Security Framework.

During this webinar, experts from both the United States and India delivered keynote addresses and presented in-depth analyses of the unique security challenges in the Indian Ocean Region (IOR). The discussions provided valuable insights into the geopolitical and security dynamics of this vital maritime area, emphasizing the need for collaborative strategies to address issues such as piracy, territorial disputes, and the protection of key sea lanes.

Earlier in June 2024, the Maritime Research Center also participated in the Indian Ocean Regional Workshop hosted by NESAC in Bangkok, Thailand, from June 24-26, 2024. A key highlight was the 4th Session of the Workshop, which took place on June 25, 2024, on the topic, "Views from Private Sector/Non-traditional Stakeholders." In this session, Dr. (Cdr) Arnab Das represented the MRC and shared insights on the evolving role of private sector players and non-traditional stakeholders in advancing maritime security in the Indian Ocean. The panel discussion explored diverse perspectives on the security challenges faced in the region and examined how collaboration between governments, the private sector, and other stakeholders could strengthen maritime governance and security frameworks across the IOR.

These engagements reflect the strong partnership between the Maritime Research Center and NESAC, which aims to foster deeper cooperation between the United States, India, and other key regional actors in promoting peace, stability, and security in the Indian Ocean.



We worked in close coordination with the Near East South Asia Centre for Strategic Studies (NESAC), USA

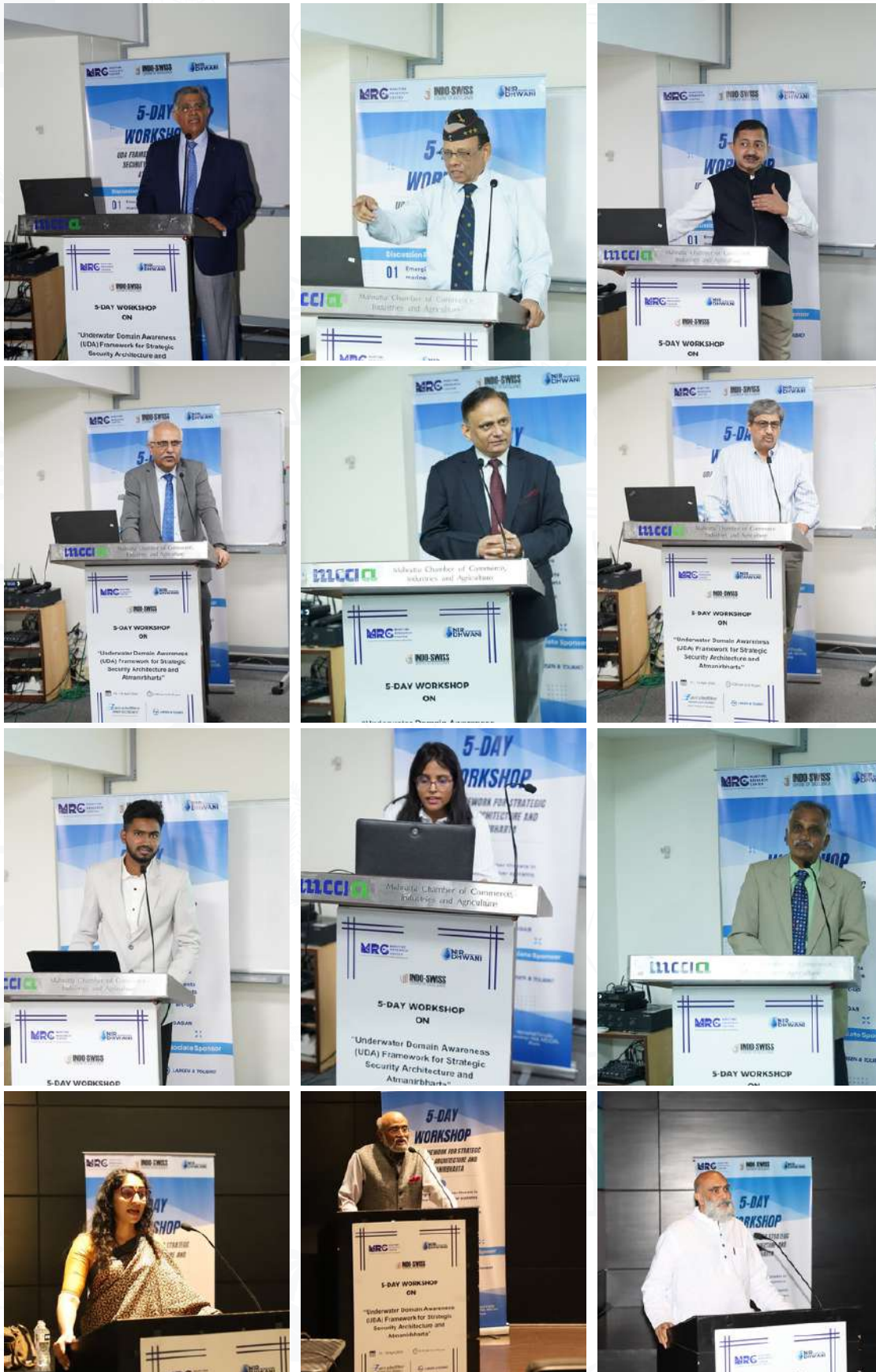
4.1.4. UDA Framework for Strategic Security Architecture and Atmanirbharta:

We collaborated with the Indo-Swiss Centre of Excellence to conduct a five-day workshop on “Underwater Domain Awareness (UDA) Framework for Strategic Security Architecture and Atmanirbharta” at the MCCIA auditorium in Pune, Maharashtra, India, from 15 April to 19 April 2024. The participants came from the strategic security community, ranging from the Armed Forces, Paramilitary Forces, Coastal Police, Defence Industry, Think Tanks, and more. Senior officers came from the Border Security Force (BSF), Andaman and Nicobar Command, Indian Navy, Indian Army, Maharashtra Coastal Police, Indian Coast Guard and Sri Lankan Navy (online).

The workshop showcased the width and depth of the UDA framework, and the participants, including those from the Indian Navy, acknowledged their limited knowledge of the underwater domain. The participants from a cross-section of strategic security establishments emphatically acknowledged the possibilities of the UDA framework. During the 5-day workshop, the conversations revolved around major initiatives by India and its key stakeholders in the Indo-Pacific region and the Indian Ocean Region (IOR) to harness the potential of these regions and the importance of the underwater domain awareness amidst all this. This workshop was in continuation to MRC’s previous workshop entitled “Institutionalized Skilling Ecosystem for Enhanced Realization of the SAGAR Vision,” which was held in March 2023 and aimed to sensitise the concerned stakeholders and deliberate on the objective of institutionalising the skilling ecosystem.

Some of the notable speakers during the workshop included Dr Ajay Kumar, Former Defence Secretary of India; Ambassador Anup Kumar Mudgal, India’s Former Indian Diplomat and Member of FICCI’s Blue Economy Task Force; Ambassador Gautam Bambawale, Former Indian Ambassador to China and Pakistan; Shri A.T. Ramachandani, Executive Vice President and Head of L&T Precision Engineering and Systems IC; and Cmde R S Vasan (Retd), Director General Chennai Centre for China Studies. The workshop also provided a platform for QUAD nations, including India, Australia, Japan, and the US, to discuss the Indo-Pacific region. There were representatives from each of the four QUAD nations who represented their countries and shared their thoughts on maritime affairs between these nations and why the Indo-Pacific region is of great relevance.

The importance of the UDA framework is slowly getting established in the QUAD circles. The Indo-Pacific initiative will require the UDA framework to meaningfully drive strategic security, sustainable blue economic requirements, and climate change risk management. The think tanks from the QUAD countries have been briefed and onboarded. The workshop was a significant morale booster for MRC on the relevance of their effort to the ecosystem and the specific stakeholders. The feedback session at the end of the workshop was overwhelming for all present. These stakeholders are convinced on three counts: the immense possibilities in the underwater domain, the urgent need for capacity and capability building, and the credibility of MRC in bridging that gap.



Our April 2024 workshop turned out to be huge success where officers from the Border Security Force (BSF), Andaman and Nicobar Command, Indian Navy, Indian Army, Maharashtra Coastal Police, Indian Coast Guard and Sri Lankan Navy participated

4.2. Technology Intervention:

This section highlights the technological advancements, projects, and innovations we have implemented or contributed to in the maritime industry. This includes the technologies or systems the Maritime Research Center has developed, tested, or deployed. This section of the annual report aims to provide details on our role in advancing technology in the maritime sector and its contribution to shaping the industry's future.

4.2.1. Development and Inauguration of the Underwater Radiated Noise (URN) Management Webpage:

This year, we are proud to announce the launch of a comprehensive **one-stop platform** dedicated to **Underwater Radiation Noise (URN) Management**, available on our website. This platform is a pivotal resource in our ongoing efforts to address underwater noise pollution, which poses significant threats to marine ecosystems. The platform consolidates a wide array of materials, offering a centralised hub for all critical information related to URN Management and methods to mitigate its impact on marine life.

Key Features and Deliverables:

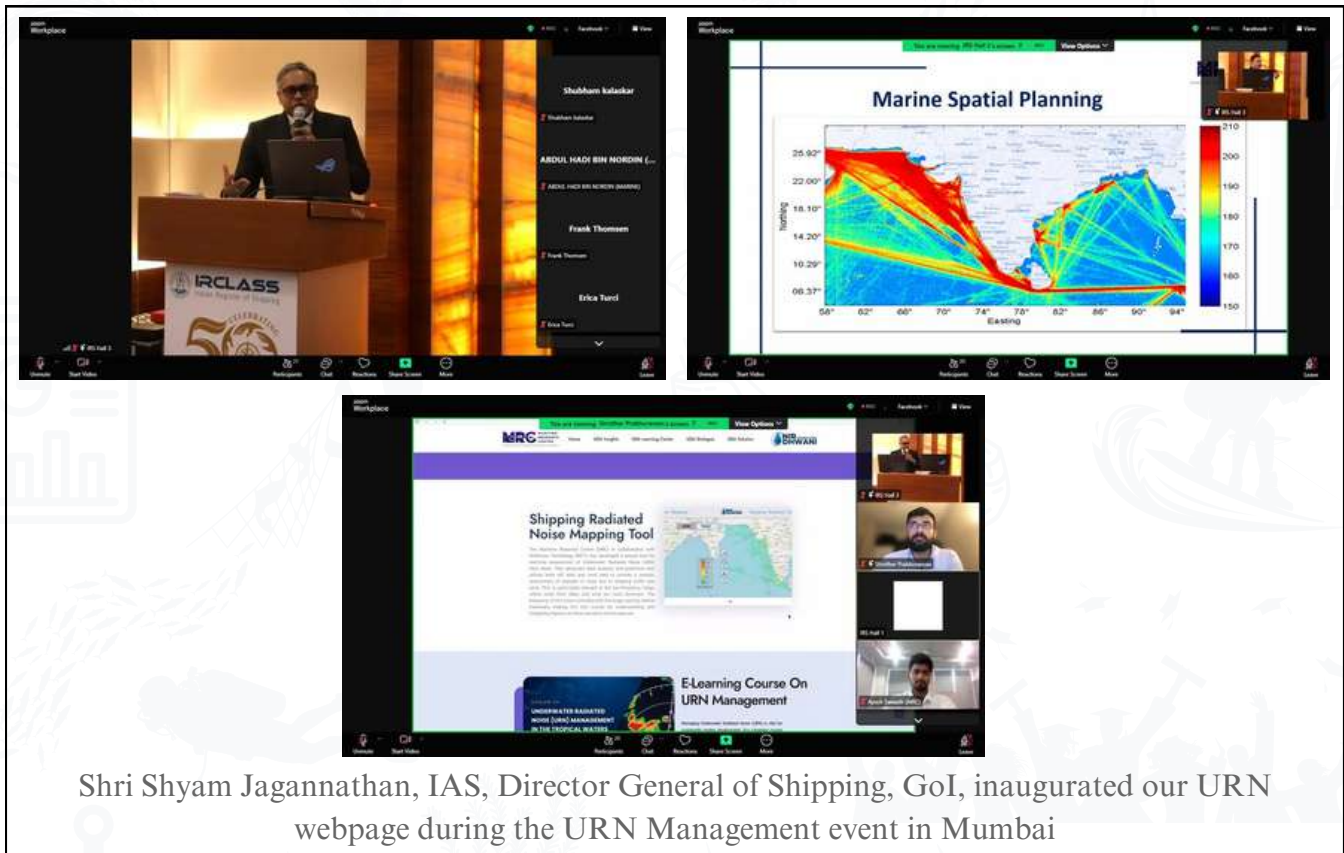
Research Notes and UDA Digest Articles: The platform features a meticulously curated collection of research notes and UDA Digest articles, providing in-depth insights into the latest findings and advancements in URN management. These resources reflect our commitment to delivering the most relevant, scientifically rigorous information to support the global push for quieter, more sustainable maritime operations.

Videos and Research Reports: Besides written content, the platform includes a range of videos and important research reports, allowing users to better understand the complexities surrounding underwater radiation noise and its effects on marine ecosystems. These resources are designed to engage users and communicate critical findings in a dynamic, easy-to-understand format.

Comprehensive URN Reduction Methods: One of the core components of the platform is the detailed outline of methods to reduce underwater noise pollution. This includes both proven and emerging technologies, as well as best practices that stakeholders across the maritime industry can implement to minimise their impact on marine environments. From advanced vessel design to operational adjustments, the platform covers a wide range of strategies to reduce the sources of underwater radiation noise.

E-Learning Modules: A significant and exciting addition to the platform is the development of e-learning modules, which are expected to be fully accessible in the first quarter of 2025. These interactive modules will provide an accessible and engaging way for professionals, researchers, and stakeholders to deepen their understanding of URN, noise pollution's effects on marine life, and effective management strategies. The e-learning resources will include video lectures, quizzes, case studies, and practical tools to enhance the learning experience and equip users with the knowledge needed to reduce URN.

By providing a comprehensive suite of resources, the URN Management platform aims to play a leading role in the global effort to mitigate underwater noise pollution. The platform offers a centralised, easily accessible space where individuals can access vital information, engage with new learning materials, and collaborate on innovative solutions to ensure that the oceans remain healthy, sustainable, and resilient to the impacts of maritime noise.

