



Linking maritime security and sustainability: Naval strategy and multilateral engagements toward SDG 14 and SDG 16

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ABSTRACT

Background: Indonesia's strategic position between the Indian and Pacific Oceans, particularly at the Sunda and Lombok Straits, makes it a key actor in Indo-Pacific maritime security. Amid growing global geopolitical rivalries, this study analyzes Indonesia's efforts to balance defense interests, strategic neutrality, and regional cooperation. This focus supports the achievement of SDG 16 and SDG 14 through transparent, collaborative, and sustainable maritime governance. **Methods:** A qualitative approach was employed using document analysis of Indonesia's defense policies and regional security cooperation frameworks. **Findings:** Indonesia is actively modernizing its naval capabilities and enhancing maritime domain awareness. Despite challenges such as resource limitations and coordination inefficiencies, the country balances strategic neutrality with multilateral engagement. **Conclusion:** This study emphasizes the strategic importance of managing the Sunda and Lombok Straits to balance maritime security and environmental sustainability. Indonesia's naval posture through capacity, neutrality, and cooperation supports sovereignty, stability, and SDG 14 and 16. The paper calls for specific policies, including regional governance mechanisms, sustainability clauses in defense cooperation, and integration of naval and conservation policies to strengthen Indonesia's role as a sustainable and resilient global maritime fulcrum. **Novelty/Originality of this article:** This study offers new insights into the dynamic relationship between Indonesia's national defense strategies and the complex geopolitical realities of the Indo-Pacific maritime region, highlighting the balance between sovereignty, neutrality, and multilateralism.

KEYWORDS: maritime security and sustainability; naval posture; SDG 14 and SDG 16; sustainable maritime governance; regional stability.

1. Introduction

The Indonesia archipelago sits astride two of the world's most critical maritime chokepoints the Sunda and Lombok Straits making its naval posture and multilateral security engagements strategically indispensable for the Indo-Pacific order. However, safeguarding these maritime gateways is not merely a matter of hard power or sovereignty; rather, it demands that maritime security be reconceived through a sustainability lens. In this respect, Indonesia's stance has profound implications for SDG 16 (Peace, Justice, and Strong Institutions) and SDG 14 (Life Below Water). By ensuring stability, transparency, and

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multilateral governance across maritime domains, naval strategy can buttress institutional resilience and conflict prevention (SDG 16). Simultaneously, responsible maritime security measures such as regulated patrols, environmental impact mitigation, and cooperation on marine protection can contribute to the health of marine ecosystems (SDG 14). Indeed, recent frameworks in maritime security scholarship emphasize the necessity of integrating security with sustainable development, arguing that achieving lasting oceanic governance requires bridging traditional security paradigms and ecological stewardship (Li, 2023). Moreover, the evolving nexus of environmental and security challenges from climate change effects to marine biodiversity pressure underscores that maritime security is inseparable from the sustainability agenda (McCabe, 2023)

Indonesia's geographical position between the Indian and Pacific Oceans, situated at the crossroads of Asia and Australia, constitutes a vital strategic node within the Indo-Pacific's geopolitical and geoeconomic framework. The Sunda and Lombok Straits, as key international maritime chokepoints, facilitate global trade and military mobility, serving as crucial conduits for economic and security interests in the region (Scott, 2019). Given the escalating geopolitical rivalry among major powers such as the United States, China, and other Indo-Pacific partners, these straits have become increasingly contested spaces vulnerable to influence competition and power projection (Debre, 2021; Sukma, 2021). Consequently, Indonesia faces urgent demands to enhance its naval defense posture in these critical areas to safeguard its sovereignty and maintain regional stability.

In response to these challenges, Indonesia seeks to strengthen its naval capabilities in the Sunda and Lombok Straits through active defense diplomacy and multilateral security cooperation. However, the country confronts several obstacles, including the difficulty of maintaining strategic neutrality amid great power tensions, limited coordination and resources in foreign policy implementation, and pressures on ASEAN's cohesion within the evolving regional security architecture (Laksmana, 2020; Tan, 2021). Transnational maritime threats, such as organized crime, piracy, and smuggling, further complicate the security dynamics, necessitating coordinated and collaborative responses (Bueger & Edmunds, 2021). Despite these difficulties, Indonesia's maritime strategy remains anchored in principles of inclusivity and regional cooperation that uphold national sovereignty (Anwar, 2019).

The Indo-Pacific maritime security environment is undergoing a significant transformation, marked by a paradigm shift from the "Asia-Pacific" to the broader "Indo-Pacific" concept. This evolution reflects recognition of the Indian and Pacific Oceans as a single interconnected strategic domain encompassing economic, political, and security dimensions (Rajagopalan, 2022). Regional powers such as the United States, Japan, India, and Australia have promoted integration through frameworks like the Quadrilateral Security Dialogue (QUAD) and AUKUS, intensifying regional competition and complexity. Indonesia, as the largest archipelagic state linking two oceans, plays a pivotal role not only in protecting its maritime sovereignty but also in actively contributing to regional stability through credible maritime power projection (Scott, 2019).

The Sunda Strait connects the Java Sea to the Indian Ocean, serving as a vital corridor for commercial and military vessels moving between East Asia, the Middle East, and Europe. The Lombok Strait, being deeper and capable of accommodating larger vessels, increasingly functions as an alternative to the congested Malacca Strait. Both straits hold immense economic and military strategic value but face cross-border threats such as smuggling, piracy, and foreign interference that jeopardize sovereignty and security. Therefore, fortifying the Indonesian Navy's presence in these straits is imperative to ensuring maritime stability and security (Debre, 2021).

Efforts to modernize naval weaponry, deploy strategic combat forces, and enhance fleet readiness form the core of Indonesia's maritime defense strategy. These endeavors aim to counter complex, multidimensional threats in national and regional waters. However, constraints such as limited defense budgets, uneven port infrastructure, and shortages of professional military personnel hinder optimal capability development. An inward-looking defense posture is insufficient; Indonesia must adopt a comprehensive strategy combining

national capability building with active multilateral cooperation to improve maritime security and regional stability (Laksmna, 2020).

