

Webinar Report

Charting Progress: Mid-Internship Insights from UDA Summer Interns from IITs- PART 2

(Event held on 12th July 2025)

About:

The Maritime Research Center (MRC), in collaboration with Nirdhwani Technology Private Limited, recently organised (on July 12, 2025) a webinar highlighting the mid-internship progress of talented students in the 2025 Underwater Domain Awareness (UDA) Summer Internship Program. The event featured compelling presentations by interns from some of India's leading academic institutions, including IIT Delhi and IIT Kanpur. These presentations offered a glimpse into the cutting-edge research and technological innovation being undertaken by young engineers and researchers in the underwater domain. The primary objective of the webinar was to showcase the innovative research and technological exploration conducted by these budding engineers and researchers in the field of UDA. This internship program plays an essential role in nurturing the next generation of innovative minds by providing them with hands-on experience and exposure to real-world challenges in underwater research and technology.

Background:

The UDA Summer Internship Program is designed to nurture young talent and engage them in real-world applications of underwater research. This program serves as a crucial platform for facilitating interdisciplinary collaboration, encouraging innovation, and building strategic capabilities in a domain necessary for national security, environmental sustainability, and blue economic growth. The mid-internship presentation webinar marked a critical milestone in the program's timeline. It served as a platform for the interns to present their progress, share their initial findings, and receive feedback that will help steer the remaining phase of their projects. This webinar was carefully curated to ensure that it not only celebrated achievements but also addressed existing challenges and guided future efforts.

Core objectives of the webinar:

The core objectives of conducting this mid-internship review include:

1. **Showcase Research Outcomes:** Interns had the opportunity to present their ongoing projects, demonstrating the innovative solutions they are developing and the scientific methods they are employing. This allowed stakeholders to gauge the potential impact of their research on the underwater domain ecosystem.
2. **Encourage Knowledge Sharing:** The webinar fostered a collaborative environment in which interns could learn from one another's work. It also facilitated meaningful dialogue among students, mentors, and attending professionals, fostering a culture of open knowledge exchange and interdisciplinary learning.
3. **Provide Constructive Feedback:** Experienced researchers, academicians, and industry experts offered valuable insights and technical guidance. Their constructive feedback will be instrumental in refining the interns' approaches, improving the quality of research, and aligning outcomes with real-world applications.
4. **Strengthen Networking:** The webinar provided a unique opportunity for interns to establish professional connections with a broader network of stakeholders. These interactions not only

enhanced the learning experience but also laid the foundation for future collaborations in research, academia, and industry.

Key takeaways from the esteemed speakers of the webinar:

The webinar was privileged to have an esteemed panel of assessors whose vast experience and strategic insights significantly enriched the discussion and provided invaluable feedback to the students. Their presence elevated the academic discourse and bridged the gap between research and real-world application.

Mr. Pradip Shah, Owner of IndAsia Fund Advisors Private Limited and Chairman of BASF and Pfizer India, brought a unique industry and investor perspective to the table. With his extensive experience in financial strategy and development planning, he emphasised the importance of translating complex environmental and technological research—such as *Habitat Suitability Modelling for Marine Spatial Planning*—into scalable and sustainable policy frameworks. He encouraged the students to consider the economic and governance dimensions and proposed innovative solutions to enhance ecological resilience and plan infrastructure.

Mr. P.V. Krishna, Partner at SIRI Investment Trust and former Managing Director at Goldman Sachs India, provided critical insights on risk modelling and strategic investment. Speaking about projects such as *Urban Flood Risk Mapping for the Brahmaputra River* and *Modelling & Simulation Frameworks*, he emphasised the importance of accurate forecasting and data-driven simulations in informing investment in climate-resilient infrastructure. He also offered constructive advice on improving research methodology and visualisation to appeal to stakeholders in the government and private sectors.

Adv. Hemant V. Chavan, practising at the Pune District and Bombay High Court, brought a legal and regulatory lens to the session. He emphasised the role of legal frameworks in supporting marine spatial planning and disaster management strategies, particularly in ecologically sensitive zones such as the Brahmaputra River basin. He focused on the ethical and legal implications of underwater surveillance and defence technologies, urging students to align innovation with policy compliance and societal impact.

