



# INDIAN NAVY – TOWARDS EFFECTIVE UNDERWATER DOMAIN AWARENESS IN THE INDIAN OCEAN REGION



INS Chakra, Nuclear-powered submarine

The Underwater Domain Awareness (UDA) is a notion that is defined as our eagerness to know what is happening in the undersea realm of the maritime areas, writes **DR. (CDR) ARNAB DAS**

The Indian Navy (IN) is emerging as a major force not just in the Indian Ocean Region (IOR), but globally as well. The force levels and assets are getting specialised and strategic, opening up a whole new sphere of operations and deployments. The induction of the aircraft carrier, INS Vikramaditya with far more reach and capability means higher vulnerability from underwater threats. The joining of INS Chakra and the possible deployment of INS Arihant in the near future is a game changer in many ways than we have seen ever before. Strategic submarine deployment demands a new level of understanding of the underwater space not just for the mission but also



INS Vikramaditya

INDIAN NAVY



Boeing's Echo Voyager is an unmanned undersea vehicle

for its safety. The IN has planned its role and force structure in a very meticulous manner and sought government approvals and support through regular formal declarations. The latest being the recent release of the Military Maritime Strategy document, "Ensuring Secure Seas: Indian Maritime Security Strategy." In the academic literature, we call such a transformation to be related to emerging from a 'Pre-modern' Navy to a 'Modern' or a 'Post-modern' Navy. The force structure of the modern navy is well planned with all the associated capabilities and capacities, put in place before we commence deployment of high-value assets.

The Underwater Domain Awareness (UDA) is a notion that is defined as our ea-

gerness to know what is happening in the undersea realm of the maritime areas. The keenness for undersea 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 mines intended to limit our access to the seas and littoral waters. However, just the military requirement may not be the only motivation to generate UDA. The earth's undersea geophysical activities have much relevance to the well being of a human kind and monitoring such activities could provide vital clues to minimise the impact of devastating natural calamities. The commercial activities in the undersea realm need precise inputs

on the availability of resources to be able to effectively and efficiently explore and exploit them for economic gains. The regulators, on the other hand, need to know the pattern of exploitation to manage a sustainable plan. With so much of activities, commercial and military, 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. The scientific and the research community need to engage and continuously update our knowledge and access to the multiple aspects of the undersea domain. The underlying requirement for all the stakeholders is to know the developments

in the undersea domain, make sense out of these developments and then respond effectively and efficiently to them, before they take the shape of an event, rather than record and manage the situation as the event unfolds.

The Indian Ocean Region (IOR) by all means is emerging as the strategic and economic center of gravity in the 21st century. The region, on the one hand, is driving economic boom, however, on another account is also being seen as the hotbed of piracy, maritime trafficking and maritime terrorism, posing a danger to international peace and security. The special status of the region and political instability is not just attracting littorals in the region, but also extra-regional powers as well. The entire post-Cold War dynamics is unfolding, and the flexing of muscles by all kinds of global entities is being seen in the IOR.

The IOR is marked by tropical waters, and the UDA formulation suffers substantially due to sub-optimal performance of the sonar systems. The random fluctuations of the medium and the unique site-specific behavior ensure significant (upwards of 50 per cent) deterioration in the effectiveness of the underwater systems. The Cold War era that was instrumental in the rapid progress of underwater technology was largely restricted to the temperate regions in the vicinity of North-West Europe. In the absence of indigenous efforts, the IOR will continue to throw challenges to the UDA initiative, both at the tactical and the strategic levels.

The UDA on a comprehensive scale needs to be understood in its horizontal and vertical construct. The horizontal part would be the resource availability regarding technology, infrastructure, capability and capacity specific to the stakeholders or otherwise. The vertical part is the hierarchy of establishing a comprehensive UDA. The first level or the ground level would be the sensing of the undersea 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 to formulate and monitor regulatory framework at the local, national and global level.