Multilateral defense cooperation, through joint exercises such as Komodo and Rim of The Pasific (RIMPAC), bolsters Indonesia's regional position and interoperability with partner navies. Such engagements foster technology transfer and capacity building, elevating Indonesia's defense diplomacy from symbolic acts to strategic trust-building measures (Laksmna, 2020). Nevertheless, maintaining active neutrality amid the US-China rivalry requires careful maritime diplomacy and strong legal frameworks to legitimize naval operations in these strategic waterways (Sukma, 2021).

Maritime Domain Awareness (MDA) systems are crucial for early detection and response to maritime threats. Indonesia's adoption of maritime drones, satellite surveillance, island-based radar systems, and underwater sensors represents a data-driven transformation of defense capabilities. MDA also facilitates civil-military and international collaboration in maritime security (Tan, 2021). Institutional reforms including regulatory harmonization and improved interagency interoperability under the Joint Defense Command System/*Komando Gabungan Wilayah Pertahanan* (Kogabwilhan) are necessary to increase operational efficiency in critical maritime areas.

Ultimately, enhancing Indonesia's maritime defense posture in the Sunda and Lombok Straits reflects a broader foreign policy strategy aimed at addressing global challenges and asserting Indonesia's role as a credible maritime axis in the Indo-Pacific. This study seeks to analyze the strategic significance of these straits, the Indonesian Navy's defense posture and internal challenges, and Indonesia's participation in multilateral security cooperation, thereby contributing academically and practically to the nation's maritime security architecture.



Fig. 1. Brainstroming

2. Methods

This study employs a qualitative research approach with a strategic and geopolitical analysis framework to examine Indonesia's naval posture and multilateral security engagements in key maritime chokepoints specifically the Sunda and Lombok Straits within the broader Indo-Pacific region. The research integrates document analysis, thematic coding, and comparative policy analysis to provide a comprehensive understanding of

maritime security dynamics and their implications for SDG 14 (Life Below Water) and SDG 16 (Peace, Justice, and Strong Institutions).

2.1 Data collection

The research data were collected through a multi-method approach comprising several stages. First, a document review was conducted on primary sources such as Indonesia's defense white papers, maritime security regulations, National Armed Forces of Indonesia/*Tentara Nasional Indonesia* (TNI) Navy doctrinal publications, and regional cooperation frameworks such as ASEAN. Second, secondary sources including academic literature, regional maritime security reports, and policy analyses were utilized to strengthen both theoretical and empirical contexts. Third, geospatial and strategic data obtained from official maritime charts and defense navigation maps were analyzed to identify the Indonesian Archipelagic Sea Lanes/*Alur Laut Kepulauan Indonesia* (ALKI) and key strategic chokepoints. All sources were selected based on their relevance, credibility, and temporal validity to ensure an up-to-date representation of Indonesia's maritime defense posture and multilateral cooperation.

2.2 Strategic geographic focus and analytical framework

This study focuses on the Sunda and Lombok Straits as critical chokepoints within Indonesia's maritime security architecture, utilizing spatial data on archipelagic sea lanes and chokepoints to map their strategic roles in global trade and military logistics, while positional analysis reveals key vulnerabilities and defense requirements necessary to uphold sovereignty amid regional power rivalries. The collected data were analyzed using a thematic coding approach to classify findings into three main dimensions: the significance of strategic chokepoints and maritime vulnerabilities, Indonesia's naval posture and defense strategy, and the role of multilateral cooperation in promoting sustainable maritime governance. In addition, a comparative policy analysis was conducted to examine how Indonesia's approach aligns with or differs from other Indo-Pacific maritime nations in terms of strategic priorities and cooperative frameworks. To illustrate the analytical structure, a conceptual diagram (Figure 2) was developed, depicting the relationship between strategic chokepoints, naval posture, and multilateral cooperation, as well as their collective contribution to SDG 14 (Life Below Water) and SDG 16 (Peace, Justice, and Strong Institutions) thereby clarifying the logical progression of the study's analytical framework.

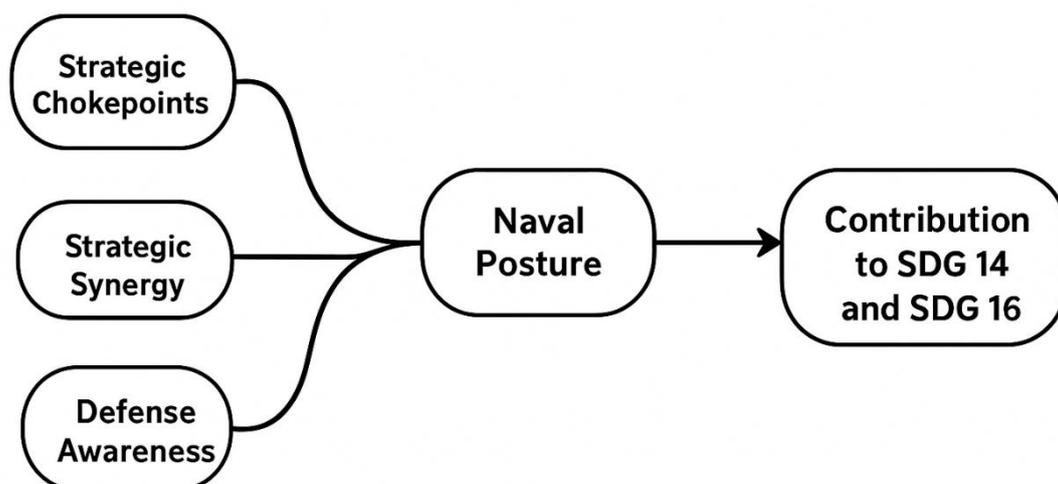


Fig. 2. Conceptual diagram

2.3 Data interpretation and limitations

This research conducts a qualitative synthesis of spatial, doctrinal, and cooperation data to build a comprehensive understanding of Indonesia's maritime defense posture, complemented by comparative analysis of regional naval strategies to position Indonesia within the Indo-Pacific security landscape, and concludes with strategic policy recommendations to strengthen Indonesia's capacity to defend critical chokepoints while upholding active neutrality and fostering regional cooperation. The assessment of Indonesia's defense posture may be constrained by restricted access to classified naval operations data, while rapid geopolitical shifts in the Indo-Pacific could affect the ongoing relevance of current multilateral engagements.