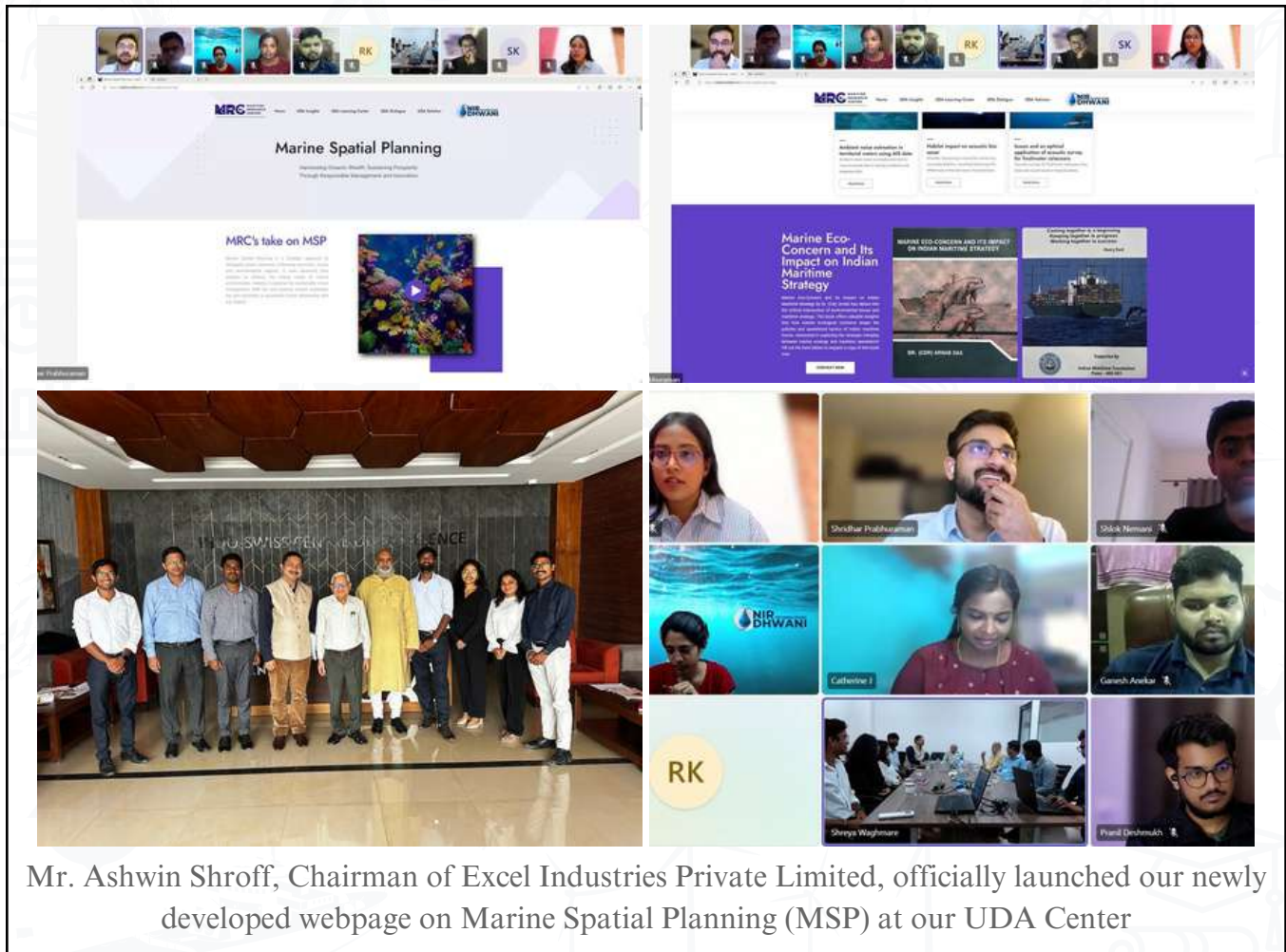


4.2.2. Development and Inauguration of our Marine Spatial Planning (MSP) Webpage:

Our team has developed a comprehensive webpage on Marine Spatial Planning (MSP) that highlights our strategic approach to organizing human activities in ocean spaces, especially in light of the increasing pressures on marine resources. This webpage was inaugurated by Mr Ashwin Shroff, Chairman of Excel Industries Limited, at our UDA center in Pune. At the core of this page is our MSP Position Paper, which serves as a vital framework for managing these challenges. Backed by rigorous research, the position paper emphasizes the need for collaborative efforts, technological advancements, and ecosystem-based management to preserve marine resources for future generations.

Additionally, the webpage features key projects such as the MSP Handbook and the MSP Tool, both developed by our in-house team. The MSP Handbook outlines India's proposal to the International Maritime Organization (IMO) on Marine Spatial Planning, with a specific focus on managing underwater noise in the Indian Ocean. It introduces the UDA framework, a cutting-edge approach that integrates advanced acoustic technologies with Modeling and Simulation (M&S) to address the unique challenges posed by tropical waters. This strategy aims to create sustainable, cost-effective solutions that are tailored to the region, benefiting the Global South and supporting broader global environmental goals.

Furthermore, we have partnered with NDT to create a unique tool for real-time assessment of Underwater Radiated Noise (URN) from ships. This advanced tool uses a combination of AIS data and wind data to predict changes in noise levels due to shipping traffic and wind conditions. The tool focuses on the low-frequency noise range, where both ship and wind noise are most prominent. This range overlaps with the frequency range used by marine mammals, making the tool critical for understanding and mitigating the impacts of underwater noise on these sensitive species.



4.2.3. Our Innovative Projects and Ideas for Technology Intervention:

(1) URN Management Tool: The tool will allow cause and impact analysis and provide policy intervention for effective URN management. Its applications include Acoustic Stealth, Acoustic Habitat Degradation management, and the Deployment of underwater systems.

(2) Sediment Management Tool: This tool will aim to allow effective sediment management across multiple applications like– Water Resource Management, Navigability in (a) Inland Waters, (b) Coastal Waters, and (c) Constrained Waters. The other important applications of the sediment management tool include port management, coastal management and construction of water bodies.

(3) Submarine Deployment Tool: The submarines are critical war machines that must be deployed with utmost care and effectiveness. The tool will make sure we can rationalise the detection capability and vulnerability assessment uniquely for both types of submarines, namely- (1) Conventional (diesel-electric propulsion) Submarines and (2) Strategic (nuclear-powered) Submarines.

(4) APY Tool for Fisheries and Aquaculture: The productivity and yield of underwater living resources are a serious concern in tropical waters. Effective management of the underwater space for higher returns will be critical. The tool will provide interventions across policy and tactical levels for Shrimp, Seaweed, and Common Carp (Freshwater Species).

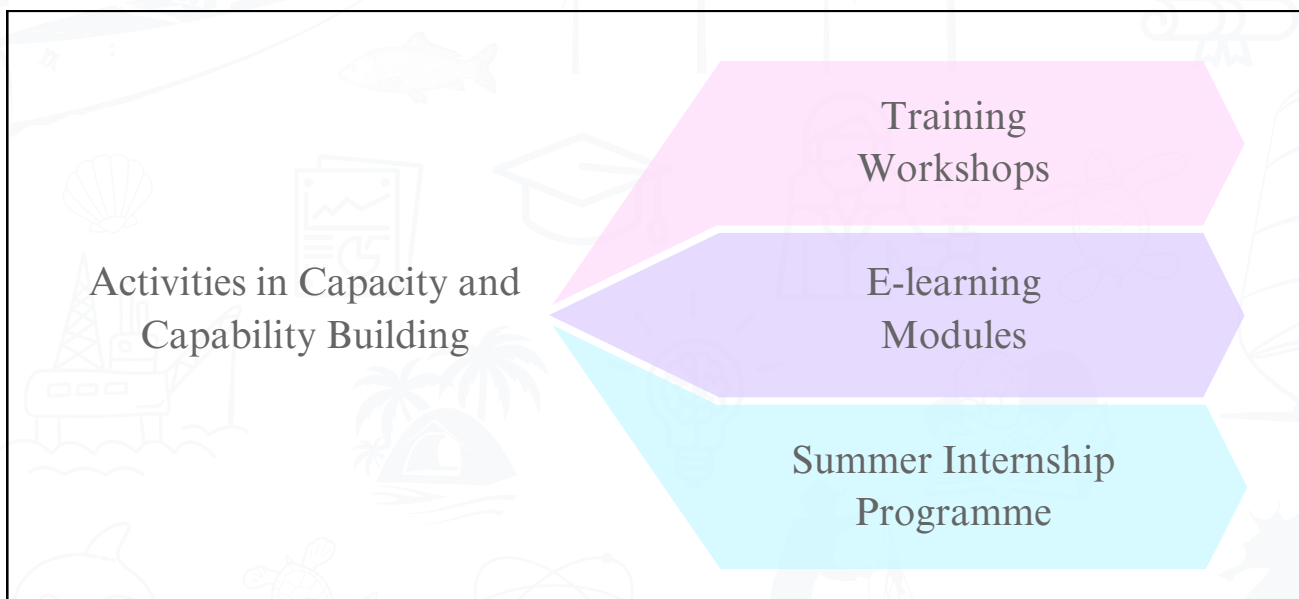
(5) Environmental Impact Assessment (EIA): A comprehensive EIA is essential for sustainable growth and containing climate change risk. The Underwater Domain will be the most critical player in global sustainability and climate change risk monitoring.

(6) Collision Avoidance System: Marine platforms, both surface and subsurface, must ensure effective navigation on the surface and the bottom. Collisions against any surface obstacle and grounding due to low water below the keel are serious limitations to a marine platform's seamless navigability. A comprehensive digital tool equipped with Artificial Intelligence (AI)- based data analytics will be a game changer, able to manage collision avoidance on the surface and prevent grounding from the bottom.

(7) Comprehensive Marine Spatial Planning (MSP) Tool: Digital transformation in marine and freshwater systems has become essential for nuanced management of challenges and opportunities. The manifestation of digital transformation in marine and freshwater systems is called Marine Spatial Planning (MSP). The 3-dimensional (3D) spatiotemporal mapping of the resources, challenges, and opportunities in any water body is a critical governance tool. Multi-sectoral and multi-dimensional maps can be coherently analysed to build seamless decision-making tools for effective and efficient governance. This will allow nuanced strategic and tactical interventions across varied applications.

4.3. Capacity and Capability Building:

This section encapsulates all our activities wherein we have spent time training our stakeholders regarding Underwater Domain Awareness. This includes our major capacity-building workshops, events, training activities, programmes, etc. The figure below explains our major activities associated with capacity and capability building.



4.3.1. Training Workshops:

Training workshops play a pivotal role in enhancing our organisational capacity and strengthening our capability-building initiatives. These workshops serve as an invaluable tool for imparting specialised knowledge to our stakeholders and integrated candidates, equipping them with a deep understanding of the intricacies involved in underwater domain awareness (UDA). By focusing on this critical area, we ensure that our personnel are well-prepared to address emerging challenges and contribute meaningfully to strategic operations.

In line with this goal, two comprehensive training workshops were conducted this year for armed forces personnel. The primary objective of these workshops was to provide them with in-depth training on strategic security within the Indian Ocean Region (IOR), a vital area of interest in global security. Given the IOR's significance in geopolitics, maritime security, and economic activities, the armed forces needed to understand the region's strategic implications and the emerging threats it faces.

Moreover, the second workshop, which is our ongoing initiative to train the officials from the Military Institute of Technology (MILIT), incorporated advanced technological perspectives, focusing on how Artificial Intelligence (AI) and Machine Learning (ML) can play a transformative role in bolstering efforts aimed at securing the IOR. Integrating AI and ML into security initiatives can significantly enhance decision-making processes, improve predictive capabilities, and provide actionable insights for better management of resources and responses to evolving security challenges.

These training sessions equipped the armed forces with cutting-edge knowledge and facilitated discussions on how such technologies can be leveraged for the greater good. The application of AI and ML in strategic security, especially in regions like the IOR, represents a forward-thinking approach to addressing security challenges while ensuring our maritime interests' long-term sustainability and safety.

Through these workshops, we have contributed to the professional development of our armed forces personnel and played an essential role in shaping the future of strategic security in the region. The combination of domain expertise in underwater awareness and the infusion of next-generation technologies like AI and ML underscores our commitment to staying ahead in the rapidly evolving global security landscape.



In addition to the initiatives mentioned above, the Maritime Research Center (MRC) has entered into a strategic collaboration with the Sushma Swaraj Institute of Foreign Service (SSIFS) in New Delhi to foster capacity and capability building among the diplomats in training within India's administrative framework. This partnership is aimed at equipping future diplomats with a nuanced understanding of maritime affairs, particularly underwater domain awareness (UDA), which is becoming increasingly critical in today's interconnected world. The training will provide the diplomats with the knowledge and skills to effectively navigate global maritime issues, engage in international dialogues, and shape policy on critical maritime security and economic matters. By incorporating UDA into their diplomatic training, the collaboration seeks to develop a generation of diplomats who are well-versed in the complexities of the maritime domain and capable of representing India's interests on the global stage.

Moreover, in November this year, Dr. (Cdr) Arnab Das conducted a specialised workshop at Strathclyde University in Glasgow, Scotland, focused on the UDA Framework. This workshop was designed to provide an in-depth understanding of the various dimensions of the underwater domain, offering valuable insights into its strategic, economic, and environmental aspects. The session covered a broad range of topics, including the blue economy, maritime security, and the importance of international cooperation in addressing maritime threats. The blue economy, which refers to the sustainable use of ocean resources for economic growth, is becoming an increasingly vital component of global economic development. By discussing the opportunities and challenges within this domain, the workshop emphasised the significance of managing marine resources sustainably while maintaining security in vital sea lanes.

Another key aspect of the workshop was a comprehensive exploration of India's efforts to strengthen its global collaboration in combating maritime threats. International cooperation has become essential as maritime security continues to evolve in response to new challenges, such as piracy, illegal fishing, and environmental degradation. Dr Das highlighted India's role in fostering multilateral partnerships, engaging in bilateral maritime security agreements, and participating in international forums aimed at addressing these challenges. The workshop underscored the importance of collective action to safeguard vital maritime routes and resources by understanding the strategic significance of maritime cooperation and security.