The UDA initiative in India is largely driven by the security requirement and the efforts of the IN and Defence Research and Development Organisation (DRDO) is the primary input. However, the challenges of the tropical littoral waters are too severe for only one stakeholder to overcome. The hardware is all imported

and continues to be deployed with sub-optimal performance. The corporate involvement has been minimal and the blue economic potential remains significantly untapped with an abysmal contribution to the GDP. The awareness of the environmental degradation is near zero, so noise ever gets generated. Any event of marine mammal stranding (indicating severe degradation of the habitat) gets attributed to several unrelated causes and forgotten in short time.

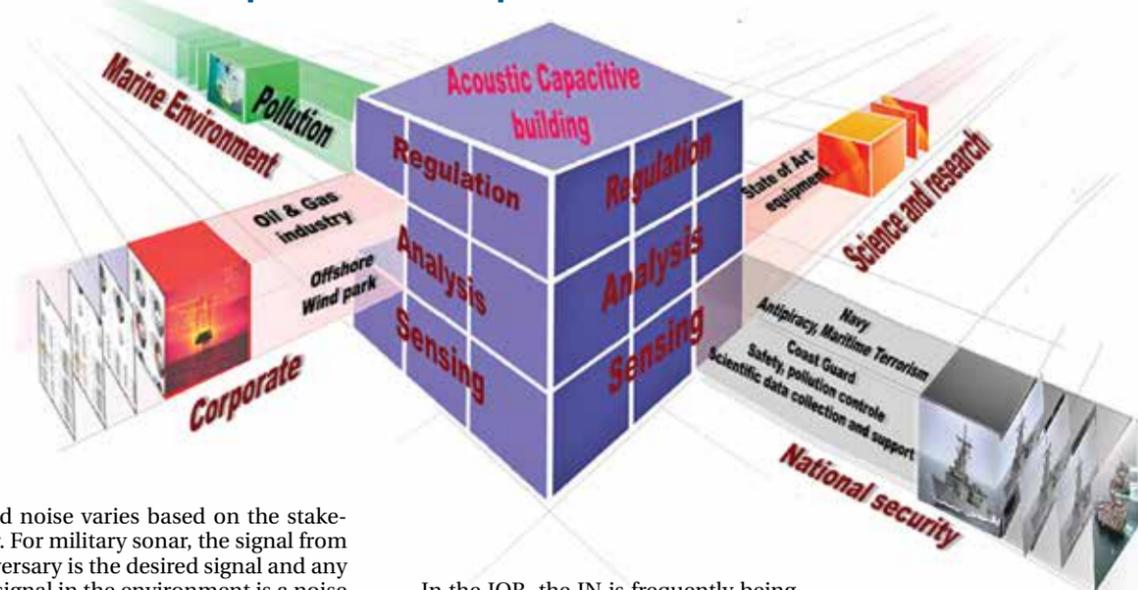
The UDA at its heart involves the core competence of acoustic sensing, supported by non-acoustic means to disseminate the information to multiple stakeholders. The immediate physical layer is to see, where we need sensors and the associated hardware required to deploy the sensors to map the entire region and high-performance computing processors. The second aspect is to understand or the analysis capability, where we make sense of the raw data that has been corrupted by noise and medium distortions. There are two aspects here – the first is the data integrity that minimizes errors due to data corruption and the second is the analysis capability to make meaningful interpretations from the data. The error mitigation requires significant understanding of the local conditions related to noise and the medium fluctuations. The analysis capability apart from the data processing and analytic techniques also requires long-term information on the local conditions to differentiate the routine from the evolution of an event. Both the aspects involve large-scale oceanographic studies and acoustic surveys. The third is the shared category, where we can make the information available to multiple stakeholders and activate a response in real time.

Acoustic capacity building refers to generating significant information on the local conditions, both to mitigate the errors and also enhance the data analytic capabilities. These sensor networks will mean fixed and mobile network nodes comprising of observatories, underwater gliders, autonomous underwater vehicles, remotely operated vehicles. Development of algorithms for data processing across stakeholders indigenously will be a critical capability. This will translate to enhanced performance of the underwater systems regarding range, robustness to medium fluctuations, data integrity and also enhanced understanding of the local underwater domain to quickly recognise any change in the status quo.