Fig. 3. Choke point Indonesia

(Processed Data Hydro-Oceanographic Office of the Indonesian Navy (Pushidrosal), Ministry of Defense of the Republic of Indonesia, and the International Maritime Organization (IMO) (2025))

3. Results and Discussion

3.1 Geostrategic significance of the Sunda Strait and Lombok Strait in the Indo-Pacific architecture

The geostrategic significance of the Sunda and Lombok Straits reflects their crucial role as international sea lanes and arenas of contestation among major world powers. These straits are not only economically and militarily important but also serve as battlegrounds for geopolitical, digital, and narrative influence between key actors such as the United States and China. As strategic connectors between the Indian and Pacific Oceans, the Sunda and Lombok Straits function as vital alternative routes to the Malacca Strait, especially in light of escalating tensions in the South China Sea. Both straits play a pivotal role in ensuring the stability of global trade, regional maritime security, as well as digital sovereignty and strategic narratives in the region. In the increasingly complex Indo-Pacific context, managing these areas requires adaptive, collaborative, and nationally grounded policies to ensure Indonesia remains a central actor in a dynamic maritime order.

As explained by Roy (2017) in his review of *The South China Sea Dispute*, the region reflects the Indo-Pacific's complexity, marked by overlapping territorial claims, great power rivalry, and the need for careful diplomatic management. The conflict involves not only

territorial disputes but also control over vital shipping lanes, access to natural resources, and strategic dominance. Resolving these issues demands multilateral diplomacy and strategic tension management, particularly with the involvement of major powers like the U.S. and China.

The Sunda and Lombok Straits are strategic maritime chokepoints directly linking the Indian and Pacific Oceans and serving as alternative routes to the heavily trafficked Malacca Strait. When the Malacca Strait faces congestion, maritime threats, or bottlenecks, the Sunda and Lombok Straits offer deeper, wider, and safer passageways for large vessels, including oil tankers and container ships. This geographic position makes the two straits not only critical for Indonesia but also essential for maintaining the stability of international trade and maritime security in the increasingly competitive Indo-Pacific region (Sony, M. et al., 2022).

History also underscores the significance of maritime routes as arenas of power contestation. Kwan (2020) pointed out that in the 19th century, piracy in the South China Sea was not merely a criminal act but also a political tool for states to form alliances and assert power. Today, modern piracy and non-traditional security threats such as smuggling, maritime terrorism, and territorial disputes underscore the urgency of cross-border cooperation to secure strategic chokepoints like the Sunda and Lombok Straits.

Tensions in the Indo-Pacific manifest not only in military actions and foreign policy but also in narrative power, which shapes geopolitical identity and legitimizes state actions. Hagström & Gustafsson (2019) argue that narrative power has become a vital tool in shaping geopolitical identities and influencing foreign policy legitimacy, historical narratives, nationalism, and morality—tools used by both the U.S. and China to frame their actions and build support. In this context, Indonesia's ownership of the Sunda and Lombok Straits places it at the heart of regional geopolitical competition.

He & Ramasamy (2020) deepened this dimension by analyzing the U.S.'s use of "naming and shaming" strategies against China in the South China Sea. Through public rhetoric and diplomatic framing, the U.S. attempts to pressure China morally and politically, though the effectiveness of this strategy remains limited. This shows that in the Indo-Pacific architecture, diplomacy and narrative can have an impact as significant as military power. As a neutral country situated between two major poles, Indonesia must skillfully navigate narrative pressures and maintain its own sovereign discourse over its strategic areas.

Great power competition also extends into the digital and technological realms. Heeks et al. (2024), in their literature review, show that China's digital expansion in the Global South through the Digital Silk Road is a comprehensive strategy encompassing digital infrastructure, smart cities, and surveillance technology. The presence of Chinese companies in the tech sectors of developing countries, including Indonesia, raises issues of digital sovereignty and control over strategic data. In the context of the Sunda and Lombok Straits, control over communication and surveillance systems becomes a key part of digital power competition that directly impacts national maritime security.

This technological dimension is further emphasized by Hine & Floridi (2022), who compare U.S. and Chinese AI policy approaches. The U.S. promotes transparency and free market collaboration, while China emphasizes state control and social stability. These divergent paradigms create competing global technology governance models that influence partner countries, including Indonesia. Therefore, Indonesia's strategy in managing the Sunda and Lombok Straits cannot be separated from the ideological and technological values shaping the Indo-Pacific environment. Beyond strategic and geopolitical aspects, the Sunda and Lombok Straits directly impact Indonesia's economy, defense, and maritime sustainability. They are crucial corridors for international energy and logistics transport, as well as access points for fisheries and tourism in western and central Indonesia. Disruptions in these straits can affect global energy supply chains, commodity price stability, and the livelihoods of coastal communities.

Militarily, the Sunda and Lombok Straits are chokepoints that require close monitoring. Strengthening Indonesia's maritime defense posture, modernizing the Navy's weaponry systems, and implementing surveillance technologies based on Maritime Domain

Awareness (MDA) are essential for safeguarding sovereignty and preventing foreign infiltration or provocations. Additionally, maritime security challenges such as piracy, smuggling, and potential regional conflict demand rapid response capabilities and adaptive military cooperation at the regional level.

To address these challenges, Indonesia adopts a multi-level approach by enhancing national capabilities and strengthening regional cooperation. Forums such as ASEAN, the Indian Ocean Rim Association (IORA), and various multilateral meetings serve as vital platforms for maritime diplomacy and joint security efforts. These initiatives are important for fostering coordination, building trust, and developing shared standards to maintain a stable and open maritime region. In conclusion, the Sunda and Lombok Straits are not merely shipping lanes but also symbols of shifting geopolitical and technological intersections. Their significance spans military, economic, narrative, and digital dimensions that are deeply intertwined within the Indo-Pacific framework. As the custodian of these straits, Indonesia bears both the responsibility and strategic opportunity to play a key role in shaping a fair, inclusive, and sustainable maritime security architecture for the region.

