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Enhancing Australia-India Underwater Domain Awareness Cooperation in the Indo-Pacific

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UWA DEFENCE & SECURITY

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THE UNIVERSITY OF WESTERN AUSTRALIA

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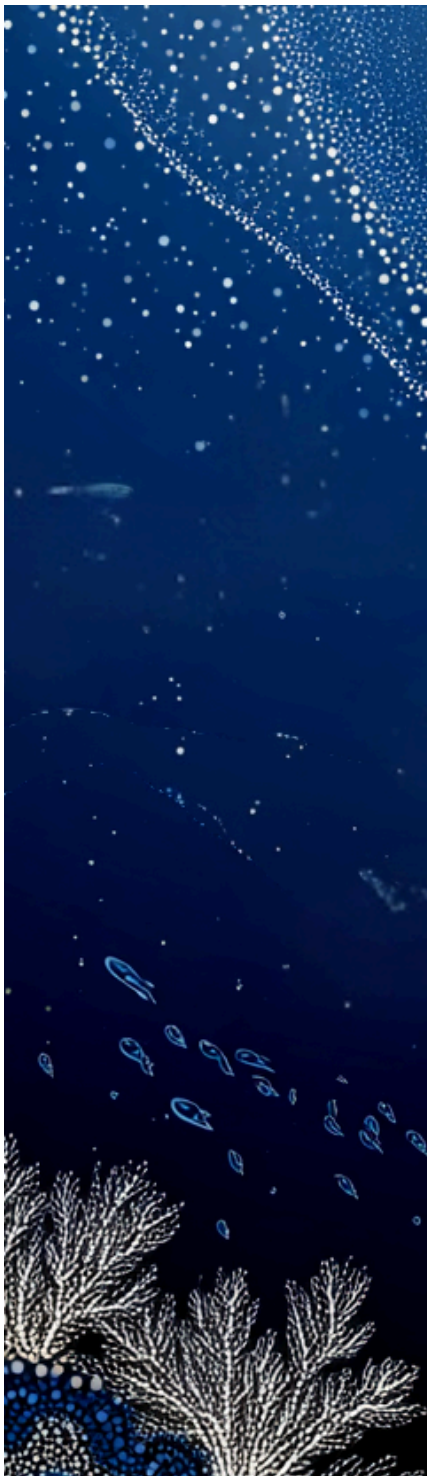

AUTHORS

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Abi Young is the Research Fellow for the UWA DSI and CSDR joint project on Enhancing Australia-India Underwater Domain Awareness (UDA) Cooperation in the Indo-Pacific. She is a researcher in the politics of international migration, national security, and international relations, and holds specialist knowledge in research security and counter foreign interference in the university sector.

Awarded her PhD in 2024 by the University of Western Australia, Abi's research examined the non-state product of long-distance authoritarianism arising from Chinese diaspora politics in Australia. Her dissertation has been adapted into a book titled 'Chinese Diaspora Politics in Australia: Transnational Repression and Social Governance'. Prior to her doctoral studies, Abi completed a Master of International Relations with a thesis that explored the operationalisation of Chinese soft power through Confucius Institutes.

Abi is currently interested in researching academic security, Chinese foreign politics, relations of the Indo-Pacific, international security, the global balance of power, reactive politics, and securitisation theory, and democratic defence against authoritarianism.

Dr. Gaurav Saini

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With a PhD in International Politics from Jawaharlal Nehru University, focusing on India's strategic culture toward China (1998-2014), Dr. Saini has been an Emerging Quad Think Tank Leader and a European Union exchange fellow.

Dr. Saini has written extensively on global policy debates, addressing themes such as India-Australia defense and security partnerships, Indian foreign policy transitions, the Quad's strategic resilience, US-India relations amid global shifts, India-Europe defense cooperation, the Global South's geopolitical rise, India's counter-terrorism doctrines, India-China dynamics within the Shanghai Cooperation Organization, India's military manufacturing advancements, Brazil-India defense synergies, and China's engagements in the Indo-Pacific.

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Troy's PhD research was undertaken at the University of Western Australia, and his dissertation, titled 'The Rise and Strategic Significance of the Indo-Pacific', analysed the emergence and significance of the new regional construct. Before joining UWA, Troy completed an MA in International Affairs at Murdoch University's Sir Walter Murdoch School of Public Policy and International Affairs in 2014, with a thesis examining the Senkaku-Diaoyu Islands dispute between Japan and China. Troy has authored several journal papers focusing on security issues in the Indo-Pacific, regionalism, and maritime security. His research interests include the Indo-Pacific, India, Japan, maritime security, regionalism, and climate change.

Capt. Sarabjeet S Parmar (Retd)

Capt. Sarabjeet S Parmar was commissioned into the Indian Navy on 01 July 1987 and retired on 30 June 2023. He has commanded two ships and a frontline anti-submarine warfare and anti-shipping helicopter squadron. He was a member of the XI Indian Antarctic Summer Expedition in 1991, attended the Management Defence Course conducted by the British Government at Colombo in 2005, and represented the Indian Navy in the first international HOSTAC (helicopter operations from ships other than aircraft carriers) conference held at Norfolk, USA in 2008. He has been a Research Fellow at the Manohar Parrikar Institute for Defence Studies and Analyses and worked in the Indian Navy's strategic apex level offices, where, as Director Strategy was part of the core team that published the Indian Navy's unclassified Maritime Security Strategy Document titled Ensuring Secure Seas: Indian Maritime Security Strategy in 2015, carried out regional maritime assessments and completed the doctrine development plan. He was the Executive Director and Senior Fellow at The National Maritime Foundation prior to retirement. He has written and spoken extensively on maritime security and strategy at various national and international conferences, and his main areas of research include national and maritime strategy, security-related aspects in the Indo-Pacific, piracy, HADR, and international maritime law, with a focus on lawfare. He is a Distinguished Fellow at CSDR and an advisor on this program.

ABOUT THE PROGRAM

This program represents a significant Australia–India initiative to strengthen cooperation in Underwater Domain Awareness (UDA) across the Indo-Pacific. Delivered jointly by the UWA Defence and Security Institute (DSI) and the Council for Strategic and Defense Research (CSDR), the initiative brings together expertise from academia, industry, and government to advance practical collaboration in maritime security.

Designed as a structured, multi-engagement series, the program seeks to deepen mutual understanding of capabilities and intentions, identify shared priorities, and generate tangible policy outcomes. It explores critical dimensions of Underwater Domain Awareness, including maritime domain understanding, anti-submarine warfare, uncrewed underwater systems, undersea search and rescue, and deep-sea awareness, recognising the strategic importance of the undersea environment to regional stability.

Underwater Domain Awareness refers to the capability to observe, detect, and assess underwater activities across oceans, coastal regions, and inland waterways, enabling comprehensive situational awareness of the undersea domain. As close maritime partners, Australia and India share a strong interest in enhancing cooperation in this area to support a secure, resilient, and rules-based Indo-Pacific, and to further strengthen the Australia–India Comprehensive Strategic Partnership.

This 24-month initiative is supported by the Australian Department of Foreign Affairs and Trade through the Australia–India Strategic and Technology Policy Initiative (SATPI). This report represents the first of five publications, as well as a white paper that will be generated from the high-level discussions and collaboration throughout the program. Through this collaboration, UWA DSI and CSDR aim to contribute meaningful policy insights, strengthen institutional linkages, and advance sustained maritime cooperation between Australia and India.

EXECUTIVE SUMMARY

The underwater domain presents a uniquely complex and hostile operating environment, and it is emerging as an increasingly critical area for countries across the Indo-Pacific to fathom. Underwater Domain Awareness (UDA) is now a critical element of contemporary maritime security, extending beyond traditional Maritime Domain Awareness (MDA) to focus on the undersea domain, where strategic competition is rapidly intensifying. For maritime nations in the Indo-Pacific, information superiority beneath the surface has become crucial to safeguarding security, economic interests, and critical infrastructure.

Australia's geographic position between the Indian and Pacific Oceans underscores the strategic relevance of the Indo-Pacific as a single, interconnected theatre. The shift from 'Asia-Pacific' to 'Indo-Pacific' reflects not only geographic realities but also India's growing strategic centrality in the region. Within this context, the elevation of Australia-India relations to a Comprehensive Strategic Partnership (CSP) in 2020 has provided a strong foundation for deeper cooperation, driven by converging security concerns, particularly China's expanding maritime assertiveness, and the shared imperative of maintaining freedom of navigation along the region's vital Sea Lines of Communication.

As maritime democracies committed to international law and UNCLOS, Australia and India have expanded defence engagement through naval exercises such as AUSINDEX and MALABAR, with increased cooperation in complex submarine and anti-submarine warfare operations. UDA, while often treated as a subset of MDA, warrants distinct attention due to its technical complexity and growing strategic significance. Advances in acoustic sensing, data processing, and undersea technologies have elevated UDA's role in both peacetime maritime industry and safety, as well as in modern conflict.

This scoping report is the first in a series of five and examines the evolving maritime risk environment in the Indo-Pacific, the strategic importance of UDA, and the technological developments shaping it. It highlights UDA as a promising avenue for Australia-India cooperation, building on complementary strengths such as India's manufacturing scale and Australia's niche intellectual property and research expertise. Recent defence dialogues and practical arrangements signal momentum toward deeper trust and capability-based collaboration. Ultimately, enhanced UDA cooperation offers both countries an opportunity to strengthen their strategic partnership while contributing to a free, open, stable, and prosperous Indo-Pacific.

INTRODUCTION

The challenges of the underwater domain should not be underestimated, with the undersea environment itself posing hazards such as high pressure, corrosion, varying temperatures and salinity, power availability, and signal attenuation. Nevertheless, underwater domain awareness—a term derived from the broader 'maritime domain awareness' and one that implies information superiority—is an emerging concept piquing the interest of security analysts and featuring prominently in governance debates and among strategic experts.