This workshop, held at a renowned international academic institution, reinforced the relevance of underwater domain awareness in global strategic discourse and provided a platform for intellectual exchange among scholars, practitioners, and policymakers. It contributed significantly to the global conversation on maritime security, offering insights into how nations, especially India, can work collaboratively to address the evolving threats in the underwater domain and ensure the stability and security of global maritime trade routes.

Through such collaborative efforts and workshops, the Maritime Research Center continues to play a key role in enhancing both the national and international understanding of underwater domain awareness and its multifaceted implications for global security and sustainable economic growth.



4.3.2. E-learning Modules:

To support our ongoing capacity and capability-building initiatives, we have developed a comprehensive series of e-learning modules designed to address key challenges in the underwater domain awareness (UDA) field. These modules aim to enhance our stakeholders' knowledge and skills by providing in-depth insights into critical topics shaping the future of underwater research and management.

The e-learning modules cover many important subjects, including the Blue Economy, Sediment Management, Digital Transformation, and Climate Change Risk Assessment. These topics are increasingly relevant as we navigate the evolving needs of sustainable marine management, environmental conservation, and technological advancement. Each module is carefully crafted to deliver real-world solutions and actionable insights, helping to bridge knowledge gaps and equip our teams with the tools needed to tackle pressing challenges in the underwater domain.

In addition to addressing technical topics, these modules are a key part of our **UDA Learning Center**, a platform designed to facilitate continuous learning and professional development. The **UDA Learning Center** serves as a centralised hub for accessing the latest educational resources, allowing users to engage with up-to-date content and deepen their understanding of complex underwater issues. Through this platform, we aim to foster a culture of learning and collaboration, empowering individuals and organisations to stay ahead of the curve in a rapidly changing landscape.

By integrating these modules into our broader **UDA Platforms**, we ensure that our teams are well-equipped to address current and future challenges. This enables them to make informed decisions and contribute meaningfully to sustainable underwater management practices.

4.3.3. UDA Summer Internship Programme:

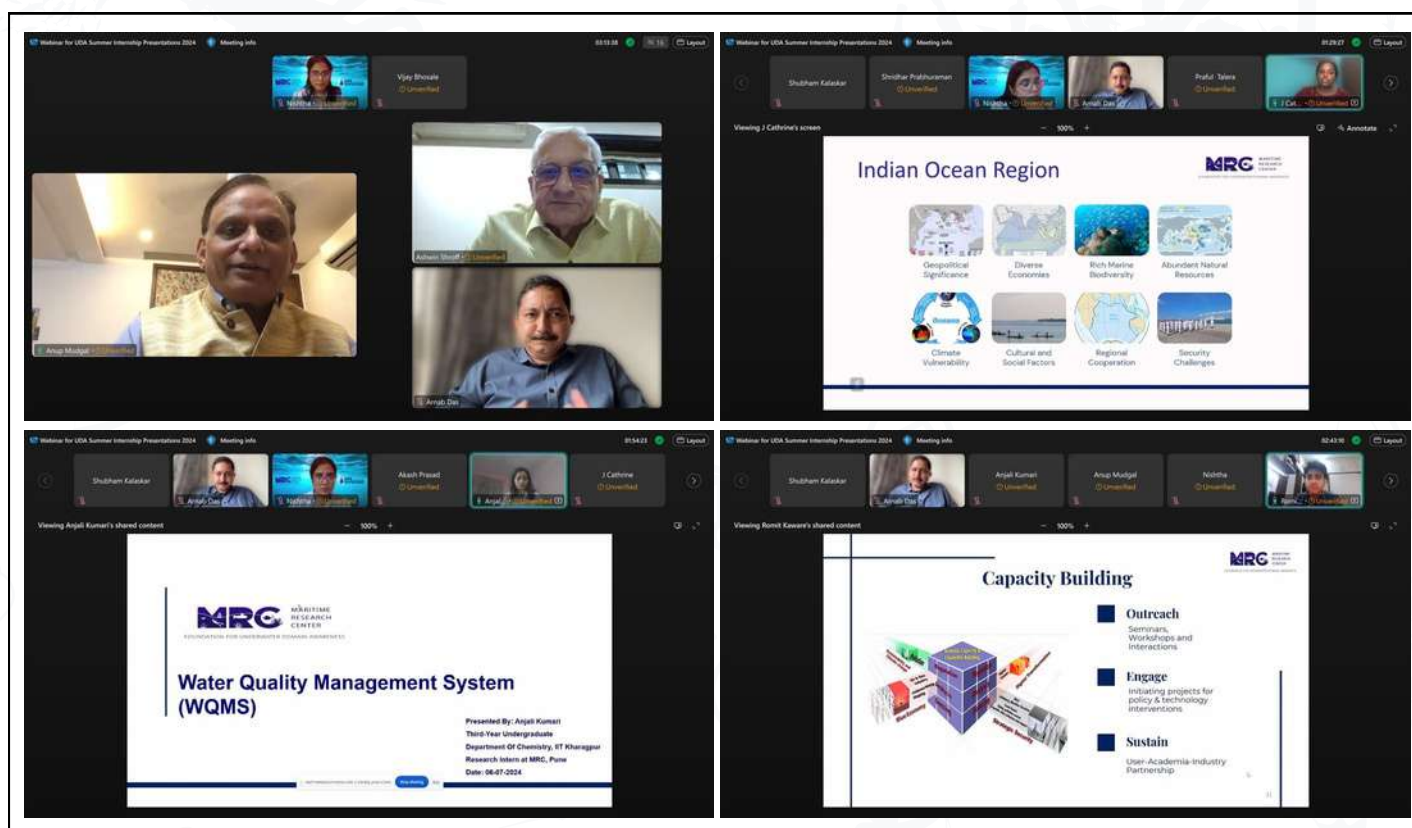
Every year, we collaborate with pioneering institutions during our summer internship programme to provide students with hands-on experience and training in key areas related to Underwater Domain Awareness (UDA). This initiative focuses on critical fields such as URN (Underwater Resource Network) Management, Collision Avoidance Systems, Climate Change Risk Assessment, Sediment Management, and other vital maritime research and technology aspects. Through these collaborations, we aim to foster the next generation of experts and researchers who can contribute to advancing underwater research and sustainable marine practices.

This year, the UDA Summer Internship 2024 programme saw the participation of exceptionally talented students from some of India's most prestigious institutions, including IIT Bombay, IIT Kharagpur, and IIT Madras. These institutions are renowned for their rigorous academic standards and cutting-edge research, making them ideal partners in this initiative.

The UDA Summer Internship programme we organise annually serves as an invaluable platform for bright young minds to immerse themselves in real-world projects. Students are given the opportunity to work on challenging, high-impact research projects that directly contribute to advancing the field of maritime and underwater domain research. Throughout the internship, they collaborate with experts in the field, gaining insights into both the technical and practical aspects of UDA while also contributing fresh perspectives and innovative ideas.

By providing this platform, we enable aspiring researchers to apply their theoretical knowledge to practical challenges, helping them develop the skills and expertise needed to drive future advancements in the field. In turn, their work often leads to valuable insights that contribute to the broader goals of improving maritime safety, environmental sustainability, and technological innovation. Through this programme, we continue to strengthen our commitment to nurturing the next generation of UDA professionals and reinforcing the importance of research and development in this critical domain.

In July 2024, we hosted a significant event that provided our summer interns with the opportunity to showcase their research and findings to experts in the field of marine conservation. This event served as a platform for the interns to present their innovative projects, which addressed a range of critical topics within the maritime sector, from sustainability initiatives to cutting-edge technological solutions. The interns' presentations demonstrated their work's impact and how it contributes to advancements in marine research, environmental conservation, and underwater domain awareness (UDA).



The event was further enriched by insightful presentations from our esteemed research fellows and internal team members, whose contributions provided a broader perspective on the ongoing work at MRC. These presentations highlighted our commitment to driving excellence in maritime research, particularly in marine biodiversity, climate change risk assessment, and sediment management.

Through this event, we recognised the accomplishments of our interns and facilitated collaboration and knowledge exchange between emerging researchers and seasoned experts in the field. It showcased the depth and diversity of the projects undertaken at MRC, reinforcing our dedication to the growth and development of young talent in the maritime sector.

This event also underscored our commitment to marine conservation, innovation, and research excellence. By providing interns with such opportunities to interact with leaders in the field, we aim to inspire the next generation of researchers and professionals who will continue to drive meaningful change in the maritime industry and contribute to the sustainable management of our oceans.

4.4. Field Interactions:

UDA is essential for ensuring that our technologies and strategies are environmentally sustainable and aligned with the needs of local communities. However, we recognise that for our efforts to be truly effective, we must understand the local context and challenges on the ground. With this in mind, the field visit to Ratnagiri and Guhagar in Maharashtra was designed with a structured approach to achieve key objectives that would guide our ongoing efforts and foster meaningful partnerships in the region.

Our first goal was to introduce the Maritime Research Center to the local community, ensuring that people were informed about who we are, what we do, and how our offerings could benefit their specific needs. The second major focus of the trip was the assessment of the feasibility and potential benefits of deploying our APY Analysis Tool in the local aquaculture sector, specifically for shrimp and seaweed farming. This tool optimises farming practices, enhances sustainability, and improves yield predictions. We engaged with local farmers and aquaculture professionals to discuss how the APY Tool could be integrated into their operations to improve both productivity and environmental outcomes.

A third key objective was to explore the social landscape and identify critical gaps in skilling, research, innovation, and knowledge. We conducted discussions with government bodies, NGOs, Self-Help Groups (SHGs), and other relevant social organisations to gain a comprehensive understanding of the challenges faced by local communities. These discussions focused on identifying gaps in capacity, education, and access to resources and understanding the expectations and needs of local stakeholders.

The final aspect of the trip focused on conducting a social impact assessment through the lens of Underwater Domain Awareness (UDA). UDA is essential to all our work, as it ensures that our interventions benefit local communities and promote the long-term sustainability of marine ecosystems. This visit was a crucial step in refining our strategies, ensuring that our technologies are aligned with the local conditions, and forging stronger partnerships to maximise our efforts' impact in the region.

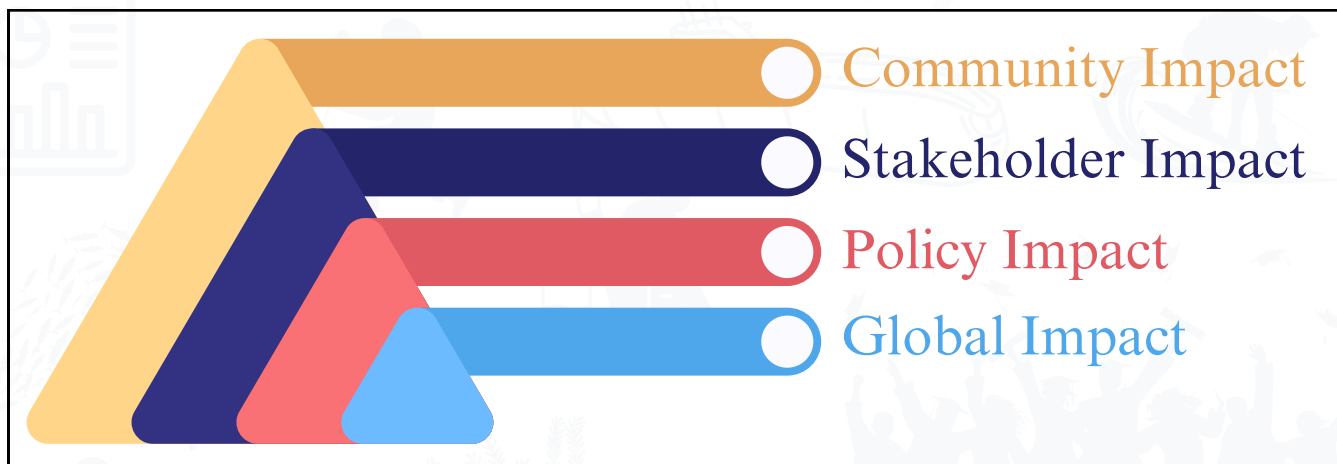


Our team held field interactions at Ratnagiri and Guhagar in Maharashtra to understand the requirements of the coastal communities

5. Year in Review

In this section, we will reflect on the impact we've made over the course of the year, not only in shaping policies but also through our direct engagement at the grassroots level. We will examine the key milestones and significant achievements that defined this year, highlighting the progress we've made and the positive changes we've driven. In addition, we will showcase the major partnerships we've forged, illustrating the strength and collaborative spirit that helped propel our initiatives forward. Furthermore, we will explore how the strategic use of digital media has amplified our efforts, enabling us to reach a wider audience and engage more effectively with stakeholders across various platforms. This comprehensive overview will provide a clear picture of how our collective efforts have contributed to creating meaningful change.

This section has been broadly divided into four parts and will assess the following:



5.1. Community Impact:

This year, we did our best to create an impact at a community level by undertaking field visits, conducting research-based workshops for defence personnel and arranging summer internship programmes for college students.

Community Interaction: The field visit to Ratnagiri and Guhagar in Maharashtra was a crucial opportunity to build relationships, establish trust, and communicate how our technologies, particularly in data collection and marine research, align with the needs of local stakeholders. We also aimed to understand what kind of support or collaboration was required from the community to facilitate the field deployment of our technology and assist in data collection efforts. One important aspect of the trip focused on conducting a social impact assessment through the lens of Underwater Domain Awareness (UDA). UDA is essential to all our work, as it ensures that our interventions are not only beneficial to local communities but also promote the long-term sustainability of marine ecosystems. By integrating UDA into our approach, we were able to explore how better awareness of underwater environments could inform policymaking, guide community engagement, and ensure that future initiatives contribute to the sustainable management of coastal resources. This focus on UDA was essential in framing all aspects of the visit and ensuring that the technologies and strategies we pursue are aligned with the principles of environmental stewardship and community welfare.

In addition, this visit was a crucial step in refining our strategies, ensuring that our technologies are aligned with the local conditions, and forging stronger partnerships that will maximise the impact of our efforts in the region. The insights gained will play a vital role in guiding our future initiatives and strengthening our collaboration with the local community and partners like ClimaCrew.

