

Risk-Based Defense Planning in Archipelagic States: Strategic Analysis, Methodological Framework, and Technological Integration in the Indo-Pacific

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Abstract: The volatile security environment of the Indo-Pacific demands that defense institutions adopt adaptive planning approaches beyond conventional threat-based models. This qualitative study examines Risk-Based Defense Planning (RBDP) implementation in archipelagic states, which face distinctive security challenges from dispersed territories, extensive maritime boundaries, and persistent sea blindness. Through systematic literature review and comparative analysis of defense planning frameworks in Indonesia and the Philippines, the study evaluates risk assessment methodologies including Multi-Criteria Decision-Making approaches specifically Fuzzy Analytic Hierarchy Process and Failure Mode and Effects Analysis for objective defense resource prioritization. The analysis also examines NATO's Risk-Based Framework for Strategic Planning as a reference model. Findings reveal three key patterns: (1) archipelagic states are shifting toward risk-oriented defense strategies, evidenced by the Philippines' Comprehensive Archipelagic Defense Concept and Indonesia's Global Maritime Fulcrum vision; (2) emerging technologies – Maritime Domain Awareness systems, unmanned vehicles, and low-earth orbit satellites are critical for situational awareness and risk mitigation; and (3) effective RBDP requires integration of military and non-military policies within total defense frameworks, supported by regional cooperation. The study contributes a synthesized RBDP framework for archipelagic contexts and offers policy recommendations for addressing hybrid threats, maritime security challenges, and climate-related risks. Limitations include the focus on two case countries and reliance on secondary sources.

Keywords: Archipelagic Defense Planning, Maritime Domain Awareness, Multi-Criteria Decision-Making, Risk-Based Defense Planning, Strategic Defense Planning

A. Introduction

The transformation of the global security environment in the last decade has forced defense institutions to abandon traditional static planning models (Sani et al., 2025). Risk-based defense planning emerged as a response to the complexity of the

environment characterized by high uncertainty, where threats are no longer monolithic but hybrid and multidimensional (Ainie et al., 2022). Unlike threat-based planning that focuses on “who” the enemy is, or capability-based planning that focuses on “what” can be done, RBDP emphasizes the “effect of uncertainty on objectives (Wildan Akbar Hashemi Rafsanjani et al., 2025). The current dynamics of the Indo-Pacific region are marked by increasing rivalry among major powers, tensions in the South China Sea, and the proliferation of multidimensional threats that are hybrid.

The uncertainty faced by defense planners is often epistemic, that is, uncertainty arising from a lack of knowledge, not merely statistical variation or aleatory (Gusriandari et al., 2024). Therefore, RBDP requires an analytical framework that is valid, verified, consistent, and transparent to support executive decision-making that is fiscally and strategically accountable (Saputro, 2021). Integrating risk management from the early stages of planning enables organizations to allocate resources efficiently, ensuring that critical areas receive attention proportional to the level of threat and potential impact (Kurnia et al., 2023). In this high-uncertainty condition, Risk-Based Defense Planning (Risk-Based Defense Planning or RBDP) emerges as a strategic response that emphasizes the effects of uncertainty on achieving state sovereignty objectives. For archipelagic states like Indonesia and the Philippines, geography is a determining factor that presents unique defense challenges (Juliana & Saputro, 2022).

Regions like in Philippines and Indonesia face extraordinary logistical challenges due to the dispersion of thousands of islands with very long coastlines (Amanda & Saputro, 2023). The sea in archipelagic countries has a dual role; it is a connector that facilitates trade and prosperity, yet at the same time becomes a barrier and a pathway of vulnerability to external threats as well as natural disasters (Sa'bani et al., 2025). The dispersion of thousands of islands and coastlines that are very long creates the phenomenon of “sea blindness”, where monitoring of sea areas continuously becomes very difficult to carry out. In addition, the existence of strategic straits (chokepoints) such as the Malacca Strait, Sunda, and Lombok demands strict surveillance because of their role as global trade routes as well as points of vulnerability to external threats (Harefa et al., 2025). Therefore, defense planning in archipelagic countries must be able to manage risks arising from the vastness of the maritime jurisdiction compared to the limitations of available resources.

At the regional level, a paradigm shift is beginning to be seen through the concept of more active territorial defense. The Philippines, for example, has launched Comprehensive Archipelagic Defense Concept (CADC) to leverage the archipelagic geography as a military advantage through forward defense (Saputro, 2022). Meanwhile, Indonesia through the vision of World Maritime Axis (Global Maritime Fulcrum) and the doctrine of Sishankamrata seeks to integrate military and non-military forces to safeguard national interests at the crossroads of two oceans (Sodik,

2018). However, the implementation of these strategies often faces constraints from defense budget limitations that are still below 1% of GDP, thus requiring strict priority mechanisms in resource allocation. To address subjectivity in strategic decision-making, the use of multi-criteria analytical methodology (MCDM) becomes very crucial.