Australia's strategic geographic location between the Indian and Pacific Oceans makes the term 'Indo-Pacific' as a single region particularly useful for Australia. More precisely, the concept of the Indo-Pacific as a single region of interest reinforces the enormity of Australia's maritime domain. The Indo-Pacific overtaking 'Asia-Pacific' as the preferred strategic nomenclature is significant because, at a geographic level, it includes the Indian Ocean, while, at the nation-state-level, it includes India.[1]

The upgrade of bilateral relations between Australia and India to a Comprehensive Strategic Partnership (CSP) in 2020 underscores the two countries' growing economic cooperation and has laid a strong foundation for future collaboration and mutual prosperity. Undoubtedly, a common security concern for Australia and India is China's regional assertiveness. This convergence of strategic interests presents further opportunity for the two states. Alongside India, Australia also has concerns over China's claims in the South China Sea, while recognising the critical importance of maintaining freedom of navigation through vital Sea Lines of Communication (SLOCs) for economic stability. In addition to representing a shared geopolitical perspective that can foster a deeper strategic partnership, potential economic collaboration between Australia and India could serve as a counterbalance, building economic resilience and reducing reliance on China.[2]

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As maritime nations, Australia and India maintain bilateral relations underpinned by a shared respect for sovereignty and international law, particularly the United Nations Convention on the Law of the Sea (UNCLOS). In the interest of promoting maritime security and safety, joint naval exercises such as AUSINDEX have been a key feature of the

relationship, growing in scope to cover a wide range of activities, including anti-submarine warfare, surface combat operations, and humanitarian assistance and disaster relief (HADR) operations. Alongside these activities, the importance of maritime domain awareness (MDA) in the Indo-Pacific cannot be understated. Broadly, MDA entails an effective understanding of any activity in the maritime environment that could impact security, safety, the economy, or the environment. 'UDA'—underwater domain awareness—can be seen as a sub-component of MDA; but, arguably, this framing downplays UDA's complexity, significance, and importance for maritime security and safety.

On 9 October, 2025, the Hon. Richard Marles MP welcomed Indian Defence Minister Rajnath Singh to Canberra. During the visit, Ministers held the inaugural Australia-India Defence Ministers Dialogue to advance defence and security cooperation between Australia and India. 2025 marks the fifth anniversary of the Australia - India Comprehensive Strategic Partnership, driven by unprecedented progress in defence and security, trade and investment, education, sports, and renewable energy cooperation.
Source: Royal Australian Navy

UDA is inherently difficult—the principal sensing mode (indeed, effectively the only sensing mode) is acoustic. The underwater environment, moreover, creates additional complexities for achieving UDA. However, Australia and India have affirmed their commitment to enhancing UDA capabilities, acknowledging this space as an important component of maritime security and identifying strategic partnership potential in a complex and novel area of research and development.

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This report examines the evolving maritime risk environment in the Indo-Pacific as it pertains to Australia and India, before considering the broader implications of risk dynamics in the region. It also explores the critical role of UDA in modern conflicts, as well as contemporary developments in UDA technology that highlight its importance. Finally, the report investigates the space for cooperation in UDA within the Australia-India relationship. In doing so, it unpacks each state's UDA framework before discussing opportunities to strengthen the strategic partnership in this domain.

SETTING THE CONTEXT: THE SIGNIFICANCE OF THE INDO-PACIFIC

The 'Indo-Pacific' is a term that has overtaken 'Asia-Pacific' over the past decade. It is a concept that combines the Indian and Pacific Oceans, acknowledging geostrategic implications that extend beyond the traditional boundaries of the Asia-Pacific region.[3] The term emphasises the increasingly vital role of the Indian Ocean as both a global trade hub and an emerging arena of competition. More broadly, the Indo-Pacific can be considered the well-connected centre of many converging interests across economic, geopolitical, and security dimensions. The world's most important trade routes are situated in the Indo-Pacific region, which encompasses the Strait of Malacca and the South China Sea (SCS). The Strait of Malacca, which links the Indian and Pacific Oceans, is the shortest sea route between the energy-rich Middle East and East Asian markets, including China, Japan, and South Korea, as well as other Pacific Rim countries.

The Indo-Pacific's strategic centrality is substantiated by robust economic and demographic indicators. Home to 60% of the global population, the region functions as the primary engine of the world economy, generating approximately 60% of global GDP and contributing two-thirds of global economic growth.[4] [5] Its maritime arteries are critical to international logistics; roughly 50% of global maritime trade transits through these waters, representing trillions of dollars in goods annually.[6] The Strait of Malacca specifically serves as a vital energy corridor, facilitating the transport of an estimated 23.7 million barrels of oil per day in 2023—a volume that notably surpasses that of the Strait of Hormuz.[7] Furthermore, according to the OECD, the region's demographic weight is projected to expand its economic leverage,

with the Indo-Pacific expected to host two-thirds of the global middle class by 2030, cementing its status as the dominant arena for future market competition.[8]

Ultimately, the 'Indo-Pacific' concept highlights the importance of the maritime domain, taking into account the geopolitical consequences of China's push westward (and India's push eastward), and acknowledging the expanding zone of competitive overlap.[9] The rise of the Indo-Pacific concept has triggered a range of responses in international politics, from full acceptance by states such as the United States, India, Japan, and Australia, to opposition from China, with a middle position held by the member states of the Association of South East Asian Nations (ASEAN), characterised by qualified acceptance.[10] However, even among those states that have fully embraced the concept, the US' Free and Open Indo-Pacific (FOIP) strategy has not received uniform support. For instance, Japan, which initially formulated the FOIP strategy in 2016, has shifted from treating it as a strategy to describing it as a 'vision', thereby avoiding perceptions of aggressive intentions.[11] While China's rise may be the main concern of Japan's Indo-Pacific approach, India has adopted a strategy of 'evasive balancing'.[12] Australia—while an early adopter of the concept and a long-time security partner of the US—embraces FOIP as a normative frame[13] and has not expressed interest in joining US Freedom of Navigation Operations (FONOPs) as part of that strategy.[14]

The emergence of the Indo-Pacific concept can certainly be seen as a response to China's Belt and Road Initiative (BRI) and its broader assertive foreign policy.[15] But the US, which has not ratified UNCLOS,[16] does not play an uncontested leading role in the region.[17] Moreover, US dominance in the Indo-Pacific may be in relative decline at the same time as the region's importance is growing. This strategic dissonance is codified in the 2025 National Security Strategy (NSS), which signals a decisive pivot from broad global primacy toward 'homeland renewal' and 'burden-shifting'. Explicitly prioritising the defence of the Western Hemisphere—articulated as the 'Trump Corollary'—the strategy advocates a contraction of indefinite forward deployments in favour of a vigilant posture driven by allied capabilities. Consequently, operational assets are being incrementally redeployed from vulnerable positions in the First Island Chain to the more defensible Second Island Chain (including Guam and Palau) and the continental US, with the aim of reducing exposure to Chinese missile saturation while preserving combat power for decisive surges.

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The Indo-Pacific region has changed radically since the start of the 2020s. The US, with which Australia has enjoyed a long-standing alliance, is no longer the unipolar leader, and China, with which Australia has closely intertwined economic interests, is actively expanding its influence in an assertive, sometimes aggressive, manner. Amid intensifying power competition between the US and China, the rapidly evolving geostrategic landscape has made clear that Australia's deterrence-through-denial strategy requires strengthened military capabilities, particularly in the maritime domain. As the significance of the Indo-Pacific as a maritime-centred region continues to rise, so too do the demands for a more robust and coordinated approach to economic collaboration and maritime security. Enhancing UDA is one such avenue for strengthening maritime security.

(l-r) Indian Navy Shivalik-class frigate, INS Sahyadri, Japan Maritime Self-Defense Force Hyuga-class helicopter destroyer, JS Hyuga, Royal Australian Navy Anzac-class frigate, HMAS Ballarat, and United States Navy Arleigh Burke-class destroyer, USS Fitzgerald, sail in company during Exercise MALABAR 25 in the West Pacific training area off the coast of Guam.
Source: Royal Australian Navy

FOUR AREAS OF UNDERWATER DOMAIN AWARENESS (UDA)

Underwater Domain Awareness can be traditionally categorised under the broader umbrella of Maritime Domain Awareness. However, UDA and MDA are distinct concepts, with niche capabilities, and require distinct understandings. In the broadest sense, UDA is the capability to observe, detect, and assess underwater activities across oceans, coastal regions, and inland waterways. It involves achieving total situational awareness of the undersea environment for security, commercial, scientific, and environmental objectives.[18] Efforts in MDA tend to focus on surface-level threats, but as emerging challenges in the underwater domain grow, UDA is necessary to address the substantial challenge of underwater security (to be discussed further).

In this report, four aspects of UDA are explored as potential areas where Australia and India could enhance their cooperation:

- **Anti-Submarine Warfare (ASW)** involves strategic and tactical efforts to track, deter, and potentially neutralise enemy submarines. It is an arm of warfighting that relies on technological advantage and has the primary aim of protecting shipping lanes and navies, ensuring that critical maritime routes remain open.

- **Uncrewed Underwater Vehicles (UUVs)** are submersible vehicles that can complement manned submarines. UUVs operate in the underwater domain and, as they do not require onboard human operators, the potential loss of human life does not influence their development and deployment to the same extent as other platforms.

- **Undersea Search and Rescue** pertains to the capability to locate and rescue immobilised underwater vehicles. Framing this effort as a public good for the Indo-Pacific could empower both countries to identify and address existing shortfalls in each country's capabilities.

