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Reconfiguring maritime defense technology for an archipelagic power: An opinion on Indonesia's strategic pivot toward indigenous, autonomous, and interoperable naval capabilities

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ABSTRACT

Indonesia stands at a strategic inflection point in maritime defense technology. As the world's largest archipelagic state, custodian of approximately 5.8 million square kilometers of maritime jurisdiction, and a middle power positioned across the geostrategic seam of the Indo-Pacific, the country faces an intensifying convergence of grey-zone coercion, naval modernization races, and technological disruption from autonomous systems. This opinion article argues that Indonesia's prevailing acquisition-led modernization paradigm—dominated by heterogeneous foreign platforms procured under fiscal constraint—is structurally insufficient to deter contemporary maritime threats, particularly persistent incursions in the North Natuna Sea and the broader contest over the South China Sea. Drawing on Mahanian sea power theory, the resource-based view of national defense industries, and emerging frameworks of archipelagic defense, the author contends that maritime defense technology should be reconceptualized not as a portfolio of imported assets but as a sovereign capability stack integrating indigenous design, autonomous and unmanned systems, maritime domain awareness, and interoperable command-and-control. The article evaluates recent milestones—the KSOT-008 autonomous submarine, the Bung Tomo-class modernization under the R41 program, and the indigenous Combat Management System—and argues that without coordinated industrial policy, technology-transfer governance, and human-capital development, these advances risk becoming isolated showcases rather than systemic capability. The piece closes with five policy recommendations for Indonesian defense planners, industry stakeholders, and the broader scholarly community studying maritime security in archipelagic developing economies.

Keywords: maritime defense technology; archipelagic state; autonomous underwater vehicles; defense industrial base; Indo-Pacific security; Indonesia.

1. INTRODUCTION

The maritime domain has reemerged, with unusual force, as the principal theater in which the geopolitical contests of the early twenty-first century are being adjudicated. For Indonesia, this reemergence is not abstract. It is materially present in the North Natuna Sea, where Chinese coast guard vessels and quasi-civilian research ships have engaged in sustained grey-zone operations, in the persistent Illegal, Unreported, and Unregulated (IUU) fishing pressures along the country's exclusive economic zone, and in the structural transformation of regional naval capabilities driven by autonomous systems, artificial intelligence, and integrated combat networks (Lee et. al, 2022). The question facing Indonesian defense planners, industry leaders, and the broader scholarly community is no longer whether maritime defense technology must be modernized, but whether the prevailing modernization paradigm is conceptually equal to the threats it claims to address.

This article advances a single, sustained argument: Indonesia's current trajectory in maritime defense technology—oriented toward heterogeneous foreign acquisitions financed under chronic budgetary constraint—is necessary but insufficient. The state has indeed achieved important milestones, including the public unveiling of the KSOT-008 autonomous submarine prototype, the comprehensive R41 refurbishment of legacy frigates and corvettes, and the indigenous development of a Combat Management System (CMS) by PT PAL Indonesia (Maritime Executive, 2025; PT PAL Indonesia, 2025). Yet these achievements coexist with a fragmented procurement portfolio drawn from the United Kingdom, France, Italy, Turkey, South Korea, and the Netherlands, with attendant logistical, interoperability, and maintenance costs. The argument here is that the country needs to move from acquisition-led modernization to capability-led, sovereignty-anchored maritime defense technology development—a paradigm in which indigenous design, autonomous platforms, maritime domain awareness, and interoperable command-and-control are pursued not as separate procurement lines but as an integrated capability stack.

The opinion is structured as follows. The next section establishes the conceptual scaffolding by synthesizing Mahanian sea power theory, archipelagic defense doctrine, and the resource-based view of national defense-industrial capability. The article then assesses the contemporary threat environment, with particular attention to grey-zone coercion in the North Natuna Sea and the broader Indo-Pacific naval competition. A subsequent section critically evaluates the current state of Indonesian maritime defense technology, examining four pillars—platform diversity, autonomous and unmanned systems, the indigenous industrial base, and human capital. The article then develops the central proposition that capability integration, rather than asset accumulation, is the binding constraint on Indonesia's maritime deterrence. The penultimate section advances five policy recommendations. The conclusion situates the argument within broader debates on middle-power defense strategy in an era of technological disruption.