The integration of methods such as Fuzzy AHP and Failure Mode and Effects Analysis (FMEA) has proven effective in minimizing bias and handling data uncertainty in risk assessment of defense (Tedyansyah et al., 2025). This methodology enables planners to evaluate the level of severity, probability of occurrence (occurrence), and detection capability (detection) against various threat spectra more accurately (Danio et al., 2025). Through this systematic study, it is hoped that a comprehensive defense planning framework can be found, which is capable of aligning strategic analysis, methodological sharpness, and technological superiority to ensure the stability and sovereignty of archipelagic states in the Indo-Pacific era.

The theoretical framework of this study is grounded in International Security Theory, particularly Structural Realism and Neoliberalism, to explain state behavior amid growing strategic uncertainty in the Indo-Pacific region (Susanti et al., 2025). Structural Realism views military capability and defense modernization as rational instruments for ensuring state survival, deterring aggression, and maintaining the regional balance of power within an anarchic international system (Nurjanah et al., 2025). From this perspective, defense modernization in archipelagic states such as Indonesia represents a strategic response to regional security dilemmas and evolving threats. In contrast, Neoliberalism emphasizes international institutions and security cooperation based on calculations of absolute gains, including burden sharing, technology transfer, and defense assistance. These perspectives are complemented by the evolution of defense planning paradigms from Threat-Based Planning to Capabilities-Based Planning and Risk-Based Defense Planning (Narahara et al., 2024). While Threat-Based Planning focuses on identifiable adversaries and anticipated conflict scenarios, CBP prioritizes the development of flexible capabilities to address multiple contingencies (Nadia et al., 2025). RBDP further advances this paradigm by placing uncertainty and its potential effects on strategic objectives at the center of defense decision-making, thereby providing a more adaptive approach to complex and unpredictable security environments.

The distinctive geographical and operational characteristics of archipelagic states are further examined through the concepts of Archipelagic Defense and Maritime Domain Awareness (Wicaksono, 2020). The Comprehensive Archipelagic Defense Concept (CADC) emphasizes the utilization of archipelagic geography as a strategic advantage through forward defense and the protection of critical maritime chokepoints, while the dispersion concept highlights the distribution of military forces across multiple islands to enhance resilience and operational survivability despite increasing logistical complexity (Darmawan, 2023). MDA provides a conceptual foundation for

developing comprehensive situational awareness of maritime activities that may affect national security and economic interests. The integration of low-earth orbit satellites, space-based surveillance, unmanned aerial vehicles (UAVs), and unmanned surface vehicles (USVs) is increasingly important for overcoming limitations in monitoring vast maritime territories (Keristanta Ginting & Statistika STIS, 2024). To enhance objectivity in defense risk prioritization, the Multi-Criteria Decision-Making (MCDM) perspective incorporates the Analytic Hierarchy Process (AHP), Failure Mode and Effects Analysis (FMEA), Fuzzy Logic, and Shannon Entropy. These approaches facilitate systematic criterion weighting, risk assessment based on severity, occurrence, and detection, the management of uncertainty in expert judgments, and objective determination of strategic priorities in defense resource allocation.

Based on this theoretical synthesis, the study addresses two research questions: (1) How can Risk-Based Defense Planning (RBDP) be implemented to address strategic uncertainty and the distinctive geographical and maritime security challenges faced by archipelagic states? and (2) How can an integrated RBDP framework incorporate objective risk-prioritization methodologies, emerging defense technologies, and total defense mechanisms to strengthen the resilience and sovereignty of archipelagic states?

B. Methods

This study adopts a qualitative comparative case study with a policy analysis approach to examine the implementation of Risk-Based Defense Planning (RBDP) in archipelagic states. Indonesia and the Philippines were selected as comparative cases because both countries possess extensive maritime territories, face similar hybrid security challenges, and have recently introduced defense modernization policies emphasizing maritime defense and capability transformation (Gusriandari et al., 2024). The study focuses on the 2020–2025 period, during which strategic competition in the Indo-Pacific significantly influenced national defense planning. The research follows a four-stage analytical framework consisting of (1) policy and literature review, (2) expert validation, (3) risk prioritization using Multi-Criteria Decision-Making (MCDM), and (4) synthesis of the Risk-Based Defense Planning framework. The systematic literature review serves to identify defense planning concepts, defense policies, capability development priorities, and strategic risks discussed in previous studies and official defense documents. These findings provide the preliminary analytical categories used throughout the subsequent stages of the research.