- **Deep-Sea Awareness**, a key capability within UDA, focuses on understanding the geophysical and ecological components of the underwater domain, as well as both employing and protecting undersea digital infrastructure, such as undersea cables. Identifying and understanding the myriad threats, both state and non-state, to digital infrastructure is another key element of Deep-Sea Awareness.

There is space in the literature for these identified areas of UDA to be further explored; rather, they represent opportunities for Australia and India to enhance bilateral cooperation in the Indian Ocean and across the broader Indo-Pacific region.

AUSTRALIA AND INDIA BILATERAL COOPERATION

Traditionally, Australia and India have shared a positive defence relationship and are now experiencing a deepening connection due to a shared interest in balancing global geopolitical powers, alongside converging challenges and exacerbated concerns in the Indo-Pacific. In 2020, Australia and India upgraded their relationship to a Comprehensive Strategic Partnership (CSP), stating an intention to boost cooperation in the maritime domain, as encapsulated in the Joint Declaration on a Shared Vision for Maritime Cooperation in the Indo-Pacific.[19] The CSP aligns with India's Indo-Pacific vision, Australia's Indo-Pacific approach, and Australia's Pacific Step-Up for the South Pacific.

There has been considerable progress in defence and security cooperation under the CSP and the Mutual Logistics Support Arrangement (MLSA), which enable greater cross-service military activity and the deployment of aircraft from each other's territories. Joint naval exercises such as AUSINDEX, Malabar, and Milan represent key manifestations of efforts to enhance both Australia and India's maritime capabilities while building interoperability. For instance, since 2003, the Royal Australian Navy has participated in every iteration of Exercise Milan, a biennial multilateral naval exercise beginning in 1995, hosted by the Indian Navy.[20]

In October 2025, Australia and India signed bilateral arrangements affirming their commitment to preserving regional peace, with the Australian Deputy Prime Minister and Minister for Defence, the Honourable Richard Marles MP, stating that,

> *Defence and security cooperation is now one of the strongest pillars of our Comprehensive Strategic Partnership. We see an increasing tempo of defence engagement, including through India's inaugural participation in Exercise Talisman Sabre 2025 … and deepening cooperation in the maritime domain.*[21]

In the Joint Statement on the 2025 Australia-India Defence Ministers' Dialogue, the Ministers discussed a Joint Maritime Security Collaboration Roadmap to advance maritime cooperation and affirmed the importance of enhancing cooperation with regional partners to help maintain a free, open, peaceful, stable, and prosperous Indo-Pacific—while noting the need to freedom of navigation, unimpeded trade in the region, and the upholding of UNCLOS in this pursuit.[22] The Dialogue reflected unprecedented progress in the bilateral defence partnership; the importance of defence cooperation among Australia, India, Japan, and the US was also emphasised, especially the ongoing commitment to enhancing collaboration on maritime domain awareness.

The 'Quad' brought together the US, Japan, India, and Australia. It was initiated by Japanese Prime Minister Shinzo Abe in 2007 before collapsing in 2008. It was then revitalised in 2017 at the ASEAN Summits in Manila as part of America's 2018 Strategic Framework for the Indo-Pacific, later revealed when US President Donald Trump declassified the document 25 years ahead of schedule.[23] Besides contending that the US would hold its own with China in the event of a Taiwan invasion, the document also restated the need to "align our Indo-Pacific strategy with those of Australia, India and Japan." The revitalisation of the Quad was driven by a shared vision for an open, stable, and prosperous Indo-Pacific, with partners reaffirming their commitment to building on efforts in the key sector of maritime security.

Since 2020, Australia has rejoined India, Japan, and the US for the Malabar Exercises—established as a bilateral training activity between India and the US in 1992, with Japan joining as a permanent participant in 2015 and Australia in 2020—thereby solidifying the Quad presence. At the 2022 Quad Leaders' Summit in Tokyo, leaders announced the Indo-Pacific Partnership for Maritime Domain Awareness (IPMDA) to enhance existing maritime domain awareness capabilities.[24]

The new security agreements between Australia and India to move from symbolic alignment towards operational coordination, therefore, represent an opportunity to transform the relationship into a maritime-first operating model that anchors broader strategic alignment.

The backdrop of Australia and India's bilateral relationship is now one of intensifying strategic competition. China's expanding naval presence and increasing contestation in the grey zone, along with minilateral initiatives such as the Quad, are reshaping the strategic landscape.[25] The new security agreements between Australia and India to move from symbolic alignment towards operational coordination, therefore, represent an opportunity to transform the relationship into a maritime-first operating model that anchors broader strategic alignment.

THE EVOLVING MARITIME RISK ENVIRONMENT IN THE INDO-PACIFIC

The underwater maritime environment in the Indo-Pacific has changed significantly since the end of the Cold War. There are general growing risks, such as increasing militarisation, climate-induced vulnerabilities, resource competition, and hybrid threats, including cyber-attacks on underwater infrastructure. Moreover, there is a new period of explicit competition between the US and China, with the maritime domain serving as a primary theatre of great power rivalry. Although some argue that the maritime domain is less prone to inadvertent escalation—or that withdrawal can be more politically palatable (as submarine deployments are rarely publicly signalled and can therefore withdrawal can be done without reputational loss[26] or the equivalent of ceding ground[27])—uncertainty within the maritime domain, including offence-defence distinguishability,[28] adds another layer of complexity to achieving a free, open, and peaceful Indo-Pacific. This section examines the maritime threats specific to Australia and India before discussing the broader implications of maritime security in the Indo-Pacific.

Threats to Australia

One of the more obvious maritime threats to Australia is the disruption or denial of access to SLOCs. Australia is heavily dependent on maritime trade for national prosperity. To emphasise the importance of maritime security for Australia, 99% of Australia's international trade by volume passes through Australian ports, contributing $264 billion annually to GDP.[29] Australia's Exclusive Economic Zone (EEZ), as prescribed by the 1982 UNCLOS,[30] is the third largest in the world.[31] Per the 2023 Defence Strategic Review, Australia's economy has become increasingly interconnected through decades of globalisation, meaning that "Australia has a fundamental interest in protecting [its] connection to the world and in the global rules-based order upon which international trade depends."[32]

Upholding freedom of navigation is critically important to Australia, but so too is access to ports and adherence to international trade rules. In 2020-2021, Australian trade was disrupted when ships carrying Australian goods were barred from unloading in Chinese ports.[33] Further legal questions arose regarding contracts for the carriage of goods and labour contracts, as crews were held on board for extended periods.[34] Thus, rather than blockading trade routes, Australia could be singled out more readily and at lower cost through the restriction of access to major ports.[35]

Given that 40.7% of Australia's maritime exports and 26.9% of Australia's maritime imports by value are with China,[36] any discussion of Australia's maritime security must consider China's role in the Indo-Pacific and its impact on Australia. The growth of Chinese naval power should not come as a surprise to Australia; however, the arrival of PLA-N warships in the Tasman Sea on 21 February 2025 and their partial circumnavigation of the continent was unannounced.[37] China's longer-term risk to Australia lies in the potential to gain coercive control over Australia's economic well-being by threatening its maritime access to markets and resources.[38]

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China is also increasing its geopolitical influence in the South Pacific sub-region, competing with Australia, the US, Japan, and Taiwan as key players in what has been described as the 'Great Game'.[39] Australia is at the forefront of this contest, given its geographical proximity and outsized engagement. It has long viewed itself, and has been viewed by

others, as a regional stabiliser. Moreover, Australia has made substantial Official Development Assistance (ODA) contributions and has repeatedly deployed military and police forces[40] for good reason: the Pacific Island Countries (PICs) form a strategic barrier for Australia ('the Melanesian arc') through which hostile powers must penetrate to threaten the Australian mainland.

The amphibious assault ship Hainan (Hull 31) and the guided-missile destroyer Yan'an (Hull 106) attached to a naval landing ship flotilla under the Chinese PLA Southern Theater Command conduct alongside replenishment-at-seawith the comprehensive supply ship Luomahu (Hull 907) during a maritime training in late December, 2025. (eng.chinamil.com.cn/Photo by Qiao Chenxi)

However, China has sought to displace Australia as the region's primary security provider, signing a security agreement with the Solomon Islands in 2022,[41] and a series of deals with the Cook Islands in 2025.[42] Regarding the contest for influence in the Pacific, Australian Foreign Minister Penny Wong stated in 2024 that Australia is in 'a state of permanent contest' with China.[43] Though the US is 'playing the game' in the region as part of its wider competition with China, the Cook Islands sit along crucial SLOCs between Australia and the US.[44]

The most important SLOC is the Strait of Malacca, which connects the Indian Ocean to the South China Sea (SCS).[45] The Strait of Malacca sees around 94,000 ships transits each year.[46] If maritime trade through the Strait were disrupted,

traffic would likely divert through the Sunda Strait, bringing shipping closer to Australia.[47] If both the Malacca and Sunda Straits were closed, transits would likely occur via the Lombok or Wetar Straits, once again pushing civilian and military maritime traffic even closer to Australian waters. Any such rerouting would significantly increase time and costs for maritime trade, and Australia would greatly need to improve its MDA capabilities to ensure the security of its maritime jurisdictions. Additionally, domestic and international ships plying Australian waters also operate in an ecologically complex and diverse sea area.[48] The increase in ship-sourced pollution from rising traffic would impact sensitive marine ecosystems.

Australia also has concerns regarding the security of its undersea cables. As an island continent, Australia is highly dependent on submarine cables for international data connectivity, rendering its digital economy and strategic communications vulnerable to cable disruptions.[49] From one perspective, Australia serves "as a critical link between Indo-Pacific and global networks, positioning it as both a beneficiary and guardian of regional connectivity."[50] While Australia has established submarine cable protection zones that criminalise actions that damage or potentially interfere with cable networks,[51] policing and legal enforcement remain limited. Moreover, although cable landing points have expanded around Australia, protection zones currently exist only off Perth and Sydney, leaving newer networks potentially vulnerable.