Collectively, the panellists commended the students—hailing from premier institutes such as IIT Delhi and IIT Kanpur—for their rigorous research and interdisciplinary approaches. Their expert inputs not only validated the technical merit of the projects but also inspired the interns to think beyond the laboratory and into real-world implementation.

Interns' presentations: Exploring the depths of maritime innovation:

The webinar showcased an impressive array of interdisciplinary research projects presented by interns from premier institutions, including IIT Delhi and IIT Kanpur. These projects explored the intersection of environmental science, data analytics, engineering, economics, and policy through the lens of the Underwater Domain Awareness (UDA) Framework. Below is a brief overview of the key themes discussed:

Habitat Suitability Model for Marine Spatial Planning: This presentation focused on developing predictive models to assess habitat suitability in marine ecosystems. Using geospatial data and ecological indicators, the interns proposed a framework to support Marine Spatial Planning (MSP), aiming to

optimise ocean resource utilisation while ensuring environmental sustainability. The study emphasised the importance of balancing developmental activities, such as fishing and shipping, with conservation.

Urban Flood Risk Mapping for Brahmaputra River: The research proposed risk-mapping strategies to guide urban planning, early warning systems, and infrastructure resilience in vulnerable regions, particularly in the northeast of India.

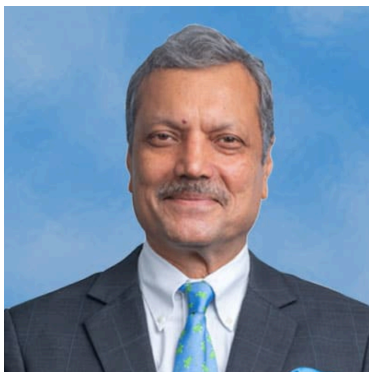
Modelling & Simulation Framework for Brahmaputra Region: Integrating datasets on river morphology, sediment flow, land use, and climate projections, the framework aimed to aid in policy-making, infrastructure planning, and disaster mitigation.

Modelling & Simulation Framework for Konkan Coast: Similar in approach to the Brahmaputra framework, this project focused on the Konkan coast, a region prone to monsoonal surges, coastal erosion, and development pressures.




Economic Impact Assessment – Climate Risk and Coastal Income: A UDA-Augmented Econometric Analysis: This theme examined the socioeconomic impacts of climate risk on coastal livelihoods through an econometric model embedded with UDA parameters. By analysing variables such as sea-level rise, salinity intrusion, and fisheries data, the interns quantified the economic vulnerability of coastal communities, providing policy insights for climate adaptation and sustainable development.





Silt Management Policy for River-Coastal Systems: A UDA-Based Economic and Environmental Framework: Building upon sediment modelling, this project proposed a policy-oriented framework for silt and sediment management. It integrated ecological sustainability and economic viability using the UDA approach, addressing the need for systemic solutions to sediment accumulation that disrupts both inland and coastal ecosystems.

[View all the presentations and keynote addresses below:](#)

Speaker	Image	Video
Mr. Pradip Shah, Owner, IndAsia Fund Advisors Private Limited (Chairman BASF & Pfizer)		Link here

Speaker	Image	Video
Mr Krishna, Partner, SIRI Investment Trust (Former MD Goldman Sachs India)		Link here
Mr. Hemant Chavan, Pune District and Bombay High Court		Link here
Dr. (Cdr) Arnab Das, Founder and Director, MRC, Pune		Link here
Mr Praful Talera, MRC's Adviser on Blue Economy		Link here

Speaker	Image	Video
Shridhar Prabhuraman, Deputy Director, MRC, Pune		Link here
<p>Mohd. Nasar Siddiqui from IIT Kanpur</p> <p>Topic: Habitat Suitability Model for Marine Spatial Planning</p>		Link here
<p>Harshit Jain from IIT Delhi</p> <p>Topic: Urban Flood Risk Mapping for Brahmaputra River</p>		Link here
<p>Atharva Agarwal from IIT Delhi</p> <p>Topic: Estimating ROC for Passive Sonar Simulator</p>		Link here