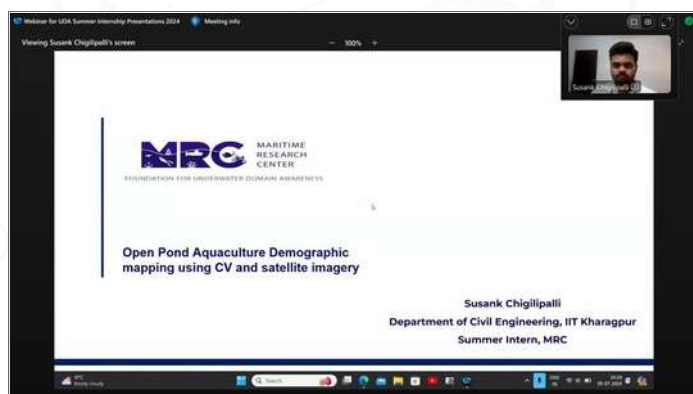
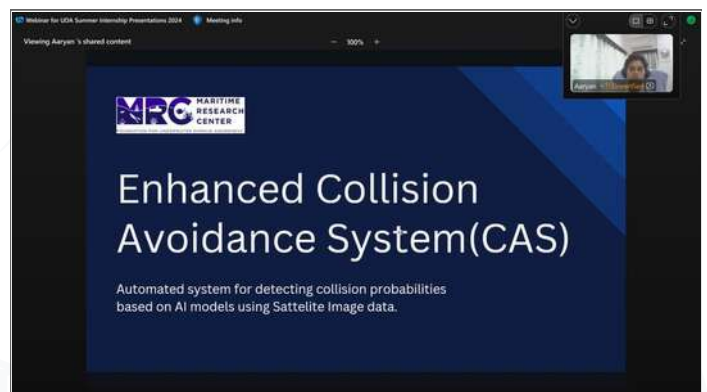
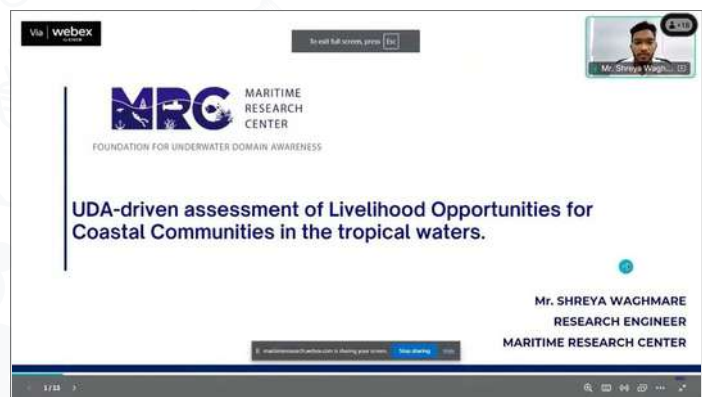


Snapshots from our field visit and interactions in Ratnagiri and Guhagar in Maharashtra

Internships and Fellowships: As part of our commitment to fostering talent and promoting cross-disciplinary collaboration, the Maritime Research Center (MRC) runs an extensive Annual Summer Internship Programme each year. This initiative is designed to provide hands-on, real-world experience for students from a wide range of academic backgrounds, not only those pursuing degrees in science and engineering but also those from liberal arts disciplines. By offering internships to students from diverse fields of study, we aim to cultivate a multifaceted understanding of the challenges and opportunities within the maritime and defence sectors. This year, we conducted our summer internship drive at some of the most prestigious institutions in India, including IIT Bombay, IIT Madras, and IIT Kharagpur. These renowned institutions have long been recognised for their academic excellence, and partnering with them allowed us to connect with some of the brightest and most promising students in the country. The response to our internship drive was nothing short of overwhelming, with over 500 students from these IITs applying for a limited number of internship positions. We were thrilled to see such strong enthusiasm from students eager to contribute their ideas, creativity, and fresh perspectives to the important work being done at MRC. This diverse influx of talent provided us with the opportunity to explore new ideas and foster innovation in areas ranging from strategic security to policy research.

The overwhelming response also underscores the impact that MRC's initiatives have on the broader academic community. By attracting such a wide range of students, we are able to play a pivotal role in shaping the future of the maritime and defence industries, encouraging the next generation of leaders to think beyond traditional boundaries and approach complex challenges from multidisciplinary angles. Our internship programme serves as an important stepping stone for students, offering them valuable exposure to industry practices and real-world challenges while also helping us tap into a reservoir of fresh talent and perspectives.

Through this initiative, MRC continues to make a meaningful contribution to the professional development of students, preparing them for future careers and fostering a deeper connection between academia, industry, and the maritime and defence sectors. We look forward to continuing this impactful tradition and expanding our internship programme to include even more institutions and disciplines in the years to come.



Our UDA Summer Interns made their final presentations to industry experts and policymakers

5.2. Stakeholder Impact:

Impact-driven workshops: At the Maritime Research Center (MRC), we are committed to fostering growth and development within the maritime and defence sectors through a variety of targeted workshops, webinars, and participation in key industry events. These initiatives are a crucial part of our broader mission to enhance the capabilities and capacities of professionals and organisations in the field. A comprehensive list of the workshops, webinars, and participations conducted throughout the year is available in the references section of our annual report for those interested in exploring the full range of our activities. One of the standout events in our calendar this year was the highly anticipated workshop held in April 2024, titled ‘UDA Framework for Strategic Security and Atmanirbharta.’ This workshop, conducted in close collaboration with the Indo-Swiss Centre of Excellence, brought together leading experts, policymakers, and practitioners in the field of strategic security to engage in deep discussions and knowledge sharing. The event was made possible through the generous support of industry giants like Larsen and Toubro and Bharat Electronics Limited (BEL), whose contributions were instrumental in the success of the workshop. The primary objective of this workshop was to provide an in-depth understanding of the UDA framework, specifically focusing on its critical role in shaping the future of strategic security within India. The concept of UDA is nuanced, with its complex structure and interdependencies presenting significant challenges that need to be addressed through collaboration, innovation, and strategic thinking. Through a series of insightful presentations, lectures, and interactive sessions, participants gained valuable insights into how UDA can serve as a strategic tool for enhancing India’s national security infrastructure, particularly in the context of the country’s push towards Atmanirbharta (self-reliance) in defence and security.

Furthermore, the workshop provided an opportunity to delve into the various challenges associated with implementing the UDA framework, ranging from technological limitations to policy and coordination hurdles. The discussions aimed not only to raise awareness of these challenges but also to identify potential solutions that can be pursued collectively by the strategic security community. By bringing together thought leaders, industry experts, and key stakeholders, this workshop played a pivotal role in strengthening the collective effort towards achieving greater autonomy in defence and security capabilities, which is in line with India’s broader vision for self-reliance in defence production.

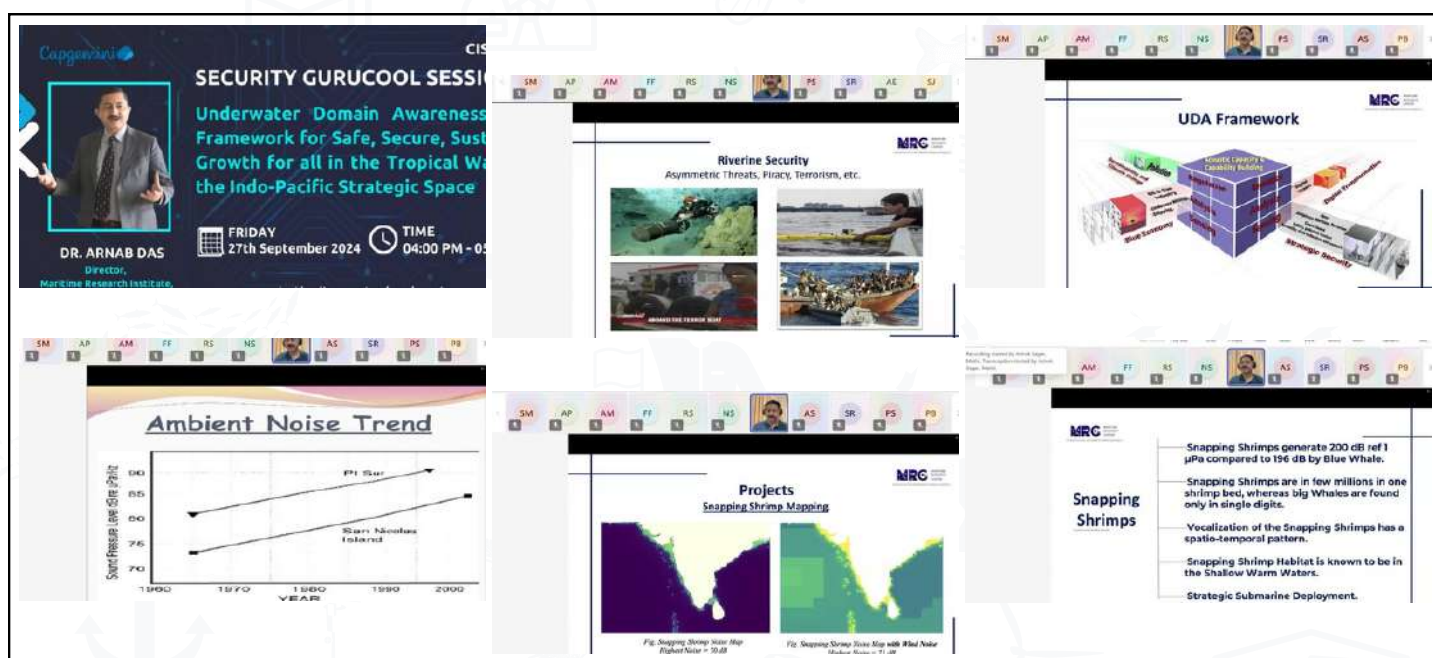
This workshop also served as a platform for networking, fostering deeper collaboration among organisations and individuals working towards the common goal of securing India’s future through innovative, strategic, and self-reliant defence frameworks.



A one-day workshop with the Capgemini Team: On September 27, 2024, we hosted a highly engaging online workshop for the Capgemini team, led by Dr. (Cdr) Arnab Das, as part of our ongoing efforts to facilitate knowledge-sharing and collaboration within the broader corporate ecosystem. The workshop, titled "Security Gurucool Session - September Edition," brought together over 500 Capgemini employees, creating a dynamic platform for insightful discussions on the "UDA Framework for a Comprehensive, Structured, and Inclusive Approach towards Digital Transformation." During the session, Dr. Das explored a range of crucial topics that resonate deeply with current global challenges, including Snapping Shrimp, Ambient Noise Trends, the Blue Economy, and Riverine Security. These topics not only highlighted the intersection of technology, security, and sustainability but also provided a broader perspective on how environmental and economic factors play a pivotal role in shaping the future of digital transformation. Dr. Das also elaborated on the four essential pillars of the UDA Framework, emphasising their interconnectedness: Strategic Security, Blue Economy, Sustainability and Climate Change, and Digital Transformation.

A key focus of the workshop was the demonstration of our ongoing initiatives, such as the Snapping Shrimp Mapping project, which illustrates our commitment to addressing environmental challenges while driving digital innovation. Through initiatives like these, we aim to bridge the gap between cutting-edge technology and real-world environmental and social issues. By mapping the effects of underwater noise on marine ecosystems, we are not only advancing the field of marine biodiversity but also contributing to the global effort to promote sustainability and climate resilience.

The workshop was not just an academic exchange; it was a powerful call to action for fostering collaboration that creates meaningful, on-ground social impact. By engaging a leading global company like Capgemini in these critical conversations, we have laid the foundation for cross-industry partnerships that can lead to tangible, real-world solutions. The knowledge shared during the session is set to catalyze positive change, empowering the corporate sector to align its digital transformation efforts with the broader goals of social responsibility, sustainability, and security. This workshop exemplified our vision of driving inclusive digital transformation-one that considers not only technological advancements but also their environmental and social consequences, ensuring that progress is made in a way that benefits both the economy and society as a whole. By collaborating with organisations like Capgemini, we continue to advocate for a holistic approach to development, reinforcing the importance of creating a better, more sustainable future for all.



5.3. Policy Impact:

This year, our impact at the policy level encompassed two key initiatives: (1) contributing e-learning modules for government officials to enhance their skills and knowledge, and (2) collaborating with the Director General of Shipping, Government of India, by participating in the International Maritime Organization's (IMO) National Taskforce on URN Management. Through these efforts, we have played an active role in shaping and strengthening maritime policy and governance.

Through our strategic partnership with the Capacity Building Commission of India (CBCI), we made a significant policy impact by enhancing the knowledge and awareness of government officials regarding the maritime and underwater environment. As detailed in section 4.1.1 of this annual report, the e-learning modules titled 'Basics of the Underwater World' were developed by the MRC as a key resource to support the capacity-building efforts of government officials across India. These modules aim to equip officials with a foundational understanding of the marine and underwater ecosystem, which is crucial for informed decision-making in maritime policy, conservation, and governance.

The policy impact of this collaboration lies in its potential to improve the competency of officials involved in managing India's vast maritime resources and environmental sustainability. By integrating these e-learning modules into training programs under initiatives such as Mission Karmayogi, the partnership has helped to create a more knowledgeable and skilled workforce within the government. This initiative directly contributes to policy development and the implementation of effective strategies for maritime security, ocean conservation, and sustainable resource management. Ultimately, this collaboration strengthens India's capacity to address the challenges of underwater and coastal ecosystem management, aligning with the country's broader environmental and development goals.

Further, through our active participation in the National Task Force established by the Director General (DG) of Shipping, Government of India, MRC has made a significant policy impact in the global and national efforts to mitigate the environmental impacts of underwater noise, particularly in the context of shipping activities. The project, led by the International Maritime Organization (IMO), focuses on reducing underwater noise pollution and its harmful effects on marine life, a critical area of concern for oceanic sustainability and biodiversity. In August 2024, MRC's involvement in an event hosted in Mumbai in collaboration with the IMO and the Ministry of Ports, Shipping and Waterways further strengthened our role in shaping policy within this domain. During the event, we presented on 'Underwater Radiated Noise (URN) Management in the Indian Ocean Region (IOR)', offering a holistic approach to URN management. Our presentation highlighted the importance of a comprehensive strategy built around three key pillars: Outreach, Engage, and Sustain. This approach emphasises the importance of raising awareness, engaging key stakeholders, and ensuring long-term sustainability through targeted seminars, continuous collaboration, and ongoing research projects.