HMAS Ballarat conducts a replenishment at sea with HMNZS Aotearoa in the South China Sea during Regional Presence Deployment 25-4. Source: Royal Australian Navy

China's expanding infrastructure presence in the Pacific is a related concern, particularly where partner nations' sovereignty may be compromised through 'debt trap diplomacy'.[52] In response, Australia established the Australian Infrastructure Financing Facility for the Pacific (AIFFP) in November 2018[53] as part of its broader Pacific Step-Up strategy. The AIFFP represents Australia's primary vehicle for financing regional infrastructure priorities, including telecommunications and submarine cable networks.

Through the AIFFP, Australia can offer Pacific nations alternative financing for critical infrastructure projects. As of 2025, six AIFFP projects focus specifically on submarine cable infrastructure, representing investments totalling over AUD $170 million,[54] with one notable investment being the East Micronesia Cable System, developed in partnership with the US, Japan, New Zealand, and Taiwan, which connects the Federated States of Micronesia, Nauru, and Kiribati. However, Australia remains largely unprepared for coordinated attacks on such infrastructure. Reliance on trusted foreign suppliers, foreign personnel, and specialised equipment for installation and maintenance introduces additional vulnerabilities.[55] Australia does not maintain or subsidise dedicated repair vessels positioned for rapid response in the Indian Ocean or broader Indo-Pacific. Global repair times average more than a month under peacetime conditions; in a heightened geopolitical environment, Australia's repair capacity would likely prove inadequate for the scale of infrastructure at risk.[56]

While Australia's trade would be significantly affected by any blockage of the Strait of Malacca or disruption in the South China Sea—both major chokepoints—China's trade would also suffer. China depends on maritime imports for 80% of its iron ore and 70% of its oil.[57] China asserts sovereignty over much of the SCS through the 'nine-dash line', reinforcing its claim through 'offensive compellence'.[58] In 2016, the Permanent Court of Arbitration in the Hague ruled that China had no legal basis for its claims within the EEZs of other countries, like the Philippines.[59] Nevertheless, China continues to deploy its so-called 'maritime militia' into the EEZs of other countries to harass and intimidate fishing vessels.[60]

Through the AIFFP, Australia can offer Pacific nations alternative financing for critical infrastructure projects...However, Australia remains largely unprepared for coordinated attacks on such infrastructure...Australia does not maintain or subsidise dedicated repair vessels positioned for rapid response in the Indian Ocean or broader Indo-Pacific. Global repair times average more than a month under peacetime conditions; in a heightened geopolitical environment, Australia's repair capacity would likely prove inadequate for the scale of infrastructure at risk.[56]

China's expanding maritime capabilities create a power imbalance for smaller Indo-Pacific states. Australia, as a middle power, is not immune to this asymmetry.[61] Indeed, "Australian security ultimately depends on a rules-based regional order."[62] In September 2015, media reports showed how China was reclaiming and guarding large areas in the disputed Spratly Islands.[63] The US responded by enhancing Freedom of Navigation Operations (FONOPS) in the SCS.[64] The possibility of Australia conducting its own FONOPS was considered, with then Defence Minister Kevin Andrews stating at the Shangri-La Dialogue that:

> *Australia has a legitimate interest in the maintenance of peace and stability in this part of the world, including the preservation of respect for international law, unimpeded trade and freedom of navigation. With ever-increasing regional and global interdependence, no country can act alone to solve the challenges that threaten the region's security.*[65]

Within the maritime domain, the SCS may represent Australia's single greatest point of strategic vulnerability.[66] Beyond its own interests, Australia is also the US's staunchest ally in the region[67] and would be expected to support the US in the event of a conflict with China.[68] Defence Minister Richard Marles has stated that Australia would inevitably be involved in such a scenario.[69] US defence strategist Eldridge Colby has similarly argued that:

> *...maintaining deterrence in the Indo-Pacific region is not a mission the United States can achieve on our own. Interoperable allies and partners are critical to our forward posture, military capabilities, and combined efforts. AUKUS is a model of the type of cooperation we need to meet the challenges of the 21st century.* [70]

The increasing competition between the US and China is reshaping strategic dynamics in the Indo-Pacific, and tensions could escalate with little warning.[71] Most hypothetical conflict scenarios in Australia's northern waters involve escalation between China and the US, stemming from either escalation or an accidental clash in the SCS.[72] The rapid growth of regional military capabilities and the speed at which they can be deployed mean that Australia cannot rely on lengthy warning times before conflict.[73] Reduced warning time also limits effectiveness of gradual adjustments to military capability and preparedness.

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As military tactics and technologies evolve rapidly, pressure on Australia's defence budget is intensifying, especially from the US, which has acknowledged that its traditional military advantage has been negated by China's modernisation.[74] Australian defence spending in 2025 stands at 2.95% of GDP, with projections of 2.34% by 2032-33.[75] [76] Pressure to raise spending to at least 3% of GDP—often advocated within NATO—will continue under the Trump administration to avoid perceptions of 'free-riding'.[77] As a middle power, Australia's ability to uphold the liberal, rules-based order is constrained, and limited defence capabilities leave "little room for manoeuvre if the US makes ongoing security guarantees contingent upon making a greater contribution to meeting the challenge posed by China."[78] Further regional volatility would place additional strain on the defence budget. However, by reaching agreements with other states, pursuing public diplomacy, and employing economic power to broaden and strengthen partnerships within the Indo-Pacific region, Australia will find greater ability to address this increasingly unpredictable environment.[79]

Threats to India

India finds itself in a challenging paradox: its location is simultaneously its greatest strength and a source of acute vulnerability. Located at the heart of the Indian Ocean Region (IOR), India sits astride the SLOCs that connect the energy-rich Middle East to the economic engines of East Asia. Yet, this advantage exposes India to a range of maritime threats that have intensified in scope and lethality over the past decade. Unlike Australia, which faces a primary challenge from a single power, China in the Pacific, India confronts a 'two-front' maritime threat environment characterised by the collusive alignment of China and Pakistan, alongside asymmetric threats from non-state actors and significant resource dependencies across the expanse of the IOR.

India's economic lifeline depends on the safety and secure access to its SLOCs. Approximately 95% of India's external trade by volume and 70% by value transits by sea, underscoring the indispensability of open sea routes for its economy. This immense volume, handled across 12 major ports and over 200 non-major ports,[80] includes critical imports of energy, fertilisers, and raw materials. The most acute vulnerability lies in energy security. India imports nearly 89% of its crude oil requirements,[81] a dependency that creates strategic vulnerability. While New Delhi has diversified its energy basket—significantly increasing imports from Russia to bypass traditional geopolitical constraints—the physical transit of these resources remains a source of concern. About 36% of India's daily crude and over 40% of its Liquefied Natural Gas (LNG) imports transit through the Strait of Hormuz.[82] This narrow chokepoint, located in a conflict-prone region, remains a perennial source of anxiety for the Indian economy.[83] Any disruption—whether from state-on-state conflict or asymmetric warfare[84]—could trigger an energy crisis, paralysing industrial output and fuelling inflation.

Simultaneously, India's eastern maritime flank faces a 'Malacca Dilemma'. Approximately 60% of India's total global trade, and nearly 100% of its LNG imports,[85] pass through the Strait of Malacca. As the PLAN expands its operational footprint into the Indian Ocean, the security of the Malacca Strait has come under increasing scrutiny in Indian strategic and military circles, as it represents a potential strategic chokepoint for China to leverage against India in a conflict. The primary state-based threat to India's maritime security is the rapid and sustained expansion of China's maritime power in the IOR. Beijing's strategy has evolved from protecting its own energy lifelines to a proactive encirclement of India,

often referred to as the 'String of Pearls'. Chinese-operated or funded ports in Gwadar (Pakistan), Hambantota (Sri Lanka), and Chittagong (Bangladesh) provide the PLAN with logistical nodes capable of sustaining forward-deployed naval assets far from the Chinese mainland.

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Of particular concern is the pervasive and constant presence of Chinese research vessels in the IOR. Since 2020, over 64 active Chinese research and survey vessels have been identified operating globally, with IOR accounting for a considerable share of these dual-use operations.[86] Moreover, 13 vessels undertaking survey activity in the IOR have links to China's military and have displayed suspicious behaviour, including docking at Chinese-operated dual-use ports or temporarily disabling tracking devices. Vessels such as those in the Xiang Yang Hong and Yuan Wang classes ostensibly conduct scientific research but systematically map oceanographic data, including salinity profiles, thermal layers, and seabed topography.[87] This dual-use data enhances subsurface knowledge of oceanographic parameters critical to submarine warfare, enabling the PLAN to identify 'shadow zones' where submarines can evade sonar detection. For instance, on September 18, 2025, the missile and satellite tracking ship Yuan Wang 5 was tracked entering the Indian Ocean just as India conducted the Malabar naval exercises, illustrating the fusion of intelligence-gathering with operational deployment.[88] This hydrographic dominance effectively negates India's home-court advantage, or its geographic vantage point in underwater domain awareness.

Technological advancements have further amplified this threat. Reports indicate that in December 2019 China deployed 12 Sea Wing underwater gliders in the Indian Ocean, completing a 550-day mission, covering over 12,000 kms.[89] More recent intelligence suggests that China is testing Extra-Extra-Large Unmanned Underwater Vehicles (XXLUUVs) capable of extended-range and payload operations in the SCS, technologies that may eventually be deployed in the IOR.[90] These platforms could, in theory, target undersea infrastructure or conduct persistent surveillance off India's coast without the political and operational risks associated with manned submarine deployments.