Speaker	Image	Video
<p>Atul Mangal from IIT Delhi</p> <p>Topic: Modelling & Simulation Framework for Brahmaputra Region</p>		Link here
<p>Ashwani Kumar Singh from IIT Kanpur</p> <p>Topic: Modelling & Simulation Framework for Konkan Coast</p>		Link here
<p>Adi Amrutha from IIT Kanpur</p> <p>Topic: Economic Impact Assessment - Climate Risk and Coastal Income: A UDA-Augmented Econometric Analysis</p>		Link here
<p>Deepak Chaurasia from IIT Kanpur</p> <p>Topic: Sediment Transport Modelling for Brahmaputra River</p>		Link here


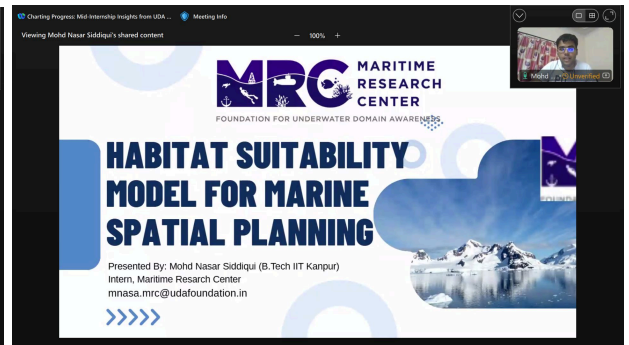
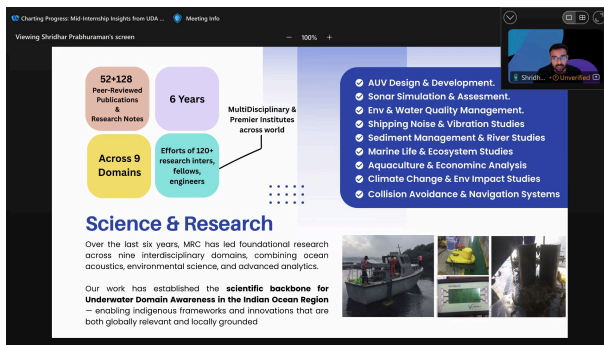
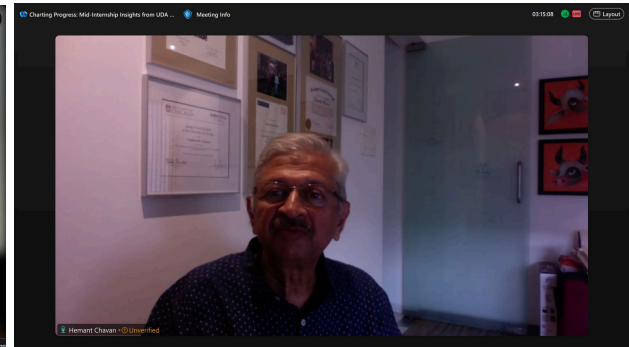
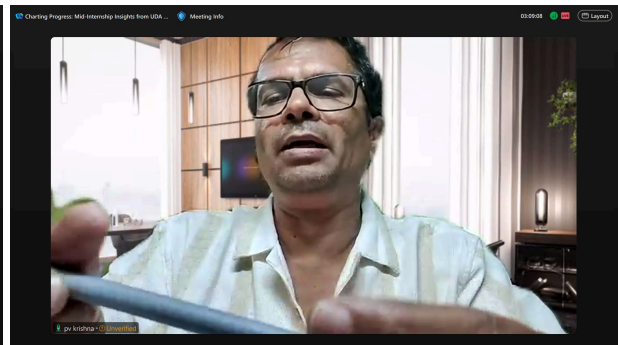
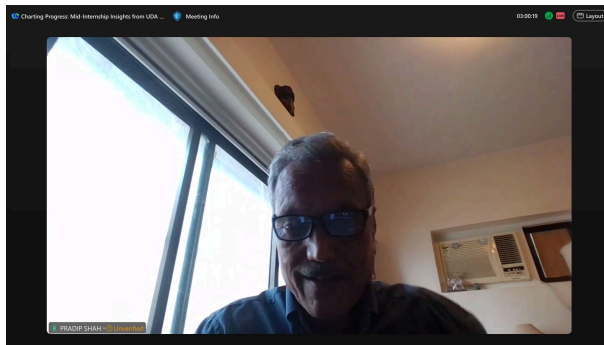
Speaker	Image	Video
<p>Harshit Logre from IIT Kanpur</p> <p>Topic: Silt Management Policy for River-Coastal Systems: A UDA-Based Economic and Environmental Valuation</p>		<p>Link here</p>