The interesting fact here is that noise is highly contextual and the desired sig-



### Comprehensive Perspective of Undersea Domain Awareness



nal and noise varies based on the stakeholder. For military sonar, the signal from an adversary is the desired signal and any other signal in the environment is a noise like a biological signal or reflection from undersea minerals. Similarly, for a marine biologist, the biological signal is of interest and everything else is noise. The see and the shared infrastructure could be imported (possibly at a high cost due to its strategic value) to start with. However, the understood mechanism is where the indigenous efforts specific to the stakeholders will be critical. On multiple fronts, pooling of expertise could be possible. However, the starting point is the infrastructure for generating the data over long time frames. The prohibitive cost of such an infrastructure discourages the stakeholders to go ahead and invest. The classified nature of the data, whether for security concerns or commercial reasons have eluded any collaborative initiatives. Probably government involvement is inescapable to build the basic infrastructure and the acoustic capabilities.

In the developed world during the Cold War era, massive acoustic infrastructures were built to generate UDA, like the Sound Surveillance System (SOSUS) and Pt. Sur Light Station, for military purposes. The Cold War period, facilitated unrestricted investments in military infrastructures, so such huge grants were supported. However, post the Cold War, massive military spending was politically unviable and to sustain the operational cost of these facilities, they had to be opened for civilian applications. This gave a boost to open research by scientists for multiple applications in the underwater domain. Underwater research is a highly resource intensive activity and only pooling of resources is the answer in today's geopolitical framework.

In the IOR, the IN is frequently being called upon to perform multiple roles, other than their mandated roles. Their assets and platforms meant for full-blown conflicts get deployed for non-traditional threats like piracy, maritime terrorism and even humanitarian relief and the constabulary role of maintaining good order at sea. Effective UDA, if realised across all the hierarchy (vertical construct) can rationalise the deployment of maritime forces and ensure efficient utilisation of their resources. Events could be prevented, and damages post an event if any could be minimised.

Effective UDA requires significant resources and infrastructure for acoustic capacity building to enhance the performance of sonars when deployed in the region. Such capabilities will be highly relevant to all the nations in the region, so opens the possibility of economic and political viability for India to play a leadership role in the region. Once the networks are in place, the second stage of generating resources and threat maps of the region can facilitate planning and monitor resource utilisation and security strategies. Information sharing with nations in the region could give diplomatic and political leverage on multiple aspects. Regulations govern the good order at sea and land. With effective UDA infrastructure and understanding, we can pitch for the comprehensive regulatory framework at the local, national, regional and global level on multiple fronts, specific to the stakeholders. The underwater domain is known to be poorly regulated due to lack of transparency and awareness. IOR with its emerging strategic and economic status requires urgent measures to regulate

from the security, equitable sharing of resources and conservation perspective. Effective UDA has the potential to provide soft power for maritime security paradigm for the emerging Blue economic thrust in the IOR.

The first step is probably the recognition that Maritime Domain Awareness (MDA) is grossly incomplete without UDA. Only a military approach (the maritime military strategy being released independent of the grand strategy) to maritime security may be limited in the absence of a comprehensive maritime strategy. Acoustic capability building for UDA needs far more emphasis in our discourse on maritime security initiatives. The UDA in IOR needs to be understood in its entirety that may require extensive deliberations and research.

A detailed study on 'Indian Navy – Towards Effective Underwater Domain Awareness in the Indian Ocean Region' could be a good beginning. The study should include the technology gaps, resource requirement for bridging the gap, policy framework to bring together the stakeholders and facilitate that along with organisational structure to make it happen. Acoustic capacity building for effective Underwater Domain Awareness is something we need to focus on going forward for a sustainable blue economic push with good order at sea in the IOR. IN may like to take the lead in bringing on-board the other stakeholders for a much greater focused initiative with pooling of resources nationally.

*The author is Director, Maritime Research Centre, Indian Maritime Foundation, Pune*