The policy impact created through our participation lies in fostering a more integrated and informed approach to underwater noise management. By actively contributing to the National Task Force, we have helped to shape India's stance on marine environmental protection and its role in global initiatives to mitigate underwater noise. Our efforts also align with national and international regulatory frameworks aimed at reducing shipping-related environmental impacts, ensuring better protection for marine ecosystems, and contributing to global efforts in achieving sustainable maritime practices. MRC's contributions support India's broader policy objectives of promoting environmental sustainability in the maritime sector, enhancing marine biodiversity protection, and strengthening international collaboration on climate and ocean health. By integrating these principles into national policy discussions, MRC is helping to influence the development of policies and regulations that will shape the future of marine conservation and shipping practices, both in India and globally.



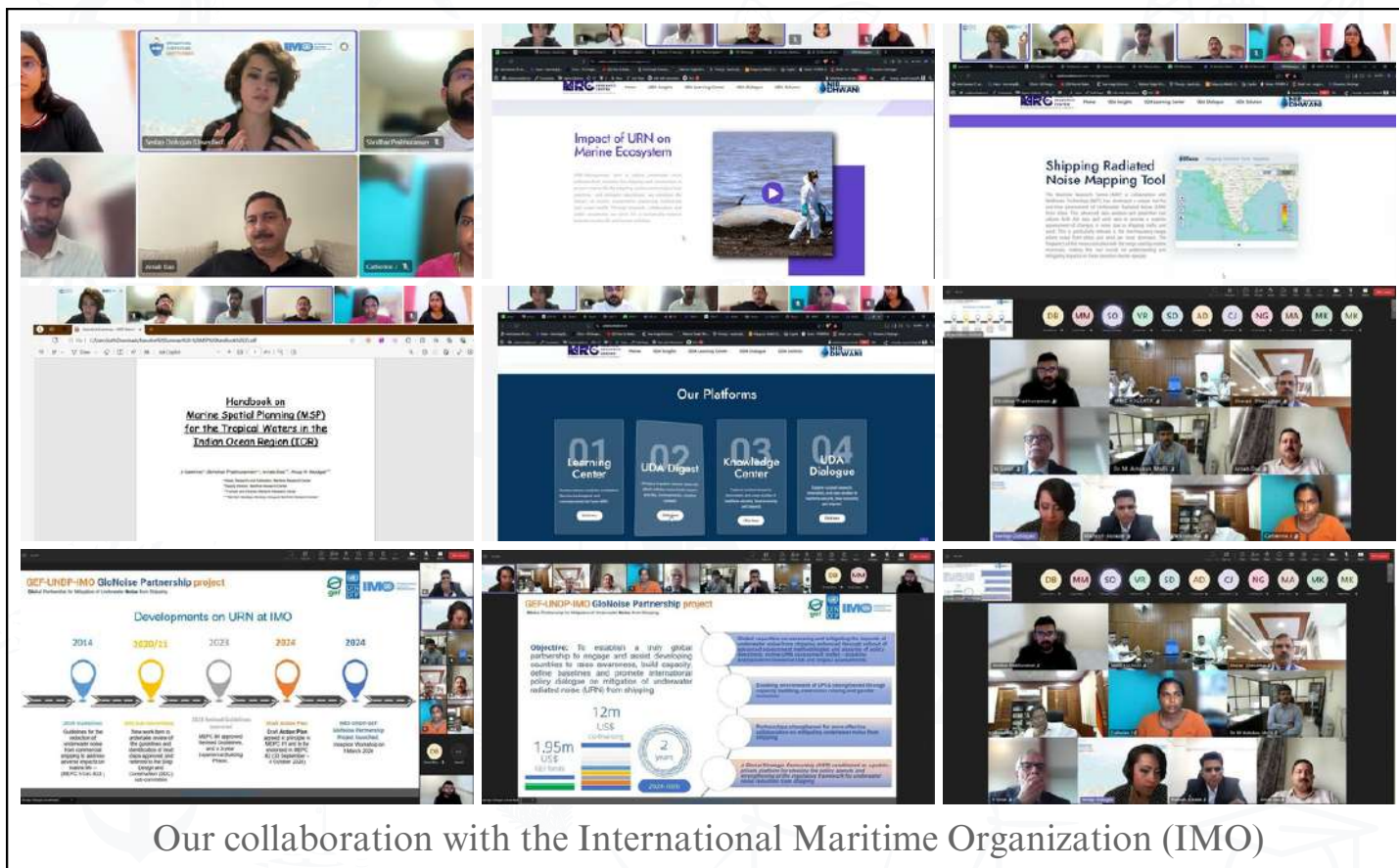
5.4. Global Impact:

This year, we have made significant strides in our ongoing efforts to create a global impact through strategic collaborations, research, and policy initiatives in the maritime sector. At the forefront of our achievements is our partnership with the International Maritime Organization (IMO) on their groundbreaking project focused on Underwater Radiated Noise (URN) Management.

IMO Collaboration on Underwater Radiated Noise Management:

A highlight of our efforts this year was our collaboration with the IMO on their Global Partnership for Mitigation of Underwater Noise from Shipping. The Director General of Shipping, Government of India established a National Task Force for this project, and we had the privilege of being part of the Indian National Task Force. This vital initiative aims to address the environmental impacts of underwater noise and improve the protection of marine life, especially in sensitive regions like the Indian Ocean.

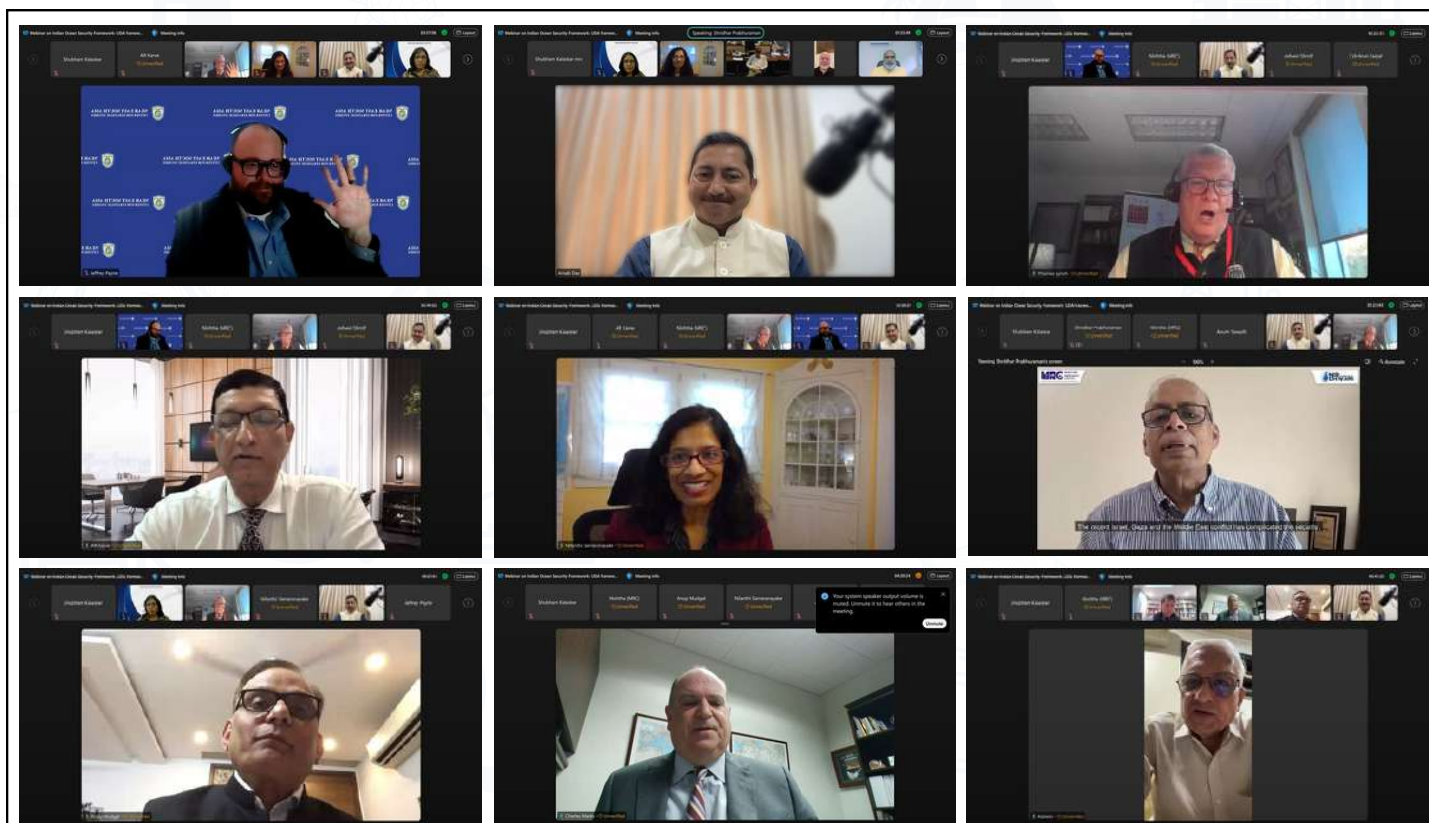
In August 2024, our team participated in an event hosted in Mumbai in collaboration with the IMO and the Ministry of Ports, Shipping and Waterways. During this event, we presented on the topic ‘Underwater Radiated Noise (URN) Management in the Indian Ocean Region (IOR)’. Our presentation emphasised a holistic approach to managing URN, focusing on the principles of Outreach, Engage, and Sustain. Through seminars, stakeholder engagement, and ongoing projects, we aim to promote long-term solutions for sustainable marine ecosystems in the region.



Indian Ocean Strategic Security Framework Webinar:

Further advancing our global initiatives, we collaborated with the Near East South Asia Center for Strategic Studies (NESA) to conduct a webinar on the Indian Ocean Strategic Security Framework. This event brought together experts from both the United States and India, who shared valuable insights into the unique security challenges of the Indian Ocean Region (IOR). Key topics included piracy, territorial disputes, and the protection of crucial sea lanes.

The webinar provided a platform for in-depth discussions on the geopolitical and security dynamics of the IOR, highlighting the need for collaborative strategies to address emerging threats. By fostering dialogue and sharing expertise, we continue to play an active role in ensuring the security and stability of this vital maritime region.



Our collaboration with the Near East South Asia Centre for Strategic Studies (NESA), USA

Workshop on Indo-Pacific Regional Challenges:

In November 2024, Dr. (Cdr) Arnab Das conducted a workshop at the Department of Naval Architecture, Ocean and Marine Engineering at the University of Strathclyde in Scotland. During the workshop, Dr. Das delved into the pressing challenges facing the Indo-Pacific region and the vital role the Maritime Research Center can play in addressing them. The workshop covered key topics such as sonar deployment, climate resilience, and the sustainable blue economy. Dr Das also emphasised the importance of Marine Spatial Planning (MSP) in ensuring the sustainable development of marine resources while preserving the health of ocean ecosystems. The workshop underscored the need for innovative policy and technological solutions to tackle the evolving maritime challenges in tropical waters, ensuring regional security and long-term sustainability.

Our Maritime Research Center continues to be at the forefront of driving global impact in maritime research, policy development, and technological innovation. Through our collaborative efforts with international organizations, academic institutions, and industry leaders, we are making significant contributions to the global maritime community. Our research initiatives, combined with strategic partnerships, are helping to shape policies that promote environmental sustainability, regional security, and the sustainable use of ocean resources. As we continue to expand our global network, we remain committed to advancing the understanding and management of the world's oceans for the benefit of all. You can view full list of our engagement with global institutions in the 'Engage' segment of the References, mentioned in the annual report.



Workshop at
University of
Strathclyde



Participation at
Indo-Norway
Committee Event



Participation
at East Asia
Summit



5.5. Shaping Public Opinion:

This section provides an overview of our media outreach efforts, showcasing our media coverage, television features, podcast appearances, and other notable mentions of our team.

'अंडरवॉटर डोमेन'मध्ये मोठ्या आर्थिक संधी कार्यशाळेत माजी संरक्षण सचिव डॉ. अजय कुमार यांचे प्रतिपादन

पुणे, दि. १५ : 'पृथ्वीवरील १४ टक्के जीवसृष्टी ही समुद्रामध्ये आहे, असे मानले जाते. मात्र, चंद्र आणि मंगळ या दोन ग्रहांवर भारताने जे काही संशोधन केले आहे, त्याच्यापेक्षा खूप कमी संशोधन हे आजवर अंडरवॉटर डोमेन या क्षेत्रामध्ये झाले आहे. ही काळजी करण्यासारखी बाब आहे. अंडरवॉटर डोमेन अर्थात जल पृष्ठभागाखालील क्षेत्राचे अनेक कॅनोरे असून, यामध्ये मोठ्या प्रमाणात आर्थिक संधी दडलेल्या आहेत, असे मत भारतीय माजी संरक्षण सचिव डॉ. अजय कुमार यांनी केले. मेरिटायम रिसर्च सेंटर (एमआरसी) इंडो-स्वीस सेंटर ऑफ एक्सलन्स व नौदल क्षेत्रातील टेक्नॉलॉजीज यांच्या विशेष सहकार्याने अंडरवॉटर डोमेन अवेअरनेस फ्रेमवर्क फॉर स्ट्रॅटिजिक सिम्युलेशन ऑफ अंडरवॉटर डोमेन या विषयावर आयोजित कार्यशाळेत ते बोलत होते. एमआरसीच्या धोरणात्मक सल्लागार समितीचे अध्यक्ष लेफ्टनंट जनरल (निवृत्त) डी. बी. शेटकर, एमआरसीचे सल्लागार प्रफुल्ल तलेरा आणि एमआरसीचे संचालक कर्मांडर डॉ. अर्णव दास यांनी उपस्थित होते.