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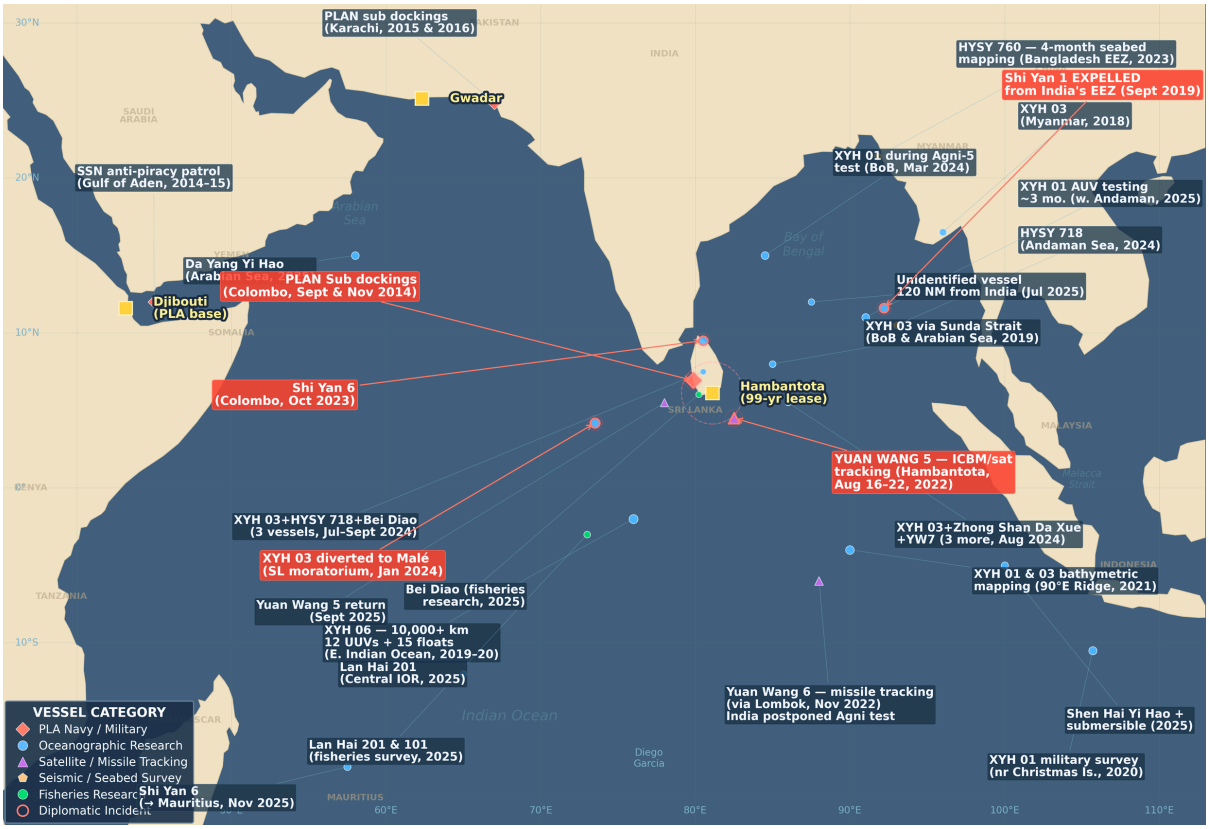
Chinese Research & Survey Vessel Deployments in the IOR (2014-2025)



Compounding the China challenge is the Pakistan factor. Although a secondary concern relative to China, Pakistan has evolved from a traditional coastal threat into a sophisticated sea-denial force, supported by Chinese assistance. The modernisation of the Pakistan Navy (PN) is singularly focused on interdiction and sea denial, aimed at severing India's energy supplies in the Arabian Sea. The core of this evolving threat is Pakistan's acquisition of eight Hangor-class submarines,[91] an export variant of China's Type 039B Yuan-class. The first vessel is scheduled to enter service by 2026,[92] with the full fleet expected to be operational by 2028. These submarines are equipped with Air Independent Propulsion (AIP) systems, significantly extending underwater endurance and allowing them to lurk stealthily near India's western seaboard and strategic chokepoints, such as the Gulf of Oman, for weeks without surfacing. In a conflict scenario, Indian naval planners would likely face a collusive threat environment: the PN interdicting vital energy flows in the west while the PLAN manoeuvres submarines or UUVs in the Bay of Bengal, stretching the Indian Navy's resources across two theatres.

Beyond traditional military threats, India faces an often-overlooked vulnerability in its critical undersea infrastructure. As a burgeoning digital power, India relies on 17 international submarine cables landing at 14 stations to carry 99% of its international data traffic.[93] This infrastructure underpins the country's massive IT services sector, financial markets, and civilian and military communications. However, the geographic concentration of these landing stations creates single points of failure. The majority of cables land in just two cities: Mumbai and Chennai, with Mumbai alone handling approximately 95%[94] of India's subsea cable traffic. A targeted attack, sabotage, or even a natural disaster at these sites could severely impact India's global connectivity. The vulnerability of this infrastructure was underscored by recent Houthi attacks on four cables in the Red Sea, which disrupted 25% of telecommunications traffic in West Asia and North Africa, and increased latency for Indian operators.[95]

Compounding this risk is the absence of a sovereign repair capability. India largely depends on foreign-flagged repair vessels to fix cable faults, a process that can take weeks due to security clearances and transit times. In a crisis, reliance on external commercial entities poses a grave security risk, potentially exposing India's digital connectivity to prolonged outages.

India's maritime boundaries are also tested by asymmetric threats and 'grey zone' tactics. The legacy of the 26/11 Mumbai terror attacks,[96]—when gunmen infiltrated the city via the sea—remains a stark reminder of coastal vulnerability to non-state actors. The sheer density of maritime traffic in Indian waters, comprising thousands of fishing vessels, dhows, and merchant ships, creates a form of 'white shipping' blindness. Many smaller vessels operate without Automatic Identification Systems (AIS),[97] making it difficult for security agencies to distinguish legitimate activity from potential threats. This 'white noise' in the littoral zone complicates the underwater acoustic picture and challenges sonar-based detection of hostile intrusions.

The threat of 'narco-terrorism' emanating from the Makran coast of Pakistan continues to grow, with proceeds often financing transnational terror networks.[98] The potential use of maritime militia, the People's Armed Forces Maritime Militia, and coast guard assets for military ends[99] (as observed in the SCS) adds further complexity, even if such tactics have not yet manifested in the IOR. The grey zone also includes the salami slicing of maritime norms, where adversaries may employ non-kinetic means to challenge India's EEZ rights or harass Indian fishermen, requiring calibrated responses that avoid escalation towards a conflict.

While external threats intensify, India faces significant internal challenges in aligning its strategic ambitions with material capabilities. The 2026-27 Defence Budget allocated a record INR 7.85 lakh crore (approximately $86–87 billion, including pensions),[100] revealing continued pressure on capital modernisation despite substantial growth. A significant portion remains absorbed by revenue expenditure (pay, allowances, pensions, and sustenance), but capital outlay on Defence Services has risen sharply to INR 2.19 lakh crore (approximately $24–25 billion, up ~22% from

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2025-26 BE), supporting acquisitions across all three services.[101] For the Navy, Naval Fleet modernisation allocation increased modestly to INR 25,023 crore (a ~2.6% rise over prior estimates),[102] contributing to overall Navy modernisation growth of ~4% and helping address, though not fully close, capacity gaps in the underwater domain.

The sanctioned force level for conventional submarines remains 24 (per the long-term 30-year plan).[103] The current operational fleet comprises around 17 conventional platforms (six Kalvari-class/Scorpene boats, alongside ageing Sindhughosh- and Shishumar-class boats), plus nuclear-powered assets such as INS Arihant and INS Arighaat (SSBNs).[104] Project 75 (P75) concluded with the commissioning of the sixth Kalvari-class submarine, INS Vagsheer, in January 2025.[105] The technologically advanced follow-on Project 75I (P75I), intended to deliver six next-generation AIP-equipped submarines (with negotiations favouring a German TKMS partnership via Mazagon Dock Shipbuilders), has faced repeated delays since the early 2000s (originally targeted for earlier timelines) and remains in an advanced contract negotiation phase as of early 2026, with potential signing expected by March 2026.[106] This capability deficit emerges precisely as adversaries accelerate their own production: Pakistan's Hangor-class submarines (Chinese-origin, AIP-equipped) saw the fourth boat (PNS Ghazi) launched in December 2025, with the first batch (China-built) now in sea trials and expected to enter service in 2026, providing a near-term endurance advantage in the shallow waters of the Arabian Sea and challenging India's traditional naval superiority, as India's conventional fleet currently lacks AIP-equipped submarines in operational service.[107]

India stands at a critical maritime crossroads. Geography, once a buffer, has become a vector for adversarial threat projection. A hostile two-front environment, deep economic dependence on vulnerable chokepoints like Hormuz and Malacca, and delays in modernisation create a precarious security architecture. To maintain its status as a Preferred Security Partner and secure its economic rise, India must urgently address these vulnerabilities—moving beyond rhetorical assertions of maritime power to building the tangible capabilities required to secure the vast, opaque, and increasingly contested waters of the Indo-Pacific.

The Broader Implications

Against the backdrop of great power competition and ongoing rivalry between China and the US, the Indo-Pacific region is becoming increasingly tense, where underwater incidents could trigger wider confrontations and escalate into major conflict with little warning. The Indian and Pacific Oceans are evolving into a theatre characterised by wavering international cooperation and rising competition, the expanded use of military and economic power to coerce middle powers into acting in the interests of superpowers, uncertainty regarding the reliability of US hegemony, and rising incidents of confrontational 'grey zone' tactics.[108] However, the broader volatility of regional politics does not necessarily need to create discomfort in the Australia-India relationship.