2. CONCEPTUAL FRAMEWORK: SEA POWER, ARCHIPELAGIC DEFENSE, AND THE INDUSTRIAL BASE

2.1. Mahanian Foundations and Their Archipelagic Reinterpretation

Any rigorous opinion on maritime defense technology must begin with a clear theoretical anchor. The seminal framework remains Alfred Thayer Mahan's theory of sea power, which posits that national greatness is materially dependent on the ability to control sea lines of communication, to project naval force, and to integrate commerce, naval capability, and maritime culture into a coherent whole (Hudaya & Putra, 2018; Mahan, 1890/2007). For an archipelagic state, however, the classical Mahanian model requires substantial reinterpretation. Whereas Mahan's nineteenth-century paradigm

privileged blue-water fleet engagements between great powers, Indonesia's strategic geography demands a hybrid posture that combines sea denial in narrow archipelagic waters, sea control in chokepoints such as the Malacca, Sunda, and Lombok Straits, and selective sea projection within its expanded exclusive economic zone (Munabari & Sellita, 2024).

Recent scholarship on archipelagic defense doctrine, particularly in comparative analyses involving Indonesia and the Philippines, has refined this hybrid posture into what may be termed distributed maritime presence. Under this framework, deterrence is achieved not by a few large capital ships but by the layered integration of unmanned systems, persistent surveillance, coastal missile batteries, and rapidly reconfigurable naval task groups (Krepinevich, 2023). The implication is that maritime defense technology in archipelagic states cannot be evaluated solely against platform metrics such as tonnage or speed; it must instead be assessed against the network effects it produces across maritime domain awareness, decision velocity, and operational reach.

2.2. The Resource-Based View of Defense-Industrial Capability

A parallel theoretical anchor is provided by the Resource-Based View (RBV) of strategic management, originally formulated by Barney (1991) and extended into defense-industrial contexts by subsequent scholars. RBV holds that sustained competitive advantage—whether for firms or, by analogous logic, for national defense industries—derives from resources that are Valuable, Rare, Inimitable, and Non-Substitutable (VRIN). Applied to maritime defense technology, this framework suggests that platforms purchased from abroad, however advanced, cannot by themselves confer strategic advantage because they are imitable through subsequent acquisition by adversaries and substitutable through alternative platforms. What is genuinely strategic, in the RBV sense, is the indigenous capacity to design, integrate, and iteratively improve maritime defense systems—the human capital, tacit knowledge, integration know-how, and sovereign control over critical software, sensors, and combat management architectures (Boezer et al., 1997; Wernerfelt, 1984).

This theoretical move has direct policy implications. It reframes the long-standing Indonesian debate about technology transfer not as an ancillary commercial term in procurement contracts but as the central object of strategic negotiation. Whether Indonesia genuinely secures the design authority, source code access, software-defined sensor calibration capability, and combat management integration knowledge associated with the platforms it imports determines whether maritime defense technology becomes a sovereign capability or a perpetual rental arrangement (Laksmana, 2018).

2.3. Grey-Zone Coercion and the Technology of Below-Threshold Conflict

A third conceptual anchor concerns the technological signature of grey-zone conflict. Grey-zone activities—operations that are coercive but calibrated to remain below the threshold of armed conflict—are not, as is sometimes implied, a purely tactical or diplomatic phenomenon. They are deeply technological. The Chinese maritime militia, China Coast Guard, and quasi-civilian research vessels operating in the North Natuna Sea are enabled by an integrated technological infrastructure: satellite-based positioning and surveillance, hardened communications, fused civilian–military intelligence pipelines, and coast guard platforms whose tonnage and armament now rival those of conventional navies (Laksmana, 2018; Lee et. al, 2022). To respond to grey-zone coercion, therefore, requires a symmetrical or asymmetrical technological response—not necessarily kinetic, but persistently observational, attributable, and rapidly communicable to both domestic and international audiences.