अंडरवॉटर डोमेन क्षेत्रात आर्थिक संधी

पुणे, दि. १५ (प्रतिनिधी) - पृथ्वीवरील १४ टक्के जीवसृष्टी ही समुद्रामध्ये आहे, असे मानले जाते. मात्र, चंद्र आणि मंगळ या दोन ग्रहांवर भारताने जे काही संशोधन केले आहे, त्याच्यापेक्षा खूप कमी संशोधन हे आजवर अंडरवॉटर डोमेन या क्षेत्रामध्ये झाले आहे. ही काळजी करण्यासारखी बाब आहे. अंडरवॉटर डोमेन अर्थात जल पृष्ठभागाखालील क्षेत्राचे अनेक कॅनोरे असून, यामध्ये मोठ्या प्रमाणात आर्थिक संधी दडलेल्या आहेत, असे मत भारतीय माजी संरक्षण सचिव डॉ. अजय कुमार यांनी केले. मेरिटायम रिसर्च सेंटर (एमआरसी) इंडो-स्वीस सेंटर ऑफ एक्सलन्स व नौदल क्षेत्रातील टेक्नॉलॉजीज यांच्या विशेष सहकार्याने अंडरवॉटर डोमेन अवेअरनेस फ्रेमवर्क फॉर स्ट्रॅटिजिक सिम्युलेशन ऑफ अंडरवॉटर डोमेन या विषयावर आयोजित कार्यशाळेत ते बोलत होते. एमआरसीच्या धोरणात्मक सल्लागार समितीचे अध्यक्ष लेफ्टनंट जनरल (निवृत्त) डी. बी. शेटकर, एमआरसीचे सल्लागार प्रफुल्ल तलेरा आणि एमआरसीचे संचालक कर्मांडर डॉ. अर्णव दास यांनी उपस्थित होते.

'अंडरवॉटर डोमेनमध्ये मोठ्या आर्थिक संधी'

पुणे, दि. १५ (प्रतिनिधी) - पृथ्वीवरील १४ टक्के जीवसृष्टी ही समुद्रामध्ये आहे, असे मानले जाते. मात्र, चंद्र आणि मंगळ या दोन ग्रहांवर भारताने जे काही संशोधन केले आहे, त्याच्यापेक्षा खूप कमी संशोधन हे आजवर अंडरवॉटर डोमेन या क्षेत्रामध्ये झाले आहे. ही काळजी करण्यासारखी बाब आहे. अंडरवॉटर डोमेन अर्थात जल पृष्ठभागाखालील क्षेत्राचे अनेक कॅनोरे असून, यामध्ये मोठ्या प्रमाणात आर्थिक संधी दडलेल्या आहेत, असे मत भारतीय माजी संरक्षण सचिव डॉ. अजय कुमार यांनी केले. मेरिटायम रिसर्च सेंटर (एमआरसी) इंडो-स्वीस सेंटर ऑफ एक्सलन्स व नौदल क्षेत्रातील टेक्नॉलॉजीज यांच्या विशेष सहकार्याने अंडरवॉटर डोमेन अवेअरनेस फ्रेमवर्क फॉर स्ट्रॅटिजिक सिम्युलेशन ऑफ अंडरवॉटर डोमेन या विषयावर आयोजित कार्यशाळेत ते बोलत होते. एमआरसीच्या धोरणात्मक सल्लागार समितीचे अध्यक्ष लेफ्टनंट जनरल (निवृत्त) डी. बी. शेटकर, एमआरसीचे सल्लागार प्रफुल्ल तलेरा आणि एमआरसीचे संचालक कर्मांडर डॉ. अर्णव दास यांनी उपस्थित होते.

जलपृष्ठभागाखालील संशोधनात मोठ्या संधी

माजी संरक्षण सचिव कुमार यांचे मत

पुणे, दि. १५ (प्रतिनिधी) - पृथ्वीवरील १४ टक्के जीवसृष्टी ही समुद्रामध्ये आहे, असे मानले जाते. मात्र, चंद्र आणि मंगळ या दोन ग्रहांवर भारताने जे काही संशोधन केले आहे, त्याच्यापेक्षा खूप कमी संशोधन हे आजवर अंडरवॉटर डोमेन क्षेत्रात झाले आहे. ही चिंतेची बाब आहे. या क्षेत्राचे अनेक कॅनोरे असून, यामध्ये मोठ्या प्रमाणात आर्थिक संधी दडलेल्या आहेत, असे मत भारतीय माजी संरक्षण सचिव डॉ. अजय कुमार यांनी सांगितले. नवीकच्या भविष्यामध्ये हे क्षेत्र नवा आवयम घेऊन उदयास येणार क्षेत्र असेल, याकडे लक्ष देणे गरजेचे आहे. 'अंडरवॉटर डोमेन अवेअरनेस' अर्थात 'पृथ्वी' या क्षेत्रात गेली अनेक वर्षे कार्यरत असलेल्या पुण्यातील मेरिटायम रिसर्च सेंटरच्या (एमआरसी) वतीने आणि 'इंडो-स्वीस सेंटर ऑफ एक्सलन्स व नौदल क्षेत्रातील टेक्नॉलॉजीज यांच्या सहकार्याने 'अंडरवॉटर डोमेन अवेअरनेस फ्रेमवर्क फॉर स्ट्रॅटिजिक सिम्युलेशन ऑफ अंडरवॉटर डोमेन' या महत्वाच्या विषयावर आयोजित करण्यात आलेल्या

माजी संरक्षण सचिव डॉ. अजय कुमार यांचे मत

पुणे, दि. १५ (प्रतिनिधी) - पृथ्वीवरील १४ टक्के जीवसृष्टी ही समुद्रामध्ये आहे, असे मानले जाते. मात्र, चंद्र आणि मंगळ या दोन ग्रहांवर भारताने जे काही संशोधन केले आहे, त्याच्यापेक्षा खूप कमी संशोधन हे आजवर अंडरवॉटर डोमेन या क्षेत्रामध्ये झाले आहे. ही चिंतेची बाब आहे. या क्षेत्राचे अनेक कॅनोरे असून, यामध्ये मोठ्या प्रमाणात आर्थिक संधी दडलेल्या आहेत, असे मत भारतीय माजी संरक्षण सचिव डॉ. अजय कुमार यांनी केले. मेरिटायम रिसर्च सेंटर (एमआरसी) इंडो-स्वीस सेंटर ऑफ एक्सलन्स व नौदल क्षेत्रातील टेक्नॉलॉजीज यांच्या विशेष सहकार्याने अंडरवॉटर डोमेन अवेअरनेस फ्रेमवर्क फॉर स्ट्रॅटिजिक सिम्युलेशन ऑफ अंडरवॉटर डोमेन या विषयावर आयोजित कार्यशाळेत ते बोलत होते. एमआरसीच्या धोरणात्मक सल्लागार समितीचे अध्यक्ष लेफ्टनंट जनरल (निवृत्त) डी. बी. शेटकर, एमआरसीचे सल्लागार प्रफुल्ल तलेरा आणि एमआरसीचे संचालक कर्मांडर डॉ. अर्णव दास यांनी उपस्थित होते.





6. Looking Ahead: Turning Ideas into Impact

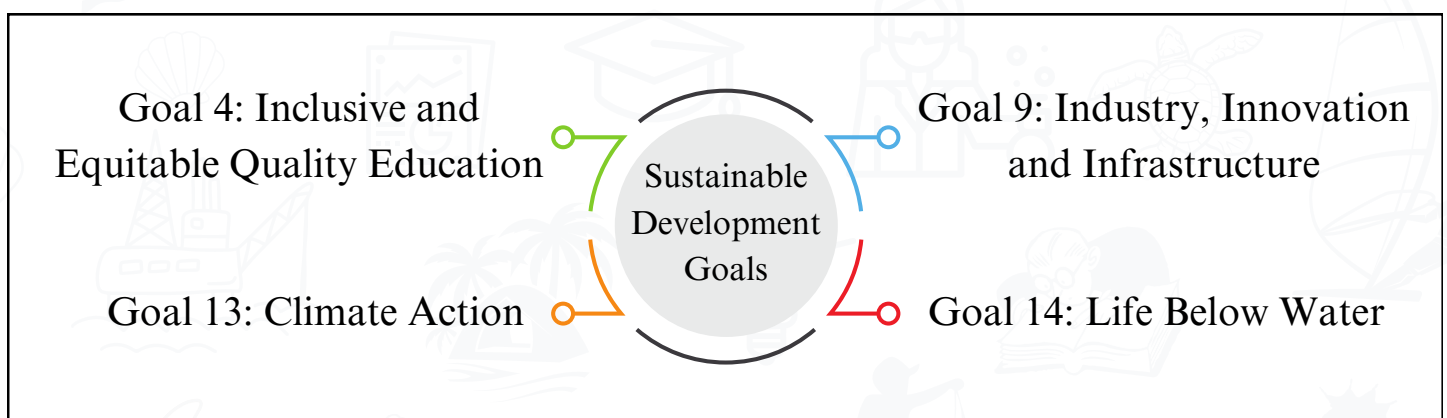
As we look ahead, we are committed to transforming innovative ideas into tangible impact and fostering a sustainable future for the maritime industry. Our focus on Corporate Social Responsibility (CSR) underscores the importance of giving back to the community while actively pursuing opportunities for collaboration with industry leaders, academic institutions, and government bodies to drive progress. Emphasising Environmental, Social, and Governance (ESG) principles, we strive to lead by example in adopting sustainable practices that contribute to the well-being of both the environment and society. With a forward-looking mindset, we are developing strategies and pathways that align with global maritime trends, ensuring that our research continues to inspire growth, sustainability, and resilience in the industry for years to come.

6.1. Corporate Social Responsibility:

Our activities are focused on advancing education to improve vocational skills, fostering environmental sustainability and the conservation of natural resources. It further supports the conservation of natural resources and supports technology incubation through academic endeavours, all of which align with the objectives outlined in Schedule VII (ii, iv, ix) of Section 135 of the Companies Act 2013 (CSR Policy).

Our wide-ranging CSR activities are driven by a core aim to transform ideas into tangible impact. This can only be accomplished through a well-structured strategy, specialised collaborations, and industry-backed expertise in the underwater domain, along with thorough assessments to ensure that our efforts deliver practical insights and meaningful contributions. In this chapter, we highlight our dedication to exchanging knowledge and actionable insights across various partnership opportunities. From empowering young individuals in India and other nations through hands-on upskilling programs to building collaborative partnerships between academia and industry, all are working together to create a more informed and proactive approach to advancing Underwater Domain Awareness.

The scope and impact of our activities are closely aligned with most of the United Nations Sustainable Development Goals (SDGs). Our mission and vision are deeply connected to the following four goals:



We remain committed to advancing the development and implementation of the UDA Framework across the SDGs, aiming to promote safe, secure and sustainable growth in tropical waters. Our key stakeholders in sectors such as maritime security, blue economy, marine environment, disaster management, and research and innovation have acknowledged these efforts, and they encourage collaborative action as we continue to move forward with dedication and purpose.

6.2. Opportunities for Collaboration:

Through the diverse, multi-disciplinary projects and initiatives highlighted in this report, our organisation remains a key contributor to the support of sustainable marine ecosystems and strategic policy in the Indian Ocean Region, driven by research and informed actions. Looking ahead, we remain committed to fostering a dynamic learning and knowledge-sharing environment grounded in our core principles.

Below are some of our initiatives that offer collaboration opportunities with our current and potential stakeholders.

100 Coastal Warriors: This project is dedicated to enhancing skills and ensuring sustainable livelihoods amongst the coastal communities. It also holds a firm commitment to preserving our delicate ecosystems, fostering diversified opportunities, and aligning with the principles of the blue economy. Our plan of action with the deployed coastal warriors revolves around revitalising coastal communities through practical solutions. The aim is to strengthen the pillars of social, economic and ecological sustainability. These warriors will follow a sequential procedure, where they first involve the engagement of the coastal community to identify their needs and the challenges they face. Based on the identified problems, the scope of intervention for digital transformation in the space needs to be understood. Our ground deployment warriors will be involved in building the desired infrastructure (deploying hardware sensors, etc.) and engaging the community to carry out the implementation of the solutions, thereby empowering the coastal people. Based on the identified challenges plaguing the growth and potential of coastal infrastructure, they need to curate documentation along the lines of policy building that identifies the limitations of existing policies and current problems in the enforcement of such policies.

By empowering coastal warriors with tailored skill development programmes, we strive to ensure their economic stability and resilience to environmental shifts and uphold the integrity of our marine and freshwater ecosystems. This commitment to ecosystem conservation aligns with our vision for a sustainable future where reliant communities thrive in harmony with their environment, contributing significantly to the Blue Economy's sustainable and responsible marine resource utilization principles. More details related to the '100 Coastal Warriors' initiative can be fetched through the following concept note - [here](#).

100 River Warriors: This initiative offers a transformative approach to safeguarding rivers and empowering riverine communities through strategic partnerships, targeted skill development and technological innovation. This initiative aims to provide a comprehensive, sustainable model for addressing these communities' ecological and socio-economic challenges by integrating traditional knowledge with modern tools such as the UDA Framework. The multi-faceted programs, from education and capacity building to hands-on restoration efforts, will foster resilience, preserve ecosystems, and create long-term employment opportunities, particularly for youth. With a clear focus on collaboration, innovation, and empowerment, the initiative aims to ignite a ripple effect for positive change that extends beyond immediate outcomes. It will contribute to global sustainability goals and ensure the prosperity of riverine communities for generations to come. Through these efforts, we aim to protect vital river ecosystems and uplift the communities that depend on them, creating a harmonious balance between development and ecological conservation. This holistic approach will create a legacy of sustainable progress, making it a critical step in building a more resilient and equitable future for all.

Through the '100 River Warriors' project, we aim to comprehensively assess the river basin's hydrology, ecology and socio-economic conditions. Further, through this project, we aim to develop a basin-wide management plan-River Spatial Plans-that sets clear objectives, strategies, and action plans. We must educate and train local communities, government officials, and other key stakeholders on sustainable water management practices to implement the same. We must also build technical and institutional capacities to manage water resources.

100 Water Warriors: Water resource management in India is a critical issue, given the country's vast population, rapid economic development, and the increasing impact of climate change. Water scarcity is exacerbated by regional and seasonal variability, over-extraction of groundwater, and inefficient usage practices. Climate change adds another layer of complexity, altering precipitation patterns and affecting the reliability of water supplies. Effective management requires a comprehensive approach, incorporating sustainable practices such as rainwater harvesting and efficient irrigation, technological innovations like remote sensing and desalination, and robust policy frameworks to ensure equitable distribution and use. Community involvement and awareness campaigns are also crucial for fostering a culture of conservation. By addressing these challenges through integrated strategies, India can secure its water future, ensuring that this vital resource supports current and future generations. The 100 water warriors will complement the deployment of the policy and technological interventions. The water warriors will be on the ground to understand the ground realities. Water resource management from dams/reservoirs/rivers and groundwater is of major focus. The UDA Framework will be utilised in understanding the local conditions. This would encompass acoustic systems for data collection and sharing, data analysis, ground truthing, etc. This data will be crucial to target the specific stakeholders and collaborate for an integrated approach. To equip the warriors with the necessary skills, the centres of excellence and skilling centres can be set up as described in the UDA framework.