Both India and Australia maintain deep economic ties with China while recognising the security threats it poses in the maritime domain. However, India may exhibit greater sensitivity and reluctance to undertake overtly security-focused partnerships that risk being perceived as crossing China's red lines. Border disputes between India and China have, at

times, turned violent over the past five years, reinforcing this caution. This dynamic can manifest in India, making it the sole opponent among the Quad states on certain security-related initiatives. Nevertheless, periodic thawing in the India-China relationship—such as the October 2024 arrangement[109] to disengage troops along the contested border in Ladakh—China's continued provocative behaviour ensures that India safeguards its own strategic interests.

Compared with other countries, China is Australia's largest two-way trading partner, accounting for almost one-third of its exports.[110] But the relationship is experiencing a downturn, becoming more tense over the past decade, especially as Australia's long-standing alliance with the US is being revitalised through AUKUS. A strategic partnership between Australia, the United Kingdom, and the United States, AUKUS rests on two pillars: Pillar I, an enhanced trilateral strategic partnership involving the supply, delivery, co-design, and co-production of eight nuclear-powered conventional attack submarines (SSNs) by the 2040s; and Pillar II, which serves as a platform for advanced technology cooperation.[111] India does not view AUKUS as competing with the Quad, nor will AUKUS impact the Quad's functioning. However, India has historically expressed discomfort regarding a non-nuclear country accepting security-focused nuclear technology, in line with its commitment to nuclear non-proliferation. In the case of AUKUS, no such objection has been voiced, perhaps reflecting a tacit recognition of the need to balance China in the region.

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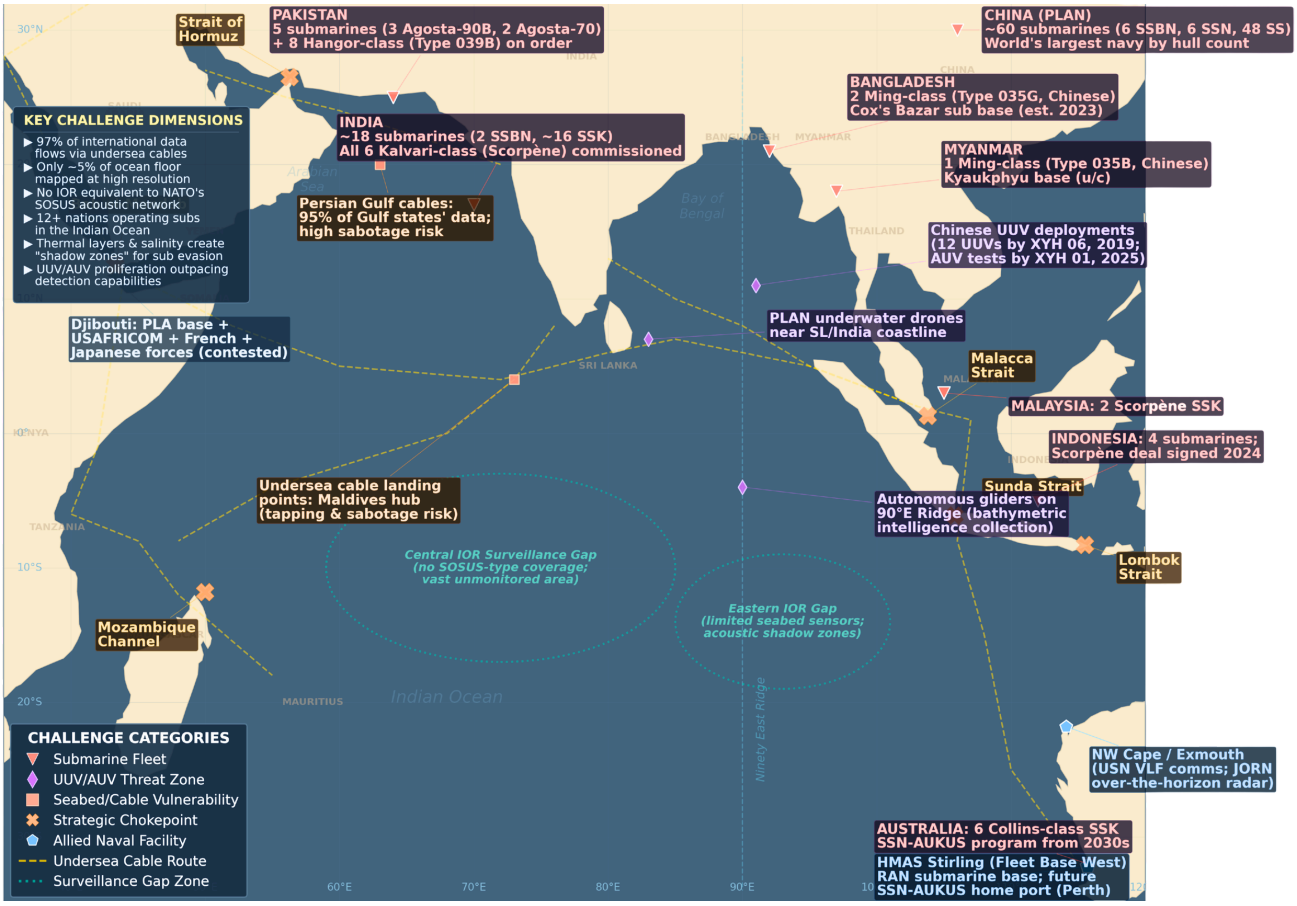
The stated objective of AUKUS is to deter China; however, as China's strategic threat grows and its military capabilities expand, Australia is concerned about the strategy's long-term effectiveness.[112] There is also some ambiguity surrounding US strategy and reliability. The Trump administration's transactional approach to international affairs, emphasising US sovereignty over key international rules and norms,[113] has raised questions about US credibility. Consequently, China's military modernisation has altered the regional balance, further eroding the US's traditional military advantage in the Indo-Pacific.[114]

For Australia and India, successive Australia-India 2+2 Ministerial Dialogues have prioritised maritime information-sharing and domain awareness, particularly with respect to protecting undersea critical infrastructure. These discussions have informed both countries' Indo-Pacific strategies and extend beyond just the bilateral relationship, producing greater impact in external relations and how other countries view Australia-India engagement too. Cooperation, reinforced through the defence agreements signed in October 2025, is oriented toward regional stabilisation. Rather than constituting a strategy of containment, closer Australia-India maritime cooperation can serve as a mechanism of reassurance, promoting mutual resilience and contributing to regional stabilisation.[115] Australia has the opportunity to diversify its security partnerships beyond the US, while India can deepen cooperation with a trusted partner without being entrenched in rigid bloc politics. Through collaboration, Australia and India can continue to affirm their support for freedom of navigation, secure access to key SLOCs, and other lawful uses of the maritime domain consistent with international law.

Underwater Domain Awareness Challenges in the IOR



THE CRITICAL ROLE OF UDA IN MODERN CONFLICTS AND THE EVOLUTION OF UDA TECHNOLOGIES

The critical role of the underwater domain in modern conflict stems from the ocean's unique physical characteristics, which have traditionally concealed underwater military assets. The ocean's opacity has long made it an ideal environment for second-strike, sea-based nuclear attacks and a preferred vector for covert operations. However, the underwater environment is now undergoing a radical transformation owing to technological advances that are mitigating the ocean's obscurity.[116] A notable shift is underway: from an opaque operational environment characterised by quiet manned submarines to an increasingly transparent, networked battlespace marked by intensified competition for information superiority. This shift—linked to safeguarding sovereignty, securing critical infrastructure such as subsea cables, and enforcing EEZ rights—has elevated UDA beyond its traditional status as a niche naval intelligence function. In this evolving landscape, the ability to generate a continuous, real-time, integrated picture of subsurface activity has become a prerequisite for deterrence, surveillance, and crisis response.[117]

At the strategic level, the importance of UDA lies in its deterrence value. A state with robust UDA capabilities can recalibrate its strategic calculus by mitigating the uncertainty of the underwater environment. The ability to identify, detect, track, and classify underwater threats raises the cost of clandestine operations while denying the adversary the element of surprise. This dynamic has profound implications for nuclear-armed states, whose Ballistic Missile Submarines (SSBNs) rely on stealth for survivability.[118] As sensor technologies and networks advance and proliferate, the invulnerable sanctuary once provided by the ocean will erode, potentially destabilising established deterrence frameworks by rendering previously secure second-strike capabilities vulnerable to pre-emptive targeting.

This dynamic is further complicated by the ambiguous nature of undersea military operations, which continue to pose challenges for attribution. Activities such as intelligence, surveillance, and reconnaissance (ISR), or sabotage against maritime infrastructure, are inherently clandestine. In crowded littoral waters or strategic chokepoints, distinguishing[119] between a biological anomaly, a commercial vessel, or a hostile Unmanned Underwater Vehicle (UUV) can be highly complex for any country. This ambiguity creates a precarious escalation matrix: a misidentified contact or a non-attributable attack on a subsea cable could trigger a disproportionate response or paralyse decision-making due to insufficient verifiable intelligence.

Recent conflicts provide empirical evidence of the operational salience of UDA, effectively serving as laboratories for the future of maritime warfare. The conflict in the Black Sea has demonstrated how the integration of low-cost, niche, and asymmetric technologies can undermine traditional naval dominance. Ukraine's deployment of Sea Baby and Magura V5 unmanned underwater and surface vehicles,[120] respectively, effectively disabled and destroyed the functioning of the Russian Black Sea Fleet, including submarines, forcing its repositioning from their headquarters in Sevastopol to safer harbours like Novorossiysk.[121] These operations highlight a critical shift: relatively inexpensive, expendable autonomous systems, when networked and employed in swarms, can impose disproportionate operational costs on high-value, less agile, and vulnerable manned underwater assets. The success of these platforms underscores the urgent need for defensive UDA capabilities that can detect and neutralise low-signature threats before they strike.