3.2 Evaluation of the Indonesian naval force posture in securing critical maritime points

Indonesia, the world's largest archipelagic country with over 17,000 islands and 108,000 kilometers of coastline, occupies a highly strategic geographic position between the Indian and Pacific Oceans. This makes maritime space management essential to national stability and security, especially amid the dynamic Indo-Pacific geopolitical landscape. The Sunda and Lombok Straits serve as vital international shipping lanes and strategic chokepoints critical to safeguarding Indonesia's maritime sovereignty. Consequently, strengthening the Indonesian Navy's posture in these straits is a primary focus to counter maritime security threats.

Current evaluation reveals an imbalance in the Indonesian Navy's force distribution, heavily concentrated in the western region under Koarmada I, headquartered in Jakarta, overseeing North Natuna Sea, Malacca Strait, and Sunda Strait. Meanwhile, the central region, including Lombok Strait, receives less attention despite rising traffic of large vessels such as tankers and container ships. This disparity necessitates adaptive redistribution of combat ships, radar systems, and supporting infrastructure to the central and eastern waters (Tsioufis et al., 2024).

Structural challenges impede readiness, including aging warships (many over 25 years old) and limited logistics facilities outside Java, reducing operational effectiveness and forcing frequent returns to main bases (Shane & Magnuson, 2016). Intelligence-driven patrol strategies and integration of advanced C4ISR technologies, drones, acoustic sensors, and satellite monitoring are critical for early threat detection like piracy and illegal fishing (Kim, 2024; Johnson et al., 2007). Modernization efforts face budgetary constraints and reliance on foreign defense imports, despite strategic collaborations with South Korea on frigate and submarine projects (Lai, 2020). Infrastructure shortcomings, particularly underdeveloped naval bases and inadequate radar systems in the Sunda and Lombok areas, further limit operational capabilities (Treves, 2009).

Human resources require urgent upgrades in technical skills aligned with modern digital defense systems. Education reforms and expanded international training partnerships are vital for cultivating a professional and adaptive navy workforce (Shane & Magnuson, 2016). The establishment of Joint Defense Commands (Kogabwilhan I & II) since 2019 has enhanced inter-service coordination and rapid response in these strategic straits (Marchione & Johnson, 2013). Strengthening Maritime Domain Awareness (MDA) through regional cooperation, transparent dialogue, and integrated spatial-temporal data analytics remains crucial to effectively address cross-border maritime threats (Tsioufis et al., 2024). Comprehensive structural reforms, balanced force distribution, technological modernization, infrastructure development, improved human capital, and multilateral cooperation form the foundation for Indonesia to emerge as a resilient, professional maritime power in the Indo-Pacific region.

3.3 *The dynamics of Indonesia's engagement in multilateral maritime security cooperation*

Indonesia, as the world's largest archipelagic state with vast maritime territory, holds a critical geostrategic position in both regional and global maritime security frameworks. To safeguard sovereignty, ensure regional stability, and secure vital sea lanes of communication, Indonesia actively participates in multilateral mechanisms such as ASEAN, the Indian Ocean Rim Association (IORA), and multinational naval exercises like Komodo and RIMPAC. Within ASEAN, Indonesia plays a pivotal role in shaping maritime security diplomacy. Through forums such as the ASEAN Defence Ministers' Meeting (ADMM) and ADMM-Plus which include major global powers like the United States and China Indonesia promotes dialogue, information exchange, and joint exercises. These initiatives aim to reduce tensions, strengthen trust, and enhance regional maritime threat responses. Similarly, through IORA, Indonesia collaborates with countries like India and Australia to strengthen maritime surveillance, safety of navigation, and efforts against transnational crimes.

Joint naval exercises further reinforce Indonesia's strategic posture. The Komodo Exercise, initiated by Indonesia, is among the largest multilateral naval engagements in the Indo-Pacific. It promotes interoperability, trust-building, and tactical cooperation among participating navies. Participation in the U.S.-led Rim of the Pacific (RIMPAC) Exercise also reflects Indonesia's commitment to strengthening global defense partnerships and testing operational readiness.

Despite these efforts, Indonesia faces several challenges. First, political divisions within ASEAN especially regarding the South China Sea hinder coherent maritime diplomacy. Second, technical and resource limitations, particularly in surveillance systems and defense readiness, demand greater investment in technology and skilled human capital. Third, interagency and cross-border coordination must be improved, as maritime security requires collaboration among the navy, police, maritime security agencies, and port authorities. Indonesia's non-aligned foreign policy helps maintain balanced relations with major powers while supporting regional cooperation.

Indonesia's defense diplomacy adopts a humanistic and capacity-building approach. Joint trainings prioritize skill development, technological integration, and sustainable maritime governance. Emerging non-traditional threats piracy, smuggling, terrorism, and environmental degradation demand collective and coordinated responses. Thus, intelligence sharing and data fusion in ASEAN, IORA, and other maritime platforms become essential.

Technological modernization is crucial. Satellite-based monitoring, drones, and integrated maritime communication networks are necessary to enhance surveillance. With adequate international support, Indonesia could lead the development of eco-friendly maritime security technologies and foster human resource development through collaborative training programs. According to Trager (2016), diplomacy functions as a strategic instrument to project intent, reduce tensions, and shape perceptions. As a middle power, Indonesia avoids entanglement in major power rivalries while defending maritime sovereignty. Keohane (2020) emphasizes that multilateral institutions are vital in conflict-prone regions to facilitate cooperation and build trust.