Primary data were obtained through semi-structured interviews with military officers, defense planners, maritime security experts, academics, and representatives of the defense industry. Informants were selected using snowball sampling because of their direct knowledge of defense planning and maritime security issues (Danio et al., 2025). The interviews were designed not only to validate the risks identified from

the literature but also to explore expert perspectives regarding threat likelihood, operational impact, capability gaps, and technological requirements for future defense planning.

The literature review and interview findings were integrated through a Multi-Criteria Decision-Making (MCDM) procedure to reduce subjectivity in strategic risk prioritization. Rather than functioning as an independent quantitative analysis, Fuzzy Analytic Hierarchy Process (Fuzzy AHP) was employed as a decision-support technique within the qualitative policy analysis. Fuzzy AHP was used to determine the relative importance of defense risk criteria based on expert judgments expressed through linguistic variables and converted into triangular fuzzy numbers. The evaluation criteria consisted of Severity (strategic impact on national defense), Occurrence (probability of threat occurrence), and Detection (the capability to detect or anticipate the threat). Shannon Entropy was subsequently applied to support objective criterion weighting and minimize evaluator bias.

The weighted criteria were then incorporated into Failure Mode and Effects Analysis (FMEA) to calculate the Risk Priority Number (RPN) for each identified defense risk. The RPN values enabled the ranking of military, non-military, and hybrid threats according to their relative strategic importance (Maolana & Wicaksana Prakasa, 2023). Subsequently, Capabilities-Based Planning (CBP) was applied to assess whether existing defense capabilities adequately addressed the highest-priority risks identified through the Fuzzy AHP-FMEA process. This integration allowed strategic risks to be systematically linked with defense capability requirements and resource allocation priorities.

Data analysis proceeded through five sequential stages: (1) identification and classification of defense risks from documentary sources and expert interviews; (2) validation of identified risks through expert triangulation; (3) weighting of evaluation criteria using Fuzzy AHP and Shannon Entropy; (4) prioritization of defense risks using FMEA and Risk Priority Number analysis; and (5) synthesis of policy recommendations through comparative analysis of Indonesia and the Philippines, supported by international best practices such as NATO's Risk-Based Framework for Strategic Planning. This sequential analytical process demonstrates how qualitative evidence, expert judgment, and structured decision analysis were integrated to construct the proposed Risk-Based Defense Planning framework. To enhance methodological rigor, credibility was established through data triangulation, comparing findings from defense policy documents, international defense databases, academic literature, and expert interviews. Dependability was strengthened by maintaining a transparent analytical procedure for coding, weighting, and risk prioritization (Alfarizi et al., 2025). In addition, the Consistency Ratio (CR) of the AHP pairwise comparison matrix was evaluated to ensure acceptable consistency of expert judgments before calculating the final risk priorities.

C. Results and Discussion

1. Results

Theme 1. Evolution of Defense Strategy in Archipelagic States

The findings demonstrate a significant transformation in the defense strategies of archipelagic states, particularly Indonesia and the Philippines, from conventional Threat-Based Planning toward Risk-Based Defense Planning (RBDP). The Philippines has institutionalized the Comprehensive Archipelagic Defense Concept (CADC), emphasizing forward defense, sea denial, and the protection of strategic maritime chokepoints. Meanwhile, Indonesia continues to strengthen its maritime-oriented defense posture through defense modernization and the Sistem Pertahanan dan Keamanan Rakyat Semesta (Sishankamrata), integrating military, reserve, and supporting components within the Total Defense framework (Shidqi Divreda Sulaeman et al., 2024). Both countries recognize that contemporary security challenges require adaptive capability development rather than reliance on conventional territorial defense alone.

Theme 2. Risk Identification and Prioritization

The study identified seven principal categories of defense and maritime security risks affecting archipelagic states through the analysis of policy documents and expert interviews. These risks encompass military, non-military, and hybrid threats with varying strategic implications for sovereignty, maritime security, and national resilience.