These three frameworks—Mahanian sea power reinterpreted archipelagically, the resource-based view of defense industries, and grey-zone technology theory—collectively provide the analytical lens through which the subsequent assessment proceeds.

3. THE CONTEMPORARY MARITIME THREAT ENVIRONMENT

3.1. Persistent Grey-Zone Pressure in the North Natuna Sea

Between May and September 2025, the Indonesia Ocean Justice Initiative and independent monitors documented repeated operations by Chinese coast guard vessels and the research ship Nan Feng within Indonesia's claimed exclusive economic zone in the North Natuna Sea (Joenoes, 2026). The Ministry of Marine Affairs and Fisheries documented a 12 percent year-on-year increase in illegal fishing cases in the same waters during 2025, the majority involving Chinese vessels (Hutagalung, 2025). These are not isolated incidents but a sustained pattern that resembles the grey-zone tactics applied to other Southeast Asian claimant states, even though Indonesia is formally not a party to the South China Sea sovereignty disputes (Laksmana, 2018).

The strategic significance of these incursions exceeds their immediate operational footprint. They constitute a deliberate test of Indonesia's resolve, the responsiveness of its maritime domain awareness systems, and the political-economic costs Jakarta is willing to bear in defense of its EEZ. To date, Indonesia's response has combined naval and Bakamla (Maritime Security Agency) patrols, diplomatic notes, and the symbolic deployment of presidential visits and fishing fleets from Java (Fulcrum, 2023). Yet, as several analysts have argued, these responses have not materially altered Beijing's calculus, in part because the underlying maritime domain awareness gap allows Chinese activities to persist with limited international transparency (Yi, 2025; Joenoes, 2026).

3.2. Regional Naval Modernization and Technological Asymmetry

Beyond the bilateral pressure at Natuna, Indonesia operates within a broader regional environment of accelerating naval modernization. The People's Liberation Army Navy has launched multiple classes of advanced surface combatants and unmanned underwater vehicles, including the AJX-002 Extra-Large Unmanned Underwater Vehicle (XLUUV), with reported torpedo-equipped variants for reconnaissance and strike (Army Recognition, 2025). Australia, under the AUKUS framework, is developing the Ghost Shark autonomous underwater vehicle in partnership with Anduril Industries, while the United States Navy advances the Orca XLUUV program (Malufti, 2025; Maritime Executive, 2025). The Royal Navy is developing the Excalibur XLUUV. These programs collectively signal that the underwater domain—long the most strategically opaque element of maritime competition—is being transformed by autonomy and persistent unmanned presence.

This trajectory has profound implications for Indonesia. The country's submarine fleet, currently comprising legacy Type-209 boats and the two new Scorpène Evolved submarines being constructed by PT PAL in partnership with Naval Group of France, is small relative to the maritime jurisdiction it must monitor (Indonesia Business Post, 2025). Without complementary investment in unmanned underwater systems, persistent acoustic surveillance, and integrated maritime domain awareness, the asymmetry between Indonesia's underwater situational awareness and that of its larger neighbors will widen even as nominal platform counts increase.

3.3. Non-Traditional and Hybrid Threats

The threat environment also includes a layered set of non-traditional maritime challenges. These include transnational organized crime, drug trafficking through archipelagic chokepoints, environmental crimes such as IUU fishing and coral reef destruction, marine pollution incidents, and the increasing frequency of climate-driven maritime disasters requiring rapid naval humanitarian response. The technological implication is that Indonesian maritime defense capabilities must be dual-use by design—capable of switching seamlessly between high-end deterrence missions and low-intensity constabulary functions (Hudaya & Putra, 2018; Prasetyo et al., 2023). This dual-use

requirement, in turn, places a premium on modular platforms, networked sensors, and the kind of software-defined combat management systems that allow rapid mission reconfiguration.

3.4. The Current State of Indonesian Maritime Defense Technology: A Critical Assessment

Indonesia's contemporary maritime defense technology landscape is best assessed across four pillars: platform diversity and modernization, autonomous and unmanned systems, the indigenous defense-industrial base, and human capital. Each pillar exhibits genuine progress alongside structural constraints.