Multilateral exercises such as Komodo and RIMPAC embody Indonesia's dual strategy: strengthening defense interoperability while preserving strategic autonomy (Clausen & Albrecht, 2021). Wernli (2023) highlights multilayered governance through computational diplomacy, as reflected in Indonesia's involvement with the Information Fusion Centre (IFC) and ReCAAP. Fanoulis & Revelas (2022) stress normative diplomacy and strategic communication tools Indonesia uses to project its image as a constructive maritime actor.

Morgado's (2023) neoclassical geopolitical model views Indonesia's Global Maritime Fulcrum doctrine as blending domestic ambitions with regional engagement. Strategic narratives, as noted by Jaworsky & Qiaoan (2021), are key to navigating global discursive rivalries. Indonesia's multilateral approach, thus, represents a layered, adaptive, and principled maritime diplomacy.

3.4 Maritime defense strategy based on collaboration and technology at Indo-Pacific chokepoints

Indonesia, the world's largest archipelagic state, holds a central position within the Indo-Pacific maritime security landscape. Spanning over 17,000 islands, its waters intersect critical chokepoints such as the Malacca Strait, Sunda Strait, Lombok Strait, and the North Natuna Sea key routes for global trade and energy supply chains. While this geography offers strategic leverage, it also exposes Indonesia to a range of non-traditional security threats, including piracy, smuggling, illegal fishing, and growing geopolitical tensions.

To effectively address these challenges, Indonesia requires a modern, integrated, and adaptive maritime defense posture. Central to this approach is the implementation of Maritime Domain Awareness (MDA) a system that integrates surveillance data from various platforms such as satellites, coastal radars, unmanned aerial vehicles (UAVs), and underwater sensors to produce real-time situational awareness. MDA enables early detection of threats, supports rapid response, and enhances interagency coordination among the Indonesian Navy/*Tentara Nasional Indonesia Angkatan Laut* (TNI AL), Maritime Security Agency/*Badan Keamanan Laut* (Bakamla), Coast Guard, and other relevant stakeholders.

The effectiveness of MDA depends on both technological infrastructure and institutional interoperability. Domestically, coordination between naval forces, maritime police, and port authorities is essential to prevent duplication and improve responsiveness. Regionally, Indonesia must pursue interoperability and data-sharing protocols with Indo-Pacific partners through joint patrols, exercises, and digital collaboration. As Tijan et al. (2021) note, Port Community Systems (PCS) play a vital role in enabling secure and efficient maritime governance through collaborative digital ecosystems.

Port infrastructure and competitiveness are integral to maritime defense. According to Wahyuni et al. (2020), enhancing port resilience requires synchronized efforts in government policy, business cooperation, and logistical efficiency. However, persistent obstacles such as weak infrastructure, bureaucratic inefficiency, and underdeveloped digital systems must be addressed through strategic reforms, professional training, and the adoption of smart port technologies.

Yang & Hsieh (2024) further emphasize 13 critical success factors for post-pandemic port digitalization ranging from safety and standardization to carbon management and real-time data integration. Strengthening port resilience directly supports MDA by ensuring that commercial and security data can be seamlessly merged into a unified system for maritime surveillance and decision-making. In this increasingly digital maritime ecosystem, cybersecurity emerges as a critical domain.

Truong et al. (2020) argue that Artificial Intelligence (AI) has both offensive and defensive applications, from detecting anomalies in network traffic to automating threat responses. Therefore, MDA systems must be built on secure architectures, integrating ethical AI, human-in-the-loop design, and robust data governance. Toth (2023) introduces the Industry 5.0 framework, emphasizing the human-technology interface, where advanced automation is aligned with human oversight and organizational objectives. Similarly, Solem et al. (2021) advocate service design routines in smart maritime systems, where operational end-users such as TNI AL and Bakamla are directly involved in co-developing tools and interfaces tailored to field needs. Ultimately, as Zeiringer & Thalmann (2021) argue, Indonesia's maritime defense strategy must transcend conventional military approaches. A future-ready posture demands a synergy of cutting-edge technology, institutional collaboration, smart infrastructure, and human-centric innovation to safeguard national sovereignty and solidify Indonesia's role as a leading maritime power in the Indo-Pacific.

3.5 Indonesia's strategic doctrine: Global maritime fulcrum and its operationalization

The relevance of the Global Maritime Fulcrum (GMF) concept to Indonesia's maritime defense policy is inextricably linked to Indonesia's geographic location at the heart of the

Indo-Pacific and its control over several strategic sea lanes, including the Sunda Strait, the Lombok Strait, and the Malacca Strait. This doctrine was introduced by President Joko Widodo in 2014 as a major vision for restoring Indonesia's identity as a maritime nation. In principle, the GMF emphasizes five main pillars: maritime culture development, marine resource management, maritime infrastructure and connectivity development, maritime diplomacy, and strengthening maritime defense. (Rochwulaningsih et al., 2019) Within the framework of maritime defense, the final pillar is particularly relevant because it directly relates to efforts to maintain territorial sovereignty, protect trade routes, and ensure maritime security as the nation's living space.

The GMF, in the context of maritime defense, emphasizes that Indonesia's maritime strength is not solely oriented toward sea-based economic development but must also be supported by strong military and institutional strength. The Indonesian Navy/*Tentara Nasional Indonesia Angkatan Laut* (TNI AL) is the primary actor bearing strategic responsibility for implementing this vision. Increasing fleet capacity, establishing naval bases at strategic locations, and strengthening maritime monitoring systems are concrete manifestations of the operationalization of the PMD doctrine. However, to make PMD more than just political jargon, its implementation at the defense policy level must be synergistic with medium- and long-term development plans, particularly through the Maritime Defense Strategic Plan/*Rencana Strategis* (RENSTRA).