This asymmetric threat is evolving rapidly. In late 2024 and 2025, the Russia-Ukraine conflict expanded to include the targeting of the shadow fleet of tankers transporting sanctioned oil, with Ukrainian naval drones striking[122] vessels like the Kairos and Virat in the Black Sea. These attacks demonstrate the versatility of UDA technologies. The ability to identify, track, and interdict such vessels, often operating with AIS disabled, requires a sophisticated fusion of acoustic signatures, satellite imagery, and open-source intelligence, capabilities central to modern UDA requirements.

Sea Baby, a Ukrainian multipurpose unmanned surface vehicle (USV) has been a game-changer in the Black Sea, forcing Russia to withdraw much of its fleet from forward bases (like Sevastopol) to safer ports and disrupting naval/logistics operations.
Source: Security Service of Ukraine

Similarly, in the SCS, the strategic value of UDA is evident in the race to map seabed terrain and monitor hydrological conditions. Detailed knowledge of underwater topography and thermal layers, critical for submarine warfare, allows commanders to exploit shadow zones where sonar is ineffective. The pervasive presence of survey vessels and gliders in this region represents a preparatory phase for future undersea dominance. Intelligence reports from 2025 confirm that China is testing[123] Extra-Extra-Large UUVs (XXLUUVs) near Hainan. Satellite imagery has revealed that these vehicles, exceeding 40 meters in length, dwarf Western counterparts such as the U.S. Navy's Orca XLUUV.[124] These behemoths, nearing the size of small submarines, feature a tailless design and X-form rudders and are capable of missions such as blockades and heavy-payload attacks.[125] This could blur the line between a drone and a conventional submarine. Their existence implies a future in which unmanned vessels could autonomously conduct blockade operations, lay mines, or hunt manned submarines, fundamentally changing the attrition models of naval warfare.

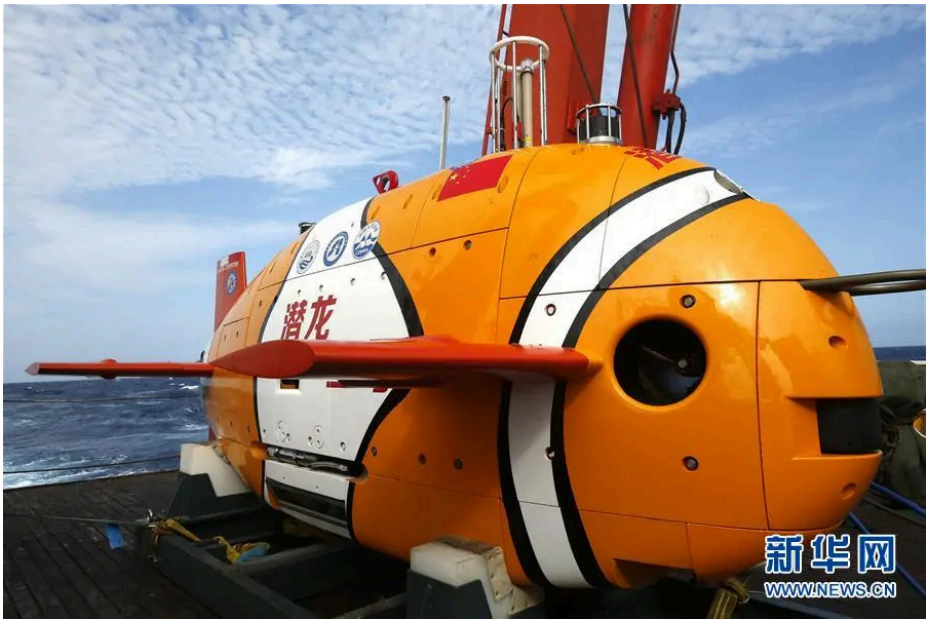
Complementing these large platforms are swarms of smaller, energy-efficient gliders that serve as the persistent sensory layer of the underwater domain. These low buoyancy-based vehicles can operate for months, silently gathering acoustic and environmental data. The efficacy of this approach was demonstrated when a fleet of 12 Chinese 'Sea Wing' (Haiyi) underwater gliders completed a 550-day hydrographic mission in the Indian Ocean, covering more than 12,000 km.[126] By deploying these gliders in large numbers, nations can create mobile, persistent sensor grids that are

difficult to detect and costly to neutralise. This persistent presence enables continuous monitoring of critical chokepoints and adversary movements without the political or personnel risks associated with manned patrols. However, the hardware of UUVs and gliders is only half the equation; the broader sensor web itself is shifting toward continuous, distributed sensing. Traditional reliance on expensive hull-mounted sonar is being supplemented by fixed seabed arrays and innovative use of existing infrastructure. China's Underwater Great Wall[127] project exemplifies this trend, aiming to construct a network of seafloor sensors, surface buoys, and satellites to create a comprehensive surveillance zone in the SCS and beyond. This modern iteration of the Cold War-era SOSUS (Sound Surveillance System) aims to make the near seas virtually transparent to Chinese commanders.

The PRC unveiled the XLUUV HSU-001 at its 70th anniversary parade in Oct 2019.
Source: Ministry of National Defense, PRC

Technological innovation is also unlocking new value from the commercial sector. Distributed Acoustic Sensing (DAS) technology, which uses standard subsea cable as elaborate sensors throughout its entire length, is revolutionising the monitoring of subsea infrastructure by transforming existing fibre-optic cables into giant passive sonar arrays.[128] By analysing the backscatter of laser light pulses sent through these cables, operators can detect acoustic vibrations from anchor drags, seismic activity, and even the noise signatures of passing vessels with remarkable precision.[129] This dual-use technology effectively turns the global telecommunications cable network into a planetary-scale acoustic monitoring apparatus. Companies like FiberSense have demonstrated the ability to fingerprint specific vessels using their acoustic signatures, even when their AIS transponders are off.[130] This capability is revolutionary for UDA, as it offers a cost-effective solution for monitoring vast swathes of the ocean floor that were previously obscured and attributes asymmetric activities, such as cable sabotage, with forensic-level accuracy.

The sheer volume of data generated by these distributed networks, encompassing biological noise, shipping traffic, and seismic activity, necessitates the third pillar of the UDA revolution: Artificial Intelligence and data fusion. Without advanced analytics, increased transparency risks producing overwhelming signal-to-noise rather than actionable intelligence. AI and Machine Learning (ML) algorithms are now essential[131] for sifting through terabytes of acoustic data to identify and classify targets in real-time. These systems can differentiate between the acoustic signature of a hostile submarine and a whale, significantly reducing false positives and operator workload. Moreover, integrating this underwater data with space-based assets, such as satellite communications buoys or surface gliders, enables the creation of a Common Operating Picture that fuses acoustic, magnetic, and optical intelligence. This networked architecture ensures that tactical data collected by a glider in the Indian Ocean can be transmitted to a command centre thousands of kilometres away, enabling dynamic re-tasking and rapid decision-making.



PLAN's Qianlong III is an advanced underwater robotic platform designed for deep-sea exploration and operations. It's engineered for tasks such as surveying the ocean floor, detecting metallic nodules (e.g., manganese), exploring natural resources such as natural gas hydrates, and supporting scientific, mining, energy, and, potentially, military applications.

Yet this networked reliance introduces new vulnerabilities, primarily in cybersecurity and data integrity. As UDA systems become increasingly software-defined and interconnected, they become susceptible to cyber threats such as data spoofing, jamming, and command-and-control hijacking. The integrity of the data is paramount, given that a hacked sensor network could feed false coordinates to a firing source or distort an adversary's approach, leading to a failure. Consequently, the cyber-hardening of underwater assets is becoming as critical as their physical survivability. This intersection of digital and physical security has opened the door for private enterprise to play a pivotal role. Commercial startups and dual-use technology firms are driving much of the innovation[132] in autonomy, low-power electronics, and AI analytics. While this infuses the sector with rapid adaptability, it also raises complex legal and export-control questions about the proliferation of high-end surveillance capabilities to non-state actors or rival nations.

Ultimately, the trajectory of UDA points toward a battlespace where concealment is fleeting and attribution is increasingly unavoidable. The unfolding reality of autonomous motherships like the XXLUUVs, persistent glider swarms, and DAS is reshaping naval warfare doctrines. In theatres like the Black Sea and the SCS, we are witnessing the early stages of this transformation, where the ability to master the underwater domain—to see, hear, and make sense of the deep—will determine the victor in future conflicts. The challenge lies in constructing resilient, integrated ocean surveillance architectures capable of withstanding high-intensity combat operations while navigating the delicate strategic equilibrium of an increasingly transparent maritime environment.

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AUSTRALIA-INDIA COOPERATION IN UDA

Cooperation between Australia and India in UDA has grown steadily in recent years. Encouraged by the successful deployment of the Indian Navy P-8I maritime patrol aircraft to Darwin, coordinated with a Royal Australian Air Force P-8A Poseidon Aircraft in 2022, the concept of 'interoperability' is inseparable from military cooperation in familiarising similar platforms. As stated by Air Vice-Marshal Stephen Meredith, "coordinated activities like these are key to enhancing Australia's maritime capabilities and building maritime domain awareness."[133]

Over the past decade, the India-Australia relationship has transformed remarkably, moving from limited bilateral interactions to developing a multi-layered partnership advancing shared regional objectives.[134] Promising domains for future cooperation include warship building and maintenance, repair and overhaul (MRO) sector. Integration in undersea surveillance, submarine cable protection, and maritime hydrography has emerged as a future avenue for maritime cooperation in the Indo-Pacific.[135] Yet, while identifying priority sectors for UDA collaboration is an essential first step in operationalising a comprehensive defence cooperation roadmap, mechanisms for technology transfer and frameworks for co-development and co-production will also be necessary.

The centrepiece of UDA systems is the establishment of a Common Operation Procedure (COP). The sum of data and intelligence drawn from many sources and organisations is fused into a coherent single picture, which can then be accessible to many users.[136] There are many technical challenges in creating a COP—synthesising data which may be in different formats, data storage and retention, data mediation and symbology. More fundamentally, a COP is designed to support informed decision-making based on shared, reliable information. This reflects the post-9/11 shift from a 'need to know' to a 'need to share' principle.[137] Consequently, the willingness of national entities to share data and intelligence represents a critical threshold in establishing an effective COP.

Cross-border data sharing, however, raises legal, political, and security challenges, including safeguarding sensitive information and addressing commercial confidentiality concerns in cases involving industry partners. Bilateral protocols may mitigate some risks, yet the initial hurdle of establishing a common nomenclature or lexicon remains—particularly in multilateral contexts. Even longstanding alliances such as the Five Eyes have encountered difficulties in creating shared operational frameworks and imagery. Although the Five Eyes partners established a Maritime Domain Awareness (FVEYMDA) Partnership Steering Group, progress has been incremental; the implementation of a shared Vessel of Interest Lexicon in 2017 marked only an early step towards a fuller COP.[138]

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At a broader level, the Indian Ocean is one of the world's largest maritime spaces. Australia possesses the longest Indian Ocean coastline, the largest maritime jurisdiction, and an extensive search and rescue zone.[139] Achieving persistent coverage across such vast expanses would require fully integrated sensor systems and networks, combined with capabilities capable of rapid and flexible deployment.[140] Nevertheless, in the 2020 Defence Strategic Update, UDA was assured to be a priority investment, stated by then-Prime Minister Scott Morrison as a foundation of deterrence.[141] The 2023 Defence Strategic Review (DSR), however, recognised that Australia's defence efforts in isolation are unlikely to be sufficient to maintain a favourable balance of power in the Indo-Pacific.[142] Rather, the Quad partners (India, Japan, and the US), as well as the UK, were named as important security partners for Australia in the Indo-Pacific region.

The Australia-India partnership is more than a bilateral engagement; it constitutes an important pillar of the emerging Indo-Pacific security architecture. In recent times, defence dialogues and joint exercises have formed the backbone of the CSP. The next phase should focus on defence industrial collaboration, where industry serves as the bridge between strategic intent and operational capability, transforming shared objectives into tangible outcomes, platforms, systems, and technologies.[143]

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Joint Opportunities

Australia and India recognise that the development and security agendas of the Indo-Pacific are intertwined.[144] Building synergies in defence collaboration could further enhance regional defence capacity. The 8th Australia-India Defence Policy Talks in 2023[145] explored the potential for cooperation between the Indian defence industry and the Australian Defence Force's shipbuilding and maintenance programs. These discussions have continued in subsequent rounds, including the 9th Defence Policy Talks in 2025,[146] underscoring the enduring focus on such partnerships. Building complementary, rather than redundant, UDA capabilities should underpin such cooperation, fostering mutually beneficial synergies that accelerate co-development, enhance skills transfer, and reinforce both nations' indigenous production capacities.

In pursuing complementarity, Australia and India may face the same challenges—limited budgets, long timelines, and the complexity of advanced technologies. Yet these constraints can act as drivers for collaboration in enhancing UDA. Redundancy should only be explored where resilience is demanding, for instance, with critical infrastructure.

At the same time, certain data and capabilities in the underwater domain will inevitably remain tightly held due to national security considerations and third-party obligations.

Thus, a tiered approach could offer a pragmatic pathway for cooperation. For low-sensitivity data and tools, there can be open collaboration; operational methods will be exchanged with careful control; and a clearly defined 'red zone' would ensure that complementarity is achieved through deconfliction and aligned outcomes, rather than the exchange of highly sensitive information.

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CONCLUSION

The CSP established between Australia and India in 2020 laid the groundwork for the 2+2 Ministerial Dialogue in 2025 and significantly advanced the bilateral relationship. Concluding arrangements such as mutual submarine rescue support, plans for Indian repair and maintenance of Australian Navy ships in the Indian Ocean, and enhanced information-sharing demonstrate great promise for these two Quad partners to engage meaningfully across the defence services sector. Nevertheless, it must be emphasised that in order to build trust between Australia and India requires a much stronger understanding of each other's systems and operating frameworks. Complementary areas of cooperation have certainly been identified, including India's advancing large-scale manufacturing capacity and Australia's niche intellectual property expertise.

India must still navigate its 'no limits' partnership between Russia and China—an incongruence with Australia's alliance-focused defence networks. But the Australia-India Institute's 2025 Australia-India Defence Conclave, on the sidelines of the Australia-India Defence Ministers Meeting, showed promise of moving from concepts to capabilities, the next logical step in the defence relationship.[146] Candid exchanges about expectations during potential regional

crises represented the building of confidence and trust. The alignment of India's Indo-Pacific Vision with Australia's perspective of the Indo-Pacific underpins the aim to enhance regional cooperation; beginning with further information-sharing marks a practical and achievable approach for Australia and India to cooperatively build towards a free, open, peaceful, stable, and prosperous Indo-Pacific.

This report has established the context for expanding maritime cooperation between Australia and India in the Indo-Pacific. Underwater Domain Awareness exists not only as an area of potential collaboration but also an opportunity to consolidate both states' roles as responsible regional stakeholders.

In the subsequent reports in this series, each of the four areas of UDA—Anti-submarine Warfare; Uncrewed Underwater Vehicles (UUVs); Undersea Search and Rescue; and Deep-Sea Awareness—will be explored in greater detail. The potential areas for enhancement, alongside associated challenges and constraints/concerns, will be examined to build a comprehensive picture of Australia-India cooperation in UDA.

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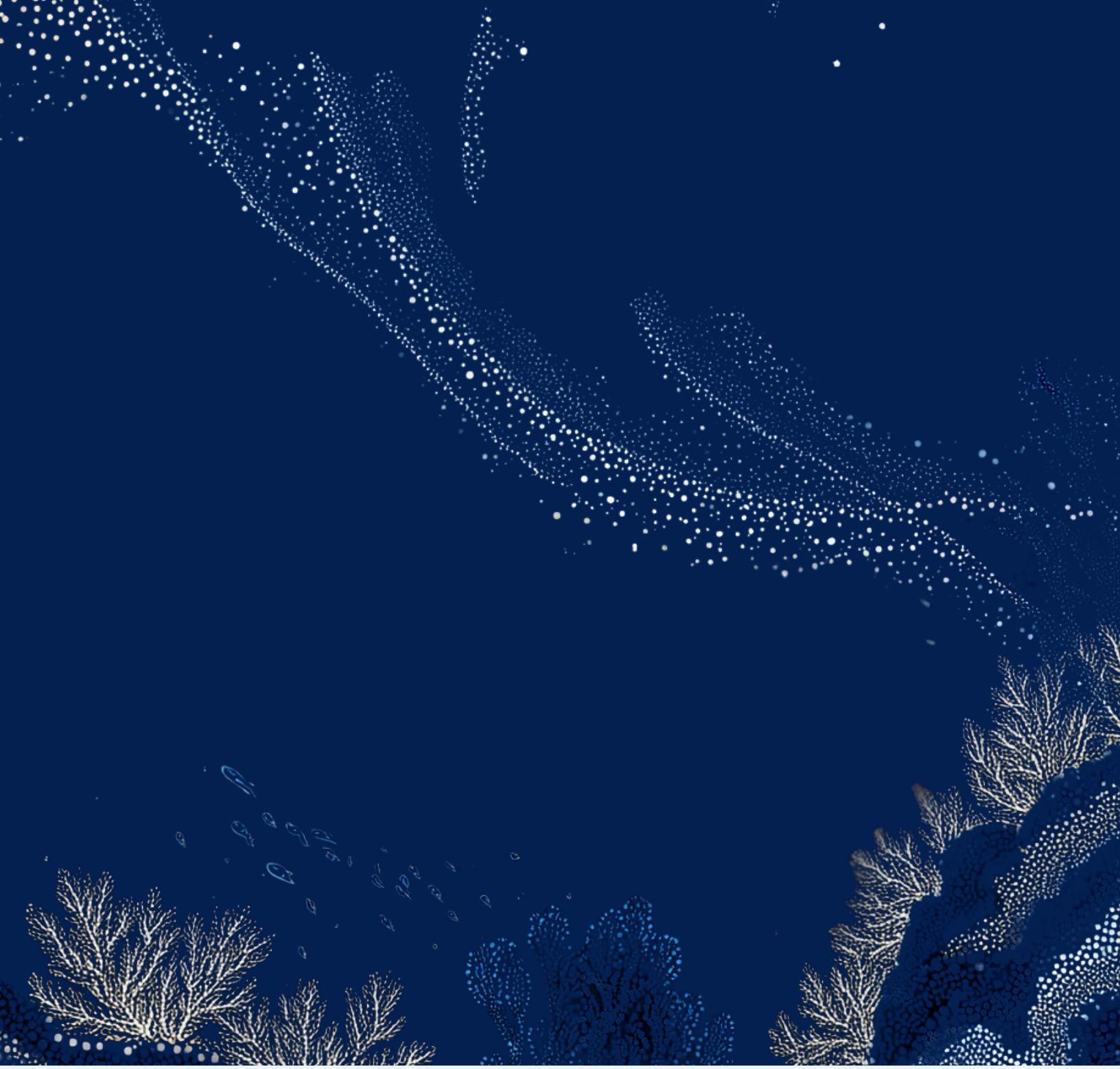

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