Image Gallery:



Enclosure

Underwater Domain Awareness (UDA) Framework

Dr (Cdr) Arnab Das

The concept of Underwater Domain Awareness (UDA), in a more specific sense, translates to our eagerness to know what is happening in the underwater realm of our maritime areas and the freshwater systems. This keenness for underwater awareness from the security perspective means defending our Sea Lines of Communication (SLOC), coastal waters, and varied maritime assets against the proliferation of submarines and mine capabilities intended to limit access to the seas and littoral waters. The freshwater systems, particularly the transboundary Rivers, are not defended by the Navy & the Coast Guard, but these waters are equally vulnerable and more complex to manage. However, military requirements may not be the only motivation for generating underwater domain awareness. The earth's underwater geophysical activities have a lot of relevance to the well-being of humankind, and monitoring them could provide vital clues to minimize the impact of devastating natural calamities. The commercial activities in the underwater realm need precise inputs on the availability of resources to effectively and efficiently explore and exploit them for economic gains. Underwater resources include fisheries, aquaculture, seaweeds, pharma ingredients, minerals, and others with significant market value. The regulators, on the other hand, need to know the pattern of exploitation to manage a sustainable plan. The connectivity through the water bodies has been recognized as the most effective and efficient mode of transportation, however, ensuring navigability in these water bodies requires a massive amount of UDA. With so many commercial and military activities, there is a significant impact on the environment. Any conservation initiative needs to precisely estimate the habitat degradation and species vulnerability caused by these activities and assess the ecosystem status and climate change risk. The scientific and research community needs to engage and continuously update our knowledge and access of the multiple aspects of the underwater domain. The global community is looking at the Indo-Pacific strategic space for their geopolitical and geostrategic engagements. The Indo-Pacific region, by definition, is the tropical waters of the Indian and Pacific Oceans. The tropical waters present unique challenges and opportunities regarding rich biodiversity and resource availability. However, the sub-optimal sonar performance is the biggest issue, limiting the UDA in these regions. The sonars that were designed for the temperate & polar waters of the Greenland, Iceland, United Kingdom (GIUK) gap during the Cold War era suffered 60% degradation when deployed in tropical waters. The developing nations in tropical waters need to customize these technologies to suit their conditions. The Western nations that are pushing this hardware do not have the manpower to deploy it. In contrast, the tropical nations, have the manpower but lack the appreciation of the technology and the know-how. The proposed UDA Framework, presented in the figure below, can optimize resource deployment and provide nuanced policy and technology intervention, along with acoustic capacity & capability building to manage the tropical challenges and opportunities. There is significant fragmentation among all four stakeholders, namely Strategic Security, Blue Economy, Sustainability & Climate Change Risk Management, and Science & Technology (Digital Transformation), and the UDA framework provides a comprehensive way forward for the stakeholders to engage and interact.