The Strategic Plans/*Rencana Strategis* (RENSTRA) of the Ministry of Maritime Affairs and Fisheries (KKP) and the Strategic Plan (RENSTRA) of the Indonesian Navy/*Tentara Nasional Indonesia Angkatan Laut* (TNI AL) are crucial documents that serve as implementation instruments for the PMD vision. On the one hand, the KKP RENSTRA places greater emphasis on marine resource management, fisheries surveillance, and improving the welfare of fishermen. On the other hand, the TNI AL RENSTRA focuses on modernizing defense equipment, restructuring the organization, and enhancing combat readiness. A key aspect of Indonesia's maritime defense doctrine is the Minimum Essential Force (MEF) concept, designed to ensure the TNI's minimum essential strength can guarantee the security of its sovereign territory. The MEF, launched in 2010, consists of three development phases until 2024, with the ultimate goal of establishing a credible, modern, and formidable maritime defense force. In relation to the PMD, the MEF serves as the backbone to ensure that Indonesia's rhetoric as a maritime axis truly has a tangible military strength base.

However, there is a gap between the PMD rhetoric as a grand strategy and the reality of operational implementation on the ground. First, the modernization of the Indonesian Navy's defense equipment (*alutsista*) has been slower than planned, largely due to a limited defense budget, which averages only 0.8–1% of GDP. This situation makes it difficult for Indonesia to fully achieve the MEF targets, particularly in the procurement of submarines, modern warships, and high-tech defense systems. Second, the development of naval bases in eastern Indonesia, which are crucial for securing ALKI II and III, remains suboptimal. Third, the inter-agency synergy that should strengthen maritime security between the Indonesian Navy, Law and Security Agency, the Ministry of Maritime Affairs and Fisheries), and the Maritime Police is often hampered by overlapping authorities. This has weakened the effectiveness of maritime law enforcement, despite Indonesia's rhetorical assertion of itself as a maritime axis nation.

Furthermore, there are gaps in maritime diplomacy. The PMD emphasizes Indonesia's active diplomacy in maritime cooperation, but in practice, Indonesia often faces a dilemma between upholding the principle of an independent and active foreign policy and the need to forge closer strategic partnerships amidst the rivalry between the United States and China. This is evident in Indonesia's stance on regional security initiatives such as the Quad or AUKUS, where Indonesia is cautious about being trapped in a particular political bloc. This gap between the PMD's idealism and geopolitical reality demonstrates that the implementation of Indonesia's maritime strategy still needs to adapt to rapidly changing regional dynamics.

Comparison with the maritime strategies of other countries in the Indo-Pacific provides important perspective on Indonesia's position. India, for example, promotes the Security and Growth for All in the Region (SAGAR) doctrine, which emphasizes India's role as a provider of public security in the Indian Ocean. This doctrine is complemented by maritime infrastructure development, joint patrols, and cooperation with small island states to enhance their security capabilities. India consistently positions its Navy as an instrument of power projection, with its fleet of aircraft carriers and nuclear submarines giving it a superior position compared to Indonesia in terms of hard power.

Australia, through its Indo-Pacific Step-Up initiative, places greater emphasis on increased diplomatic engagement, development assistance, and defense cooperation with Pacific nations. This strategy is rooted in Australia's interest in maintaining stability in the South Pacific region while balancing Chinese influence. From a defense perspective, Australia is undertaking major modernization efforts, including plans to acquire nuclear-powered submarines through AUKUS. This demonstrates a strong coherence between strategic rhetoric and implementation, in contrast to Indonesia's continued resource constraints.

Meanwhile, China is promoting the Maritime Silk Road (MSR) strategy as part of its Belt and Road Initiative (BRI). The MSR is not merely an economic project but also a geopolitical instrument to expand Chinese influence through the construction of ports, logistics routes, and maritime cooperation with various countries. (Celik et al., 2024) Beneath the rhetoric of joint development, the MSR carries military implications, as the ports it constructs have the potential to serve as logistics bases for the Chinese Navy. China's strategy demonstrates a high degree of consistency between its grand strategy, substantial funding, and concrete infrastructure implementation. In comparison, Indonesia, with its PMD, appears to still be in the internal consolidation stage, unable to fully articulate its vision into a foreign and defense policy as robust as China's.

This comparison demonstrates that Indonesia's position within the Indo-Pacific maritime architecture remains defensive and reactive compared to major powers that have combined maritime strategy with military power and more integrated economic diplomacy. Nevertheless, the PMD still holds significant potential as a strategic doctrine if the implementation gap can be narrowed through concrete steps: increasing maritime defense budget allocations, accelerating defense equipment modernization, integrating cooperation between maritime institutions, and strengthening defense diplomacy capacity. Thus, the PMD can evolve from a mere political vision into a maritime defense doctrine with real leverage in the Indo-Pacific geopolitical arena.

3.6 Socio-economic and ecological implications of chokepoint management

Effective management of the Sunda and Lombok Straits is increasingly vital, as recent studies show both socio-economic benefits and ecological risks that demand urgent attention. For example, the implementation of the Traffic Separation Scheme (TSS) in Lombok Strait has been demonstrated to improve maritime environmental safety, particularly by reducing risky vessel behavior and pollution (Priadi et al., 2024). Such governance enhancements contribute to improved shipping safety, lower logistics costs, and greater predictability for trade, reinforcing Indonesia's competitiveness in global supply chains.

Beyond trade, energy security forms a critical dimension: the straits are corridors for substantial oil, gas, and other fuel transit. Disruptions due to environmental disaster or poor navigational governance could inflate energy costs regionally, heightening vulnerability. Concurrently, coastal and island communities face both opportunity and risk. Fisheries, tourism, and port economies depend on clean seas and safe shipping lanes; pollution or ecological degradation erodes livelihoods.

Ecologically, emerging evidence underscores growing threats. The Lombok region, for instance, suffered widespread coral bleaching in 2020, impacting biodiversity and reef ecosystem services to local communities (Ghafari et al., 2025). High shipping density also

brings issues like marine pollution (oil, grey water, solid waste), underwater noise, and risk of accidental spills. IMO's revised guidelines on Underwater Radiated Noise (URN) are relevant here; new efforts aim to reduce ecological harm from shipping noise and protect marine life (IMO, 2023). To balance these multiple concerns, Indonesia could adopt integrated chokepoint governance. This might include stricter environmental monitoring in high-traffic areas; aligning naval and defense patrol operations with stewardship norms; enforcing IMO and MARPOL regulations; and engaging multilateral partners in data sharing, ecological risk assessment, and joint environmental protection measures.