6.3. Existing Partnerships:

Some examples of our impact-driven existing activities from 2024 include the following:

Ratnagiri Field Visit Experiment: In collaboration with Excel Industry Limited and Clima Crew, we conducted a field visit to Ratnagiri and Guhagar in Maharashtra to explore the social landscape of these coasts and identify critical gaps in areas such as skilling, innovation, and knowledge. For this, we conducted discussions with government bodies, NGOs, Self-Help Groups (SHGs), and other relevant social organisations to gain a comprehensive understanding of the challenges faced by local communities.

UDA Summer Internship and Fellowships: We collaborated with renowned educational institutions like IIT Bombay, IIT Kharagpur, IIT Madras, Symbiosis School of Liberal Arts and TERI to continue hosting successful internships and fellowships that foster innovative projects and research publications. Excel Industries has been a significant supporter of these initiatives.

UDA Workshop series: This year, we partnered with Nirdhwani Technology Private Limited and Indo-Swiss Centre of Excellence to conduct a 5-day workshop for skilling over 100 personnels from the strategic security space. Our workshop series was sponsored by Bharat Electronics Limited (BEL) and Larsen & Toubro (L&T). This 5-day workshop, aimed at policy, technology, and capacity building interventions, provided a comprehensive report on further developments for government and corporate stakeholders.

Indo-Swiss Centre of Excellence: Our partnership with the Indo-Swiss Centre of Excellence for Skilling works to address skill gaps identified across various domains pertaining to Underwater Domain Awareness. Various hands-on programmes and academic courses aim to bridge these gaps.

Sincere gratitude to our partners and affiliates:



6.4. Future Strategies and Pathways to Progress:

As a Public Policy Think Tank, our core activities encompass conducting research, building capacity, driving innovation, and developing technologies that support our evidence-based findings. We are also committed to empowering the nation's youth and fostering greater engagement among corporate, academic, and individual stakeholders. Looking ahead, we envision a future where the dissemination of knowledge, active participation, and sustainable practices converge, creating a seamless synergy for lasting impact.

6.4.1. Skilling:

As part of our 2025 plan, we aim to deepen our engagement with the strategic security community by building on our existing collaboration with the Military Institute of Technology (MILIT). Through this partnership, we are providing specialized training in critical areas such as sediment management, URN management, and the application of Artificial Intelligence and Machine Learning to enhance strategic security. These initiatives are designed to equip personnel with the advanced skills needed to address contemporary security challenges. In addition, we will expand our efforts by collaborating with India's diplomatic community to offer targeted training in blue economy-related fields. This will include a focus on sustainable maritime practices, resource management, and the strategic importance of the ocean economy. By strengthening the expertise of diplomats in these areas, we aim to support India's growing engagement with nations across the Indian Ocean Region (IOR), fostering stronger economic, security, and environmental partnerships. Through these initiatives, we are committed to advancing India's position as a key player in the blue economy and ensuring a more secure and sustainable future for the region.

6.4.2. Internships and Fellowships:

In 2025, a central focus of our efforts will be to equip students with the critical skills and knowledge necessary to excel in the underwater domain. This will involve not only enhancing their understanding of maritime ecosystems, underwater technologies, and climate risk assessment but also preparing them to address the evolving challenges of oceanic exploration and conservation. To achieve this, we will forge strategic partnerships with leading academic institutions, enabling us to provide specialised training programs, workshops, and research opportunities. Through these collaborations, we aim to create a dynamic learning environment that fosters greater engagement with the underwater field. By connecting students with cutting-edge research and real-world applications, we seek to cultivate a new generation of experts who are well-prepared to contribute to the sustainable development of the underwater domain and the broader blue economy. This initiative will help ensure that the next wave of professionals is equipped with the expertise needed to drive innovation, conservation, and technological advancement in this critical sector.

6.4.3. Corporate Membership:

In the rapidly growing maritime sector, corporate institutions play a crucial role in driving industry-specific research and developing skilled human resources. Our Corporate Memberships are designed to meet the needs of startups, think tanks, non-profit organizations, and commercial entities, promoting deeper engagement at various levels. Members benefit from a range of advantages, including access to valuable insights, regular interactions, research outcomes, and publications, as well as invitations to exclusive events, opportunities to participate in research activities, and hosting stakeholder projects. The diverse membership options for different types of organizations provide a gateway to a wide array of collaborative opportunities, making a significant contribution to UDA and its real-world applications.

6.4.4. Individual Membership:

Our individual membership program is designed to accommodate a wide range of engagement levels, welcoming both enthusiasts and professionals to join the dynamic field of Underwater Domain Awareness. With five membership tiers, from Student Members to Patrons, this program provides an opportunity to actively participate in UDA-related activities and decision-making processes. Memberships, which are valid for a specific period, offer various levels of involvement in UDA initiatives, ensuring a broad and inclusive platform for participation.

6.4.5. Field Deployment:

In 2025, we anticipate the development and deployment of a diverse array of tools aimed at advancing various fields within the underwater domain. These tools, which are designed to address critical challenges and enhance our capabilities, have been comprehensively outlined in section '4.2.2' of this annual report, which details our activities under 'Technology Intervention' for this year. Among the key tools discussed are the APY tool, URN Management tool, and Sediment Management tool, each aimed at serving a unique purpose in the realm of underwater research and resource management. The APY tool, for instance, is being designed to improve data collection and analysis in underwater environments, while the URN Management tool focuses on optimizing the management of underwater resources. The Sediment Management tool will play a pivotal role in monitoring and mitigating sediment-related issues that impact marine ecosystems. These innovations are part of our ongoing commitment to advancing technology in the underwater domain, providing essential solutions that will drive progress and sustainability in this critical field.

7. Financial Report

FOUNDATION FOR UNDERWATER DOMAIN AWARENESS Company Identification Number- U85300PN2019NPL182720 REGISTERED UNDER SECTION 8 OF THE COMPANIES ACT 2013 102, Cordia, Nyati Estate, Mohammadwadi, Hadapsar, Pune- 411060					
STATEMENT OF PROFIT AND LOSS FOR THE YEAR ENDED 31ST MARCH, 2024					
Rs. in '000					
PARTICULARS	Notes No	As at 31st March 2024		As at 31st March 2023	
		Rs.	Rs.	Rs.	Rs.
Revenue from operations:	10				
Course Fees			60.00		15.00
Donations			9,650.00		9,607.00
Other Income	11		50.95		35.00
Total Income			9,760.95		9,657.00
Expenses					
Cost of Materials Consumed					
Changes in inventories of finished goods, work in progress and Stock-in-trade					
Other Manufacturing expenses					
Employee benefits expense	12	692.34		25.00	
Finance Costs	13	0.03			
Depreciation and amortization expense	6	33.67		5.41	
Other Expenses	14	9,076.01		8,103.10	
Total Expense			9,802.05		8,133.51
Profit before exceptional and extraordinary items and tax			(41.08)		1,523.49
Exceptional Items					
Profit before extraordinary items and tax			(41.08)		1,523.49
Extraordinary items					
Profit before tax			(41.08)		1,523.49
Tax expense:					
(1) Current tax					
MAT Payable					
MAT Receivable					
(2) Deferred tax					
Profit(Loss) for the period from continuing operations			(41.08)		1,523.49
Profit(Loss) for the period from discontinuing operations					
Tax expense of discontinuing operations					
Profit(Loss) from discontinuing operations (after tax)					
Profit(Loss) for the period			(41.08)		1,523.49
Earnings per equity share:					
(1) Basic					
(2) Diluted					
See accompanying notes forming part of the financial statements	1-36				
As per our report of even date attached. For Anupam Kharat & Company Chartered Accountants Firm Reg No. 147153W  Mr. Anupam Kharat Proprietor M.No.-183039 UDIN : 24183039BKCLRA3750 Place : Pune Date : 24/09/2024  For and Behalf of the Board of Directors of FOUNDATION FOR UNDERWATER DOMAIN AWARENESS  Praful Talera Director DIN : 00337983  Arnab Das Director DIN : 07657449					

FOUNDATION FOR UNDERWATER DOMAIN AWARENESS

Company Identification Number- U85300PN2019NPL182720
REGISTERED UNDER SECTION 8 OF THE COMPANIES ACT 2013
102, Cordia, Nyati Estate, Mohammadwadi, Hadapsar, Pune- 411060

BALANCE SHEET STATEMENT AS ON 31ST MARCH, 2024

Rs. in '000

PARTICULARS	Notes	As at 31st March 2024		As at 31st March 2023	
		Rs.	Rs.	Rs.	Rs.
LIABILITIES					
CORPUS FUNDS					
(a) Trust & Copus Fund	3	100.00		100.00	
(b) Reserves and Surplus	4	1,565.77		1,606.85	
(c) Money received against share warrants			1,665.77	-	1,706.85
NON-CURRENT LIABILITIES					
(a) Long-term borrowings				-	
(b) Deferred Tax liabilities (Net)				-	
(c) Other Long term liabilities				-	
(d) Long-term Provisions				-	
CURRENT LIABILITIES					
(a) Short term borrowings				-	
(b) Trade payables				-	
(i) Total outstanding dues of micro and small enterprises				-	
(ii) Total outstanding dues of creditors other than micro and small enterprises				7,610.00	
(c) Other current liabilities	5	-			
(d) Short term provisions					7,610.00
			1,665.77		9,316.85
ASSETS					
NON-CURRENT ASSETS					
(a) Property, Plant & Equipments and Intangible assets	6				
(i) Property, Plant and Equipment		254.08		48.66	
(ii) Intangible assets				-	
(iii) Capital work-in-progress				-	
(iv) Intangible assets under development				-	
(b) Non-current investments				-	
(c) Deferred tax assets (net)				-	
(d) Long-term loans and advances				-	
(e) Foreign Currency Monetary Item Translation Diff			254.08		48.66
CURRENT ASSETS					
(a) Current investments					
(b) Inventories					
(c) Trade receivables				1,350.00	
(d) Cash and Bank Balances	7	325.94		6,920.77	
(e) Short-term loans and advances	8	100.00		100.00	
(f) Other current assets	9	985.75		897.42	
			1,411.68		9,268.19
			1,665.77		9,316.85
See accompanying notes forming part of the financial statements	1-36				

As per our report of even date attached.

For Anupam Kharat & Company
Chartered Accountants
Firm Reg No. 147153W
Mr. Anupam Kharat
Proprietor
M.No.-183039
UDIN : 24183039BKCLRA3750
Place : Pune
Date : 24/09/2024



For and Behalf of the Board of Directors of
FOUNDATION FOR UNDERWATER DOMAIN AWARENESS

Pratul Talera
Director
DIN : 00337983

Ashish Das
Director
DIN : 07657449

8. References:

Note: This section highlights all our activities under the 'Outreach, Engage, and Sustain' framework. The 'Outreach' component encompasses our key workshops, participations, and webinars. The 'Engage' aspect focuses on our primary engagement efforts with various stakeholders. Lastly, the 'Sustain' component includes activities that have been developed into long-term partnerships or collaborations.

Outreach:

Webinars:

(i) World Environment Day 2024: An online webinar was planned and conducted on 'World Environment Day' on June 5, 2024 from 1600 hrs onwards to encourage Young India to focus on the UDA initiative for enhanced marine environment consciousness and effective maritime governance. The workshop provided a broad exposure to innovative projects driven by MRC under the UDA Framework. Major participants at the World Environment Day webinar were domain experts, industry representatives, research scholars, professionals, start-up mentors and policymakers. To learn more, [click here](#).

(ii) World Oceans Day 2024: We collaborated with the Indo Swiss Centre of Excellence to celebrate 'World Oceans Day 2024' on June 8, 2024. During the webinar, MRC Interns showcased their project presentations and deliver insightful thoughts on the realities of the UDA. This was followed by illustrious presentations by MRC Fellows and other internal team members. Celebrating World Oceans Day stands of utmost importance for the Maritime Research Center (MRC), as it drives the concept of the Underwater Domain Awareness (UDA) amongst its key stakeholders. To learn more, [click here](#).

(iii) World Maritime Day 2024: To commemorate the 'World Maritime Day 2024,' we hosted a webinar titled "Underwater Domain Awareness (UDA) Framework for Safe, Secure and Sustainable Growth for All in the Tropical Waters of the Indian Ocean Region (IOR)." The webinar was conducted on September 26, 2024 from 1600 hrs onwards and it brought together strategic thinkers, experts, policymakers, academicians, researchers, and stakeholders to deliberate on this crucial issue and find a nuanced way forward. To learn more, [click here](#).

(iv) Webinar on Indian Ocean Security Framework: In October 2024, we partnered with the Near East South Asia Centre for Strategic Studies (USA) to conduct a webinar titled "Underwater Domain Awareness (UDA) Framework for Effective Security in the Tropical Waters of the Indian Ocean Region (IOR)." This virtual event brought together leading strategic thinkers, experts, policymakers, academicians, researchers, and stakeholders to discuss the vital security concerns of the IOR. The webinar successfully provided a platform to deliberate on the UDA framework as an effective solution to the IOR's security needs. The event concluded by reinforcing the value of cooperative frameworks to address the complex challenges of the Indian Ocean's tropical waters. Our webinar has been watched by more than 7,400 YouTube viewers, demonstrating that the event has successfully conveyed its key messages to the right stakeholders. To learn more, [click here](#).