Table 1. Major Defense and Maritime Security Risks in Archipelagic States

Threat	Category	Strategic Risk	Main Actors	Required Response
Maritime Terrorism	Non-conventional	Disruption of strategic sea lanes and energy supply	Navy, Police, Maritime Security Agency	Intelligence, port security, and coordinated patrols
Armed Robbery at Sea	Non-military	Shipping and maritime trade disruption	Navy and Maritime Security Agency	Joint patrols and regional cooperation
Weapons and Goods Smuggling	Hybrid	Domestic instability and border vulnerability	Navy, Customs, and Police	Border surveillance and law enforcement
Illegal Fishing	Non-military	Economic losses and food security threats	Navy, Fisheries Authority, Maritime Security Agency	EEZ surveillance and law enforcement

Maritime Boundary Disputes	Strategic/Military	Sovereignty disputes and regional tensions	Navy and Ministry of Foreign Affairs	Military presence and defense diplomacy
Military Incursion	Military	Threat to territorial integrity	Armed Forces	Forward deployment and territorial defense
Cyber and Economic Threats	Hybrid	Disruption of critical systems and national resilience	Military and Civil Institutions	Integrated national defense response

The findings indicate that maritime boundary disputes, military incursions, cyber threats, maritime terrorism, illegal fishing, and transnational smuggling represent interconnected strategic risks rather than isolated security issues. Their multidimensional characteristics require integrated defense planning that simultaneously considers operational capability, institutional coordination, and resource allocation.

Theme 3. Methodological Integration through Fuzzy AHP-FMEA

The integration of Fuzzy Analytic Hierarchy Process (Fuzzy AHP) and Failure Mode and Effects Analysis (FMEA) provided a structured mechanism for defense risk prioritization (Datwurina & Rizkiana, 2022). Expert judgments were converted into triangular fuzzy numbers to accommodate uncertainty before calculating criterion weights based on Severity, Occurrence, and Detection. The weighted criteria were subsequently incorporated into the FMEA procedure to calculate the Risk Priority Number (RPN) for each identified defense risk. The analysis indicates that surveillance gaps, logistics delays, and detection failures constitute the highest operational priorities requiring immediate policy attention (De Castro, 2025). Furthermore, the application of the Pareto Principle revealed that a relatively small number of high-priority risks account for most overall defense risk exposure, thereby supporting more efficient resource allocation.

Theme 4. Technology Integration for Maritime Domain Awareness

The findings emphasize that technological integration is essential for overcoming maritime surveillance limitations in archipelagic environments. Maritime Domain Awareness (MDA) systems combine coastal radar, Automatic Identification System (AIS), satellite surveillance, and integrated command-and-control platforms to generate comprehensive maritime situational awareness. Emerging technologies including Low Earth Orbit (LEO) satellites, Synthetic Aperture Radar (SAR), Unmanned Aerial Vehicles (UAVs), Unmanned Surface Vehicles (USVs), and Unmanned Underwater Vehicles (UUVs) significantly enhance the detection of dark vessels and expand surveillance coverage across dispersed maritime territories.

Theme 5. Implementation Constraints and Challenges

Despite technological advancements, the implementation of Risk-Based Defense Planning faces several structural challenges. The findings identify three dominant constraints: limited fiscal resources for defense modernization; dependence on imported defense technologies; and institutional fragmentation among military, maritime, and civilian agencies. Regional cooperation initiatives, including the Indo-Pacific Partnership for Maritime Domain Awareness (IPMDA) and the Boe Declaration, partially mitigate these limitations by strengthening information sharing and maritime security cooperation among Indo-Pacific states.

2. Discussion

Theoretical Implications: Structural Realism and Neoliberalism

The findings reinforce the relevance of Structural Realism, which argues that states adapt their defense capabilities in response to changes in the external security environment. Indonesia's maritime defense modernization and the Philippines' adoption of CADC illustrate rational strategic responses to increasing geopolitical competition and maritime security uncertainty in the Indo-Pacific (Hudaya & Putra, 2018). At the same time, the importance of regional initiatives such as IPMDA demonstrates that Neoliberal Institutionalism also provides a valid explanatory perspective, as security enhancement increasingly depends upon institutional cooperation, information sharing, and collective burden-sharing mechanisms. Consequently, Risk-Based Defense Planning in archipelagic states should balance autonomous defense capability development with regional security collaboration.

Comparative Analysis with International Frameworks (NATO Risk-Based Framework for Strategic Planning)

The results are consistent with NATO's Risk-Based Framework for Strategic Planning (RBFSP), which integrates strategic risk assessment into long-term capability development and resource allocation (Hubler et al., 2022). Similar to the NATO approach, the proposed RBDP framework emphasizes systematic risk identification, capability prioritization, and adaptive decision-making under uncertainty. However, this study extends existing international frameworks by incorporating the distinctive characteristics of archipelagic states, including dispersed islands, extensive maritime jurisdictions, strategic sea lanes, and persistent maritime surveillance limitations (Ifaka et al., 2022). These geographical conditions require a stronger emphasis on maritime domain awareness, distributed force posture, and logistics resilience than conventional continental defense planning models.