3.5. Pillar One: Platform Diversity and the R41 Modernization Program

The Indonesian Navy's fleet currently combines vessels from at least six countries of origin, including the United Kingdom (Bung Tomo-class corvettes/light frigates originally built by BAE Systems), South Korea (Type-209 Chang Bogo-class submarines), the Netherlands (Sigma-class corvettes), Indonesia (KCR-60M Sampari-class), and recent or pending acquisitions from France, Italy, and Turkey (Basundoro, 2025). Under the R41 program—a partnership between the Ministry of Defense and PT PAL—at least 41 vessels are being refurbished and enhanced through engine, hull, propeller, radar, communications, and weaponry upgrades (Indo-Pacific Defense Forum, 2025). The November 2025 launch of comprehensive modernization for KRI Bung Tomo (357) and KRI John Lie (358), with Thales Netherlands as combat system integrator and PT Len Industri as mission system integrator, exemplifies this trajectory (Malufti, 2025).

This modernization is genuinely consequential. The Bung Tomo-class upgrade incorporates new surveillance and tracking radars, a modern combat management system, fire-control solutions, communication systems, and electronic support measures. The October 2025 commissioning of KRI Belati-622, a 60-meter fast attack craft built domestically by Tesco Indomaritim with a hybrid water-jet and propeller propulsion system, represents a further milestone for the indigenous shipbuilding sector (Antara News, 2025a). Yet the underlying structural problem persists: a fleet drawn from multiple national standards imposes substantial logistical, training, and interoperability burdens, while constraining the country's ability to develop a coherent domestic combat-systems architecture (Laksmana, 2025; Basundoro, 2025).

3.6. Pillar Two: Autonomous and Unmanned Systems—The KSOT Trajectory

Arguably the most strategically significant development in Indonesian maritime defense technology over the past two years has been the public emergence of the *Kapal Selam Otonom* (KSOT) autonomous submarine program, developed by PT PAL Indonesia. The KSOT-008 prototype, unveiled during the 80th anniversary parade of the Indonesian Armed Forces (TNI) on October 5, 2025, is reported to have a length of approximately 15 meters, a beam of 2.2 meters, a displacement of 37 tons, a submerged endurance of up to 72 hours, a maximum speed of 20 knots, and an operational range of 200 nautical miles, with control via radio frequency or satellite communication through an Autonomous Submarine Command Center (ASCC) (Maritime Executive, 2025; Indonesia Business Post, 2025).

Three additional configurations of the KSOT—surveillance, one-way-attack (OWA), and torpedo-launch variants, with the latter capable of carrying two heavyweight torpedoes—have been announced for development, with reported partnerships involving Diehl Defence of Germany. The platform is built with reported indigenous content (TKDN) exceeding 50 percent, an important benchmark for sovereign capability metrics (Indonesia Business Post, 2025).

The strategic significance of the KSOT program cannot be overstated. It positions Indonesia among a small group of nations actively developing and fielding autonomous underwater vehicles with potential combat capability, alongside the United States (Orca), China (AJX-002), Australia (Ghost

Shark), and the United Kingdom (Excalibur). For a country whose submarine fleet is constrained by acquisition cost, training pipelines, and infrastructure, an indigenous autonomous platform offers a route to expanding underwater presence at a fraction of the cost per platform. Yet a candid assessment must also note that the KSOT remains, at the time of writing, a prototype with no announced commissioning timeline, and that the gap between technology demonstration and operationally fielded capability has, historically, been substantial across many national autonomous-systems programs.

3.7. Pillar Three: The Indigenous Defense-Industrial Base

PT PAL Indonesia, headquartered in Surabaya, has evolved from a state-owned shipbuilder into the anchor of a maritime defense-industrial cluster that includes PT Len Industri (mission systems integration), DEFEND ID (the state-owned defense industry holding), Tesco Indomaritim (smaller fast attack platforms), and an emerging set of private suppliers. PT PAL's unveiling of an indigenous Combat Management System (CMS) at Indo Defence 2025 marks a particularly important step, since CMS integration—the software backbone that fuses sensors, weapons, and communications across a warship—has historically been a chokepoint controlled by a small number of European and North American suppliers (Indonesia Business Post, 2025; PT PAL Indonesia, 2025).