Important Participations:

- Dr. (CDR) Arnab Das held insightful discussion at the 3rd International Conference on Education, Science, Technology, and Management held in Mumbai on Feb 3, 2024. During his presentation, Dr Das shared his thoughts on creating a sustainable world order focusing on climate sustainability.
- On 15 Feb 2024, Dr. (CDR) Arnab Das highlighted the importance of UDA and its framework at a two-day National Conference on "Sustainable Development Goals (SDGs): Technology and Management". He emphasized how UDA addresses maritime issues, strategic concerns, climate change, and sustainability, underscoring the collaborative efforts of MRC and NDT.
- Dr. (CDR) Arnab Das delivered a compelling address during a Round Table Conference on Fisheries Startup and Policy Framework, hosted by the ICAR-Central Institute of Fisheries Education in Mumbai on 18th March 2024. Dr. Das spoke during Session 3 of the conference, entitled 'Charting the Course: Understanding the Policy Framework of Fisheries in India'. His expertise illuminated the intricacies of the policy framework governing fisheries in India.
- Dr (Cdr) Arnab Das participated in a conference entitled, "Sustainable Blue Economy in Context of Climate Change and Biodiversity Degradation Power by Marine Technologies," which was organized by Digital innovation HUB Innovamare, in collaboration with the University of Zadar on 10 April 2024 in Zadar, Croatia. Dr. Das explained to the participants about the MRC–devised UDA Framework and its nuances and he also discussed the concept of Marine Spatial Planning (MSP).
- On July 5, 2024, the Maritime Research Center (MRC) participated in the 6th East Asia Summit (EAS) Conference on Maritime Security Cooperation in Mumbai. Dr. (Cdr) Arnab Das presented on "Cooperative Adaptation-Measures against Climate Change Maritime Impacts."
- 6. On September 20, we participated in the 4th Project Steering Committee meeting of the 'Indo-Norway Integrated Ocean Management and Research Initiative'. Dr. (Cdr) Arnab Das led a session on Underwater Domain Awareness (UDA), focusing on its relevance for maritime security. Key discussions included lessons from Marine Spatial Planning (MSP) in Puducherry and future directions for the project.
- We participated at the 'GeoSmart India 2024: Hydrosatial Infrastructure and Blue Economy Summit' on December 5, 2024 in Hyderabad. Dr (Cdr) Arnab Das actively engaged in Session 2 of the event, titled "Digital Seas: Ocean Climate Change Advisory Services and Delivery Platform." Dr. Das highlighted our ongoing work, particularly emphasizing our team's progress in research and technology innovation related to Marine Spatial Planning.

- Dr (Cdr) Arnab Das participated as a judge panel member at the GreenX Hackathon - Pune Edition on December 21, 2024. This prestigious event, hosted by the ECOICE Sustainability Services, brought together an inspiring community of industry leaders, policymakers, and technologists, all working towards one common goal: tackling climate challenges and advancing urban sustainability and carbon neutrality.

Important Workshops:

- We conducted a high-level dialogue in collaboration with the Nirdhwani Technologies Pvt. Ltd. (NDT) and the Indo-Swiss Centre of Excellence (ISCE) from 15th April to 19th April 2024. The five-day workshop was supported by Bharat Electronics Limited (BEL) and Larsen and Toubro (L&T). During the span of the five-day workshop on “Underwater Domain Awareness (UDA) Framework for Strategic Security Architecture and Atmanirbharta,” the conversations revolved around major initiatives by India and its key stakeholders in the Indo-Pacific region and the Indian Ocean Region (IOR) to harness the potential of these regions and the importance of the underwater domain awareness amidst all this. To learn more, [click here](#).
- On March 12, 2024, Dr. (Cdr) Arnab Das presented on Underwater Domain Awareness and its framework at Fergusson College, Pune, Maharashtra. He engaged students, highlighting India's unique demographic advantage alongside the challenges it poses in fostering meaningful youth engagement.
- MRC conducted an Underwater Domain Awareness (UDA) workshop specific to the Indo-Pacific strategic space for the Andaman and Nicobar Tri-services Command officers from 24 to 25 April 2024. During his two day visit to Port Blair, Andaman and Nicobar Islands, Dr. Das interacted with their senior officers.
- Dr. (Cdr) Arnab Das led an engaging session with officials at Vizhinjam International Seaport in Thiruvananthapuram, Kerala, on 2nd May 2024, diving deep into the implementation of the research work on the maritime domain sector at MRC.
- Dr. (Cdr) Arnab Das delivered an insightful lecture to the Faculty and Student Officers of the Defence Services Technical Staff Course (DSTSC), attended by nearly 150 officers from the ADGPI - Indian Army, Indian Navy, Indian Air Force, and Indian Coast Guard and friendly foreign countries. To learn more, [click here](#).
- Dr. (Cdr) Arnab Das led a workshop with the Indian Navy at the AntiSubmarine Warfare School in Kochi, Kerala, on September 21. He shared insights on Underwater Domain Awareness (UDA) and its role in strategic security space and noise management in the Indo-Pacific's Tropical Waters. To learn more, [click here](#).

- Dr (Cdr) Arnab Das held a UDA workshop with the foreign services officers at the Sushma Swaraj Institute of Foreign Services in New Delhi on December 12, 2024. Dr. Das, delved into the critical concept of Underwater Domain Awareness (UDA) and emphasised why it should be a top priority for strategic players in the Indo-Pacific region. To learn more, [click here](#).

Engage:

- **Engagement with Clima Crew and Excel Industries Limited:** We collaborated to the Clima Crew and Excel Industries Limited to conduct a field visit to Ratnagiri and Guhagar in Maharashtra to study seaweed cultivation practices. During this field visit, our team engaged with local communities, as well as governance and administrative officials to assess the needs of farmers and the broader coastal community for seaweed production.
- **Engagement with MILIT:** We have collaborated with Military Institute of Technology (MILIT) to offer research training to their student officers through our regular training sessions and full-day workshops at our UDA Center in Pune, Maharashtra. This is part of the six-month project based training for the Defence Services Technical Staff Course (DSTSC) officers on Underwater Radiated Noise (URN) management and Sediment Management. Our team has introduced the visiting officers to Marine Spatial Planning (MSP) and the innovative MSP tool our team has been developing.
- **Engagement with Students' Community:** We engaged with student community through our annual summer internship prorgamme 2024. This year, as part of our engagement, we engaged with students from Indian Institute of Technology (IIT) Bombay, IIT Kharagpur and IIT Madras. Some of the topics on which these interns worked on their research and UDA Digest issue brief were sediment classification, climate change in the Indian Ocean Region (IOR), collision avoidance of ships in maritime, underwater radiated noise management, sediment management, digital transformation, etc.
- **Engagement with Indian Diplomats:** We conducted an introductory workshop with the foreign services officers at the Sushma Swaraj Institute of Foreign Services in New Delhi. In addition, Dr (Cdr) Arnab Das had crucial discussion with Ambassador Raj Kumar Srivastava, Dean of Sushma Swaraj Institute of Foreign Services in New Delhi, where he spoke about the ongoing UDA Projects which are aligned with key areas such as Marine Spatial Planning, Coastal Management, Blue Economy, and more.

Engagement with International Institutions for Global Outreach:

- **Pathfinder Indian Ocean Security Conference:** Dr (Cdr) Arnab Das participated in the Pathfinder Indian Ocean Security Conference in Colombo, Sri Lanka on February[22081283G1] 28, 2024. Dr. Das served as the primary presenter during Session 2 of Day 1, which focused on "Underwater Domain Awareness: Security and Economic Dimensions." Admiral Jayantha Perera, former Commander of the Sri Lanka Navy, moderated this session. His Excellency Ranil Wickremesinghe, the Honorable President of Sri Lanka, emphasized Sri Lanka's dedication to Indian Ocean security and its responsibility as a protector of prosperity.
- **Indian Ocean Regional Dialogue:** We participated in the 'Indian Ocean Regional Workshop,' held in Bangkok, Thailand, from 24 June to 26 June 2024. Dr. (Cdr) Arnab Das participated in the 4th Session of the Workshop, which was held on 25 June 2024, on the topic 'Views from Private Sector/ Non-traditional Stakeholder.' During this session, the panel explored perspectives on the waters of the Indian Ocean Region (IOR) and how maritime security can be advanced.
- **East Asia Summit 2024:** On July 5, 2024, we participated in the 6th East Asia Summit (EAS) Conference on Maritime Security Cooperation in Mumbai. Dr. (Cdr) Arnab Das presented on "Cooperative Adaptation-Measures against Climate Change Maritime Impacts." During the 5th conference session on "Cooperative Adaptation-Measures against Climate Change Maritime Impacts," Dr. Das highlighted the critical importance of Maritime Domain Awareness (MDA), maritime safety, and the maritime environment. His insights underscored the need for collaborative efforts to address the challenges posed by climate change in the maritime domain.
- **World Ocean Science Congress:** Team MRC made a significant impact at the World Ocean Science Congress 2024 (WOSC) held in Chennai, Tamil Nadu, on February 27. Notable achievements included G A Ramadass from NIOT acknowledging MRC's session on Underwater Domain Awareness (UDA). Ambassador Anup Mudgal delivered a keynote address, while team members J. Catherine and Romit Kaware presented offline on UDA. Dr. Sateesh Shenoy from MRC's Research Advisory Board emphasized the importance of traditional knowledge. Dr. Vijaykumar participated in MRC's oral and poster sessions.

Important visits to our UDA Center:

- We were honoured to host Rear Admiral Nelson D'souza, Commandant of the Military Institute of Technology (MILIT), at our UDA Centre in Pune, Maharashtra. We showcased the diverse and impactful work we've been immersed in, including Sediment Management, Marine Spatial Planning, Underwater Radiated Noise (URN) Management, Water Resource Management, Blue Economy, Climate Change in the Indian Ocean Region (IOR), maritime security, etc. Rear Admiral D'souza also toured our Underwater Domain Awareness (UDA) Skilling Center, where he had valuable interactions with our Senior Management team.

- We welcomed Mr. Ashwin Shroff, Chairman of Excel Industries Ltd. to our Underwater Domain Awareness (UDA) Center in Pune, Maharashtra, India. During Mr Shroff's visit, our team showcased our cutting-edge work on pivotal subjects such as the Blue Economy, Marine Spatial Planning, Underwater Radiated Noise (URN) Management, Acoustic Habitat Degradation, Climate Change, and Sediment Management. Our remote team also joined the visit online, providing an in-depth demonstration of our ongoing projects and achievements.
- We hosted Dr PV Rao, a maritime researcher at our UDA Center in Pune on September 25, 2024. Dr PV Rao is currently associated with the Indian Council of World Affairs, where he is writing his book about the Maritime Powers of India. He is also the former Director of the Centre of Indian Ocean Studies at Osmania University, Hyderabad. During his visit to our center, Dr Rao noted our emerging work in the maritime domain over the past few years. Our online team showcased our key deliverables and research on topics such as Underwater Radiated Noise (URN) Management, Sediment Management, Water Quality Management, Climate Change, etc.

Sustain:

Collaboration with the University of Strathclyde, Scotland:

In 2023, we signed an MoU with the University of Strathclyde to collaboratively enhance our research, education, policy and practice objectives pertaining to Underwater Domain Awareness. Last year, we hosted Dr. Chaitanya Patil, a distinguished academic and lecturer with the Department of Naval Architecture, Ocean and Marine Engineering at the University of Strathclyde, and facilitate his delivery of a comprehensive presentation on the subject of Underwater Domain Awareness. During his workshop at our UDA Center, Dr. Patil emphasised the UDA framework's geopolitical implications, exploring the intricate balance between policy, technology, and the necessity for integrated strategies that align environmental conservation, socio-economic growth, and technological innovation.

This year, in November 2024, Dr (Cdr) Arnab Das held a workshop at the Department of Naval Architecture, Ocean and Marine Engineering (University of Strathclyde), in Scotland, where he emphasised on the pressing challenges facing the Indo-Pacific region and the vital role UDA can play in addressing them. Dr Das explored innovative policy and tech solutions, covering topics like sonar deployment, climate resilience, and the sustainable blue economy. He also delved into the intricacies of Marine Spatial Planning (MSP) and the importance of regional security in tropical waters.

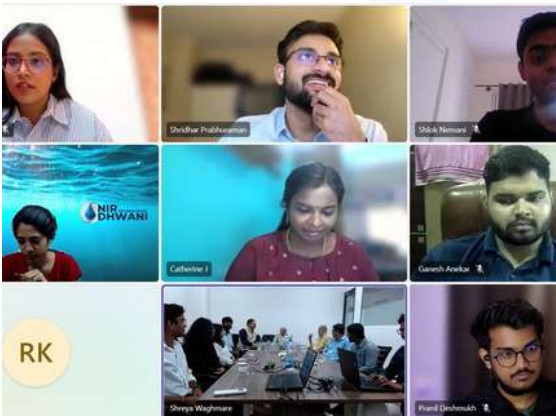
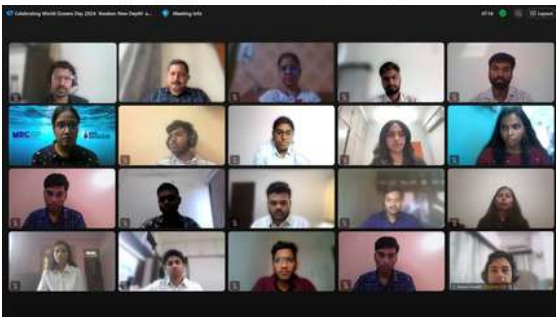
Collaboration with the Capacity Building Commission of India:

As part of the Union Ministry of Commerce and Industry (Government of India), the Capacity Building Commission of India works closely with the Prime Minister's Office through initiatives such as Mission Karmayogi, which strives to equip government officials with the necessary skills and knowledge required for effective public service delivery under the country's economic and educational development plans. This year in January, we successfully contributed an e-learning module that was adopted as part of Mission Karmayogi's structured learning modules, thereby making a nationwide impact through competency-driven official training in the underwater domain.

Collaboration with Excel Industries Limited and Clima Crew:

This year, we collaborated with the Excel Industries Limited and the Clima Crew team to reach out to the coastal communities and try and understand their needs, especially for seaweed farming. One of the main objectives of our visit to Ratnagiri and Guhagar in Maharashtra was to explore the social landscape of these coasts and identify critical gaps in areas such as skilling, innovation, and knowledge. For this, we conducted discussions with government bodies, NGOs, Self-Help Groups (SHGs), and other relevant social organisations to gain a comprehensive understanding of the challenges faced by local communities. Through this visit, we also wanted to understand the community's issues, whether in farming, tourism, or other sectors, to identify opportunities for capacity building, knowledge transfer, and addressing the unmet needs that could contribute to the region's long-term growth and resilience. Our key takeaway from this analytical visit is that Underwater Domain Awareness (UDA) is essential to ensure that our interventions benefit local communities and promote the long-term sustainability of marine ecosystems.

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Let's Collaborate !!

For General Inquiry & CSR Collaborations

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