By doing so, Indonesia can ensure that maritime security is not only about sovereignty and defense, but also contributes to SDG 14 (Life Below Water) through protection and restoration of marine ecosystems, and to SDG 16 (Peace, Justice, and Strong Institutions) by promoting transparency, accountability, and rule-based governance across maritime domains. The following table (Table 1) summarizes the key elements of Indonesia's naval posture capacity, neutrality, and cooperation and their corresponding contributions to sustainable maritime governance and the achievement of SDG 14 and SDG 16. This integrated framework highlights how strengthening naval capabilities and multilateral engagements can simultaneously enhance maritime security, protect marine ecosystems, and foster institutional resilience.

Table 1. Summary of Indonesia's naval posture elements and their strategic linkages to SDGs

Naval Posture Element	Characteristics	Strategic Relevance in the Sunda and Lombok Straits	Link to SDG 14 (Life Below Water)	Link to SDG 16 (Peace, Justice, and Strong Institutions)
Capacity	Modernization of naval fleets, domain awareness systems, and maritime surveillance technologies.	Enhances Indonesia's ability to monitor, respond, and secure maritime chokepoints against transnational threats.	Supports sustainable ocean use by reducing illegal fishing and marine pollution through better surveillance.	Promotes institutional resilience and rule-based maritime law enforcement.
Strategic Neutrality	Adherence to non-alignment while engaging constructively with multiple regional powers (ASEAN Outlook on the Indo-Pacific).	Maintains Indonesia's autonomy amid great-power rivalry and upholds freedom of navigation principles.	Prevents military escalation that could endanger marine ecosystems and coastal communities.	Strengthens peaceful dispute resolution and reinforces Indonesia's diplomatic credibility.
Multilateral Cooperation	Participation in ASEAN-led mechanisms, IORA, and coordinated patrols with Australia, India, and Japan.	Expands maritime interoperability and collective response capabilities for security and sustainability.	Facilitates regional marine conservation, joint monitoring, and ecological data exchange.	Enhances transparency, interagency coordination, and regional trust-building mechanisms.

3.7 Policy implications and future strategic directions

Indonesia's maritime defense policy stands at a crucial intersection between the urgent need to strengthen maritime sovereignty and the demands of adapting to changes in the global strategic environment. Indonesia's geographical position, which controls three Indonesian Archipelagic Sea Lanes/*Alur Laut Kepulauan Indonesia* (ALKI) as well as the Sunda and Lombok Straits, makes it not only the largest archipelagic nation but also a key point in the Indo-Pacific security architecture. Therefore, various policy implications must be addressed to ensure that Indonesia's vision as a Global Maritime Axis does not remain mere rhetoric but is realized through consistent and long-term strategic steps.

3.7.1 Modernization of the Indonesian navy

The most urgent policy recommendation is to accelerate the modernization of the Indonesian Navy/*Tentara Nasional Indonesia Angkatan Laut* (TNI AL). Currently, most Indonesian warships are over 30 years old, with limitations in terms of weapons systems, radar, and interoperability. The Minimum Essential Force (MEF) concept, targeted for achievement by 2024, still faces numerous obstacles, particularly in the procurement of submarines, modern frigates, and high-tech weapons systems. Modernization does not only involve defense equipment, but also the development of a multi-layered defense system capable of integrating naval fleets, maritime air power, and satellite-based surveillance. Concrete steps that need to be prioritized include: first, investment in stealth-capable submarines and surface vessels to increase deterrence. Second, construction of naval bases in eastern Indonesia, particularly around the Lombok Strait and Ombai Strait, to strengthen surveillance of ALKI II and III. Third, increasing personnel capacity through joint international exercises to enable the Indonesian Navy to operate within a multilateral framework. Fourth, integrating maritime defense doctrine with cyber and space defense concepts, considering that modern warfare occurs not only in the physical domain but also in the digital domain.

3.7.2 Accelerating maritime infrastructure development

Besides military modernization, accelerating maritime infrastructure development is an equally strategic policy. Port infrastructure, shipyards, and the national logistics system must be developed to support both defense and economic functions. Maritime security is inseparable from the sustainability of maritime trade, so investment in infrastructure has a dual dimension: increasing economic competitiveness while strengthening national resilience. Major ports in Indonesia, such as Tanjung Priok, Tanjung Perak, and Bitung, must be equipped with modern security facilities, including digital access control, automatic container scanners, and integrated monitoring systems. Furthermore, port development in border areas such as Natuna, Morotai, and Saumlaki must be accelerated so that they function not only as economic hubs but also as defense logistics bases.

3.7.3 Strengthening maritime security agency and digitalizing the MDA system

The Maritime Security Agency/*Badan Keamanan Laut* (Bakamla) plays a crucial role in integrating maritime security functions across agencies. Currently, coordination between Bakamla, the Indonesian Navy, the Ministry of Maritime Affairs and Fisheries/*Kementerian Kelautan dan Perikanan* (KKP), and the Maritime Police still faces challenges due to overlapping authority. To strengthen Bakamla's effectiveness, institutional reforms are needed that provide a clear mandate as the national coast guard. Furthermore, Bakamla's strengthening must be accompanied by the digitalization of the Maritime Domain Awareness (MDA) system. This system allows Indonesia to monitor all activities in its waters through the integration of data from the Automatic Identification System (AIS), coastal radar, remote sensing satellites, and maritime drones. Digitizing the MDA will accelerate early detection of threats, from illegal fishing to potential foreign submarine infiltration. By establishing an integrated MDA command center, Indonesia can improve patrol effectiveness and expand surveillance coverage without significantly increasing the number of vessels.

3.7.4 Implications for the blue economy and marine sustainability

The Blue Economy concept positions the sea not only as a defense space but also as a pillar of sustainable development. (Cisneros-Montemayor et al., 2022) Integrating maritime security with marine-based economic development can create strategic synergies. For example, stable maritime security will support investment in the fisheries sector, marine

renewable energy, and marine tourism. Conversely, sustainable management of marine resources will reduce the potential for conflict, both between fishermen and between countries.