Synthesis: An Integrated Risk-Based Defense Planning Framework for Archipelagic States

One of the principal contributions of this research is the development of an integrated Risk-Based Defense Planning framework specifically designed for archipelagic environments (Ifaka et al., 2022). The framework synthesizes five interrelated components: Strategic risk identification; structured risk prioritization through Fuzzy AHP-FMEA; capabilities-based planning; technology-enabled maritime domain awareness; and adaptive policy implementation supported by regional cooperation. Rather than treating these components independently, the proposed framework integrates them into a continuous decision-support cycle that enables defense planners to align strategic risks with capability development and resource allocation priorities.

Integration of Total Defense Mechanisms

The findings also demonstrate that effective Risk-Based Defense Planning requires the integration of military and non-military institutions within a Total Defense framework. Indonesia's Sishankamrata provides an institutional foundation for coordinating the Armed Forces, ministries, maritime agencies, law enforcement organizations, local governments, and strategic industries. Accordingly, Total Defense should be understood not merely as national mobilization but as an integrated governance mechanism combining strategic intelligence, interoperable technologies, inter-agency coordination, and evidence-based resource prioritization (Aslam, 2022). This broader interpretation strengthens national resilience against hybrid and multidimensional security threats.

Study Limitations and Implications

This study has several limitations. First, the comparative analysis is restricted to Indonesia and the Philippines, limiting the generalizability of the findings to other archipelagic states. Second, the study primarily relies on qualitative policy analysis and expert judgment, while the Fuzzy AHP-FMEA approach serves as a decision-support tool rather than a fully quantitative optimization model. Third, rapidly evolving defense technologies and geopolitical dynamics may influence future defense planning priorities beyond the temporal scope of this study. Despite these limitations, the study contributes both theoretically and practically by proposing a structured Risk-Based Defense Planning framework tailored to the unique security characteristics of archipelagic states (Bhumkar et al., 2025). The findings also provide practical guidance for policymakers in integrating strategic risk assessment, capability development, maritime surveillance technologies, and Total Defense mechanisms into future defense planning processes.

The application of the Multi-Criteria Decision-Making (MCDM) framework shows

that the integration of Fuzzy Analytic Hierarchy Process (Fuzzy AHP) and Failure Mode and Effects Analysis (FMEA) provides a systematic mechanism for assessing defense risks. Risk factors were evaluated according to severity, occurrence, and detection, while fuzzy logic was used to accommodate uncertainty in expert judgments. The prioritization process identified logistics delays, surveillance gaps, and detection failures as critical operational risks. The application of the Pareto Principle further indicated that a limited number of critical risks accounted for a substantial proportion of total defense risk exposure.

The findings also identify technology integration as a major component of maritime risk mitigation. Maritime Domain Awareness (MDA) systems integrate coastal radar, Automatic Identification System (AIS), and satellite-based surveillance to develop an integrated operational picture (Allodi & Massacci, 2017). The combination of Low Earth Orbit (LEO) satellites, Synthetic Aperture Radar (SAR), and AIS improves the identification of dark vessels, while UAVs, USVs, and UUVs expand surveillance coverage across geographically dispersed maritime areas. However, the findings reveal three major implementation constraints: limited fiscal capacity, dependence on foreign defense technologies, and institutional fragmentation between military and civilian maritime agencies (Maolana & Wicaksana Prakasa, 2023). Regional mechanisms, including the Indo-Pacific Partnership for Maritime Domain Awareness (IPMDA) and the Boe Declaration, were also identified as supporting instruments for information sharing and regional maritime security cooperation.

D. Conclusions

The findings demonstrate that Risk-Based Defense Planning (RBDP) has become increasingly important for archipelagic states facing complex and uncertain security dynamics in the Indo-Pacific. Indonesia and the Philippines have progressively shifted from predominantly internal security-oriented approaches toward active, maritime-centric territorial defense, as reflected in the Comprehensive Archipelagic Defense Concept (CADC) and Indonesia's maritime defense orientation. The implementation of Fuzzy AHP-FMEA and Capabilities-Based Planning (CBP) provides a more systematic basis for managing uncertainty, reducing subjectivity in risk assessment, and prioritizing limited defense resources according to the severity and likelihood of strategic risks. Thus, effective defense planning requires a transition from conventional threat-based approaches toward adaptive, risk- and capability-based decision-making. Technological integration is a critical pillar for overcoming sea blindness and the limitations of physical surveillance across vast archipelagic territories. Maritime Domain Awareness (MDA), supported by Low Earth Orbit (LEO) satellites, Synthetic Aperture Radar (SAR), unmanned