However, the indigenous industrial base remains uneven. Sovereign capability is concentrated in a few state-owned enterprises, the supplier ecosystem of small- and medium-sized defense technology firms is thin relative to comparable middle-power industries, and critical subsystems—propulsion, advanced radars, undersea weapons, certain classes of sensors—continue to depend on foreign sources (Indonesia Business Post, 2025). The structural challenge is not whether Indonesia can build a ship, but whether it can build, integrate, sustain, and iteratively improve the full technology stack that makes a modern combat vessel effective.

3.8. Pillar Four: Human Capital and Operational Sustainment

The often-neglected fourth pillar is human capital. Naval modernization requires not only the platforms and the industrial base to build them, but also the operators, engineers, software developers, intelligence analysts, and logistical professionals to sustain them across decades-long service lives. Reports on the Bung Tomo-class modernization explicitly note the challenges of training and sustainment associated with operating heterogeneous foreign platforms, and the broader Basundoro (2025) assessment of Indonesian naval modernization identifies maintenance and training under a constrained 2025 navy budget of approximately USD 1.32 billion as a binding constraint.

For an emerging defense industry such as Indonesia's, the human-capital question is intimately connected to the technology-transfer question. Whether engineers at PT PAL, PT Len, and the universities and polytechnics that supply their workforce gain genuine design authority and integration know-how through foreign partnerships—rather than serving as assembly labor for foreign-designed platforms—will determine whether Indonesia's maritime defense technology trajectory is sustainable.

3.9. The Central Proposition: From Asset Accumulation to Capability Integration

The foregoing assessment supports the central proposition of this article: the binding constraint on Indonesia's maritime deterrence is not asset count, nor even budget per se, but capability integration. A fleet of heterogeneous foreign platforms, however individually capable, does not produce coherent deterrence if its sensors cannot fuse, its combat management systems cannot communicate, its training pipelines cannot scale, and its sustainment costs grow nonlinearly with platform diversity. Conversely, a smaller, more carefully composed force structure built around indigenous architectures, autonomous force multipliers, and high-quality maritime domain awareness can generate disproportionate deterrent effect.

This proposition aligns with broader empirical observations in the comparative defense studies literature. Israel, Singapore, South Korea, and Sweden—each a country with constrained budgets relative to potential adversaries—have generated outsized maritime and broader military capability precisely by emphasizing capability integration, indigenous design, and selective foreign partnership over heterogeneous accumulation (Boezer et al., 1997; Stockholm International Peace Research Institute, 2024). The opportunity for Indonesia is to selectively learn from these models while accounting for its distinct archipelagic geography, its developing economy, and its principled non-alignment in great-power competition.

Three subsidiary propositions follow from the central one. First, autonomous and unmanned systems—exemplified by the KSOT program—should be treated as the strategic pivot of the next decade of Indonesian maritime defense technology, not as supplementary capabilities. Unmanned platforms uniquely allow archipelagic states to extend persistent presence across vast maritime jurisdictions at a fraction of the per-platform cost of crewed vessels. Second, the indigenous Combat Management System, sovereign sensor calibration, and software-defined integration capabilities should be treated as strategic national assets on par with the platforms themselves. Third, maritime domain awareness—the fused, real-time picture of activity across Indonesia's maritime jurisdiction—should be reconceived as the integrative layer that connects platforms, autonomous systems, sensors, and decision-makers into a coherent deterrence architecture.

4. POLICY RECOMMENDATIONS

Five policy recommendations follow from the analysis. They are offered in the spirit of constructive opinion rather than prescriptive certainty, and they are scoped to the next planning horizon of approximately five to ten years.