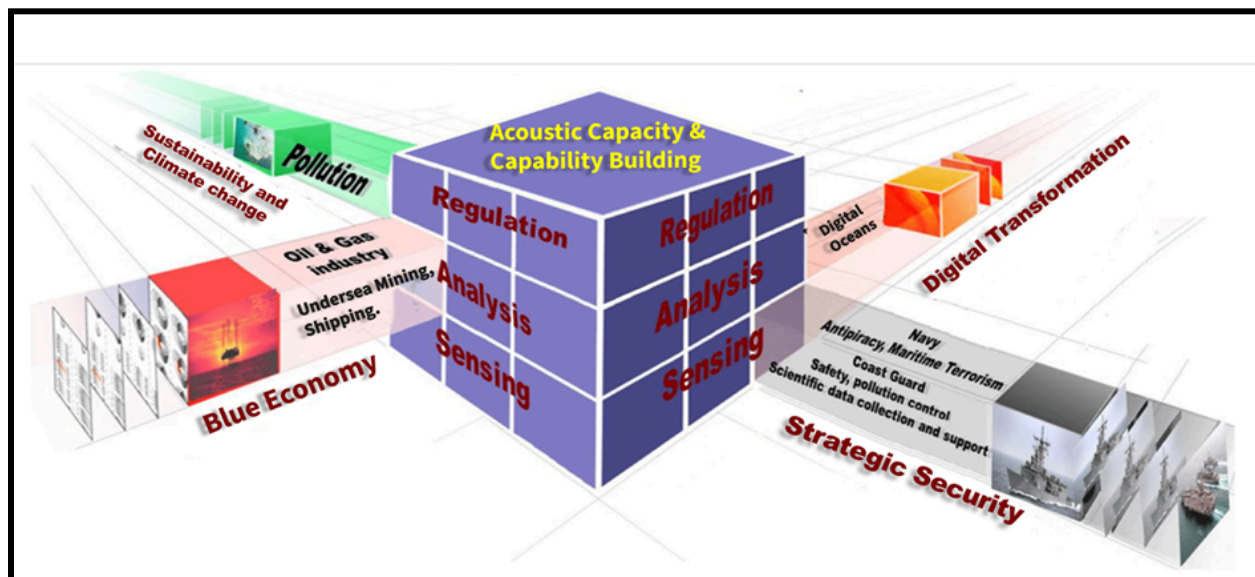


Figure. Comprehensive Perspective of the UDA Framework

On a comprehensive scale, the UDA Framework needs to be understood in terms of 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 the sensing of the underwater domain for threats, resources, and activities. The second level would be making sense of the data generated to plan security, conservation, and resource utilization strategies. The next level would be to formulate and monitor regulatory framework at the local, national, and global levels. The individual cubes represent specific aspects that need to be addressed. The 'User-Academia-Industry' partnership can be seamlessly formulated based on the user requirement, 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 being faced by the global community today. Meaningful engagement of the young and aspirational population is probably the most critical aspect that deserves attention. Multi-disciplinary and multi-functional entities can interact and contribute to synergize their efforts towards a larger goal seamlessly.

The UDA Framework is a structured, comprehensive, and inclusive framework to drive the underwater domain effectively and efficiently. The structured approach will minimize the fragmentation among the stakeholders, regional players, national authorities, and local bodies. The multiple entities will have divergent interests and priorities, thus, converging them into one single and focused governance mechanism will be a challenge. The governance mechanism must be comprehensive and recognize all dimensions of the stakeholder requirement. The dimensions include varied layers that are instrumental in building a strong governance mechanism. The first layer would be five pillars: research, skilling, academia, innovation, and policy. The second layer is its translation into policy & technology intervention, along with acoustic capacity & capability building. The inclusive aspects include varied socio-economic, socio-political, and socio-cultural native groups in the larger governance framework. The varied socio-economic strata of the society, particularly the coastal & riverine communities, get

excluded from the conventional development models. The students need to prepare for real-world challenges and get very late before they get exposed to the nuances of real-world issues. The political spectrum is always driven by the social structure, based on left or right leanings. The governance mechanism has to address the concerns and aspirations of both sides. The cultural divide translates to the traditional practices and beliefs that drive their livelihoods and social structure. The governance mechanism has to address these divides and integrate everyone into one national, regional, or global framework.

The global community is also professing the triad of people, economy, and nature for enhanced governance mechanisms. The people component includes the livelihood, well-being of the native communities, social dynamics, and more. The economic component is the growth and prosperity associated with the activities. The nature component addresses sustainability and climate change risk management. This is also measured in terms of the Environmental, Social, and Governance (ESG) formulation. The UDA Framework is consciously addressing all these varied measures of global good parameters.

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Some essential links have been mentioned below for your kind reference:

- MRC website: <https://maritimeresearchcenter.com/>
- UDA Foundation website: <https://udafoundation.in/>
- NDT website: <https://nirdhwani.in/>
- Our latest Newsletter (Q2-2025): [Link here](#)
- UDA Digest: [Link here](#)
- UDA Knowledge Center: [Link here](#)