In this context, Indonesia's maritime defense policy must consider environmental security aspects. The development of ports and maritime industries must be equipped with sustainability standards to avoid damaging marine ecosystems. Furthermore, maritime security must include efforts to combat marine pollution, protect coral reefs, and prevent overexploitation of resources. Thus, maritime defense and the Blue Economy can work hand in hand as a comprehensive strategy.

3.7.5 The importance of maritime cybersecurity

The digital era presents a new dimension to maritime security: cybersecurity. Modern ship navigation systems rely on AIS, electronic radar, and satellite communications, which are vulnerable to cyberattacks. Attacks on these systems could paralyze trade routes, mislead ship navigation, or even open the door to foreign military infiltration. To anticipate this threat, Indonesia needs to establish a dedicated maritime cybersecurity unit integrated with the Indonesian Navy/*Tentara Nasional Indonesia Angkatan Laut* (TNI AL), the Maritime Security Agency/*Badan Keamanan Laut* (Bakamla), and the National Cyber and Crypto Agency/*Badan Siber dan Sandi Negara* (BSSN). These efforts include: first securing national AIS data to prevent it from being easily manipulated by foreign parties. Second, protecting the Indonesian Navy's radar and satellite systems from malware attacks or eavesdropping. Third, Training maritime personnel in digital forensics and cyber incident response. Fourth, international cooperation in maritime cybersecurity, particularly with Indo-Pacific countries facing similar threats.

3.7.6 Indonesia's role in the Indo-Pacific rule-based order

Indonesia has a strategic interest in establishing an inclusive, collaborative, and rules-based Indo-Pacific security architecture. As a non-aligned country with an independent and active foreign policy, Indonesia can play the role of an honest broker, bridging the interests of the United States, China, India, and ASEAN countries. Through forums such as the ASEAN Outlook on the Indo-Pacific (AOIP), Indonesia can promote a maritime cooperation agenda that emphasizes transparency, trust, and peaceful dispute resolution mechanisms. Active involvement in multilateral exercises, joint patrols, and maritime data exchange will strengthen Indonesia's credibility as a regional leader on maritime security issues. By prioritizing an inclusive approach, Indonesia can ensure that the Indo-Pacific is not polarized by great power rivalry but rather becomes a region of mutual cooperation.

3.7.7 Long-term scenario: Indonesia as a middle maritime power

In the long-term scenario, Indonesia has the potential to become a middle maritime power with normative leadership in the Indo-Pacific. This status does not mean Indonesia must possess a military power as large as the United States or China, but rather must be a regional actor with significant influence, both in international norms, security capacity, and maritime diplomacy. To achieve this, Indonesia needs to: first, complete the development of the MEF and then shift to a more offensive Credible Defense Force concept. Second, strengthen defense diplomacy networks with key Indo-Pacific countries. Third, become a pioneer in non-traditional security issues, such as fisheries security, climate change, and maritime energy security. Fourth, integrate technological innovation in maritime defense, including artificial intelligence, big data analytics, and unmanned systems. With a combination of credible hard power and soft power based on international norms, Indonesia can solidify its position as a respected middle maritime power. This normative leadership is crucial to ensuring that Indonesia's national interests align with the stability of the broader Indo-Pacific region.

4. Conclusions

This study highlights that the effective management of the Sunda and Lombok Straits plays a strategic role in balancing maritime security and environmental sustainability. Through an analysis of Indonesia's naval posture encompassing capacity, neutrality, and multilateral cooperation it is evident that Indonesia's naval strength contributes not only to sovereignty and regional stability but also to the achievement of SDG 14 (Life Below Water) and SDG 16 (Peace, Justice, and Strong Institutions). The integration between defense strategy and international collaboration underscores the importance of synergy between hard power and soft diplomacy in realizing sustainable maritime governance.

However, the current policy recommendations remain relatively general. Therefore, this study suggests the inclusion of more specific and actionable policy proposals, such as: first, developing regional maritime governance mechanisms under ASEAN or IORA frameworks to strengthen coordination in maritime security and environmental conservation. Second, embedding sustainability clauses in defense cooperation agreements and joint exercises to align military activities with marine conservation objectives. Third, integrating naval policy with national marine conservation policy, particularly in monitoring coastal ecosystems and mitigating environmental risks associated with high shipping density. Then, by adopting more targeted and evidence-based policies, Indonesia can further reinforce its role as a global maritime fulcrum one that is not only resilient in defense but also firmly committed to sustainability and responsible ocean governance.

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Author Contribution

Conceptualization, R.S, A.A and L.Y.; Methodology, R.A.; Software, R.A.; Validation, A.A. and L.Y.; Formal Analysis, L.Y.; Investigation, A.A.; Resources, R.S.; Data Curation, A.A.; Writing – Original Draft Preparation, R.S.; Writing – Review & Editing, A.A.; Visualization, L.Y.; Supervision, A.A.; Project Administration, L.Y.; and Funding Acquisition, A.A..

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Written informed consent has been obtained from the participants to publish this paper, if applicable.

Data Availability Statement

The data supporting the findings of this study, entitled Linking maritime security and sustainability: Indonesia's naval posture and multilateral engagements in the Sunda and Lombok Straits toward SDG 14 and SDG 16, are available from the corresponding author upon reasonable request. Due to the sensitive nature of certain maritime security information, some data cannot be publicly disclosed in order to protect national security interests and comply with applicable confidentiality agreements.

Conflicts of Interest

The authors declare no conflict of interest. The research titled Linking maritime security and sustainability: Indonesia's naval posture and multilateral engagements in the Sunda and Lombok Straits toward SDG 14 and SDG 16 was conducted independently. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

Declaration of Generative AI Use

During the preparation of this work, the author used Grammarly to assist in improving grammar, clarity, and academic tone of the manuscript. After using this tool, the author reviewed and edited the content as needed and took full responsibility for the content of the publication.

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