4.1. Recommendation One: Codify a Capability-Integrated Modernization Doctrine

The Ministry of Defense and the Indonesian Navy should formally adopt and publicly articulate a capability-integrated modernization doctrine that explicitly prioritizes the coherence of the force structure over the accumulation of individual platforms. Such a doctrine would establish interoperability requirements at the outset of any procurement, mandate the integration of indigenous combat management systems wherever feasible, and create accountability mechanisms by which the marginal value of each procurement decision is assessed against systemic capability outcomes rather than platform-level metrics.

4.2. Recommendation Two: Treat the KSOT Program as a National Strategic Asset

The KSOT program should be elevated from a single-platform development effort to a national strategic asset with dedicated, multi-year funding, an explicit operational doctrine, and an integration plan with the broader fleet. Specific actions include: establishing a clear progression from the KSOT-008 prototype to operationally fielded variants; integrating the planned surveillance, OWA, and torpedo configurations into a coherent operational concept that includes anti-access/area-denial (A2/AD) layers around Natuna and other critical zones; and investing in the doctrinal, ethical, and legal frameworks governing autonomous lethal systems consistent with Indonesia's principled foreign policy posture and emerging international norms.

4.3. Recommendation Three: Reorient Technology-Transfer Negotiations Toward Sovereign Capability

Indonesia's technology-transfer terms in foreign procurement contracts should be reoriented from quantitative metrics such as TKDN percentages toward qualitative metrics of sovereign

capability: design authority, source-code access for combat and mission management systems, sensor calibration capability, weapons-integration know-how, and the right to indigenously modify, upgrade, and export derived platforms. Negotiations for the Scorpène Evolved submarine program, the ongoing partnerships with Thales Netherlands, and any future major acquisitions should be evaluated against these qualitative sovereignty metrics, not merely the headline numbers of co-production volumes.

4.4. Recommendation Four: Build a Distributed Maritime Domain Awareness Architecture

Indonesia should accelerate the construction of a distributed Maritime Domain Awareness (MDA) architecture that fuses satellite imagery, coastal radar networks, Automatic Identification System (AIS) feeds, undersea acoustic arrays, unmanned aerial and surface vehicles, and intelligence inputs from Bakamla, the Indonesian Navy, the Ministry of Marine Affairs and Fisheries, and regional partners. This MDA architecture should be sovereign in its core data and decision layers, while remaining selectively interoperable with partner nations through frameworks such as the existing maritime cooperation arrangements with Australia, Japan, France, and the United States (Indo-Pacific Defense Forum, 2025). The strategic value of such an architecture lies in its ability to attribute, document, and rapidly communicate grey-zone activities, thereby raising the political and reputational costs of below-threshold coercion.

4.5. Recommendation Five: Invest Systematically in Defense Human Capital and Supplier Ecosystems

Finally, Indonesia should commit to a long-term human-capital and supplier-ecosystem strategy that complements its hardware investments. Concrete elements include: expanded scholarships and graduate programs in naval architecture, marine engineering, autonomous systems engineering, defense software development, and operations research; structured rotational programs between PT PAL, PT Len, the Indonesian Navy, and foreign technology partners to accelerate tacit knowledge transfer; and a deliberate Small- and Medium-Sized Enterprise (SME) policy that nurtures a dense supplier ecosystem capable of providing the long tail of components, software, and services that any modern defense industry requires. These investments are slow-maturing but compounding; their absence will eventually constrain even the most ambitious platform programs.

4.6. Discussion: Strategic, Industrial, and Scholarly Implications

The argument advanced here has implications across three audiences. For Indonesian defense planners, the core implication is that the next planning cycle should be organized around capability integration metrics rather than platform-by-platform acquisition targets. The Minimum Essential Force (MEF) framework that has guided modernization through 2029 has produced important results but is, by construction, an inventory-oriented framework. Its successor should be a capability-oriented framework in which interoperability, indigenous combat management integration, and autonomous-systems coverage are first-class objectives (Indonesia Business Post, 2025; Munabari & Sellita, 2024).

For Indonesian industry stakeholders, the implication is that the window for transitioning from foreign platform assembly to sovereign capability development is open but narrow. The KSOT program, the indigenous CMS, and the R41 modernization create the substrate on which a genuinely sovereign maritime defense industry can be built—but only if industrial policy aligns financing, procurement, technology transfer, and human capital. The risk is that, absent coordinated industrial policy, individual milestones become showcase artifacts rather than systemic capability.

For the broader scholarly community studying maritime security, defense industries, and middle-power strategy, the Indonesian case offers a particularly rich empirical setting. It permits comparative inquiry into how archipelagic developing economies can pursue technology-intensive

deterrence under fiscal constraint, how the resource-based view of competitive advantage applies to national defense industries, and how grey-zone competition reshapes the technological requirements of maritime deterrence. The growing literature on archipelagic defense doctrine, including comparative work on the Philippines' Comprehensive Archipelagic Defense Concept (Indo-Pacific Defense Forum, 2025;), provides a productive analytical companion to Indonesian case studies.

4.7. Limitations and Anticipated Counterarguments

As an opinion article, this piece does not present primary empirical analysis and instead synthesizes available open-source reporting, policy literature, and conceptual frameworks. Several counterarguments to its central proposition deserve acknowledgment. First, critics may argue that Indonesia's constrained defense budget makes ambitious capability-integration objectives unrealistic. The response is that capability integration is, in fact, the most cost-efficient path under constraint: heterogeneous accumulation has higher lifecycle costs per unit of deterrence produced than coherent integration. Second, some may contend that diplomatic neutrality and ASEAN-centered legalism remain Indonesia's most appropriate responses to grey-zone pressure, and that emphasis on technological deterrence risks militarization (Yi, 2025). The response is that technological capability and diplomatic neutrality are complementary, not substitutable: credible capability strengthens, rather than undermines, the diplomatic position of a principled non-aligned state. Third, skeptics may question whether the indigenous defense industry can absorb the scale of investment implied by these recommendations. The response is that incremental scaling, tied to demonstrated capability milestones, is preferable to either stagnation or uncritical expansion.

Future research should pursue several lines of inquiry that this opinion article can only gesture toward: quantitative analysis of the lifecycle cost differentials between heterogeneous and homogeneous fleet compositions; structural equation modeling of the determinants of indigenous defense-industrial capability across comparable middle powers; bibliometric mapping of the emerging literature on archipelagic defense doctrine; and case studies of technology-transfer governance in major Indonesian procurement contracts. These methodological agendas would substantially strengthen the empirical base on which strategic opinions, including this one, ultimately rest.

5. CONCLUSION

Indonesia is, geographically and demographically, a maritime nation. Whether it becomes a maritime power in the full strategic sense will depend on choices being made now about how maritime defense technology is conceived, developed, integrated, and sustained. The argument of this article has been that the current acquisition-led modernization paradigm, however well-intentioned and however productive of individual milestones, is structurally insufficient for the threat environment of the late 2020s and beyond. A capability-integrated, sovereignty-anchored, autonomy-augmented paradigm is required.

The components of this paradigm are largely already present in nascent form: the KSOT autonomous submarine program, the indigenous Combat Management System, the R41 fleet modernization, and the emerging defense-industrial ecosystem anchored by PT PAL, PT Len, and DEFEND ID. The remaining task is one of coherence—of organizing industrial policy, procurement practice, technology-transfer governance, human-capital development, and operational doctrine around a single, integrated vision of what Indonesia's maritime defense technology should accomplish. That task is the responsibility of defense planners, industry leaders, scholars, and the broader public who together constitute the strategic community of an archipelagic state. The choices made in the coming planning cycle will shape not only the security of Indonesia's maritime jurisdiction but the

broader question of whether a middle power in the Indo-Pacific can build genuine technological sovereignty in an age of intensifying competition.

The opinion advanced here is offered as a contribution to that strategic conversation, in the conviction that ideas advanced in scholarly form can, modestly but consequentially, inform the choices that ultimately matter.

Ethical Approval

This study did not require ethical approval because it is based exclusively on published literature and did not involve human participants, animals, or identifiable personal data.

Informed Consent Statement

Not applicable because this study is a systematic literature review and did not involve direct data collection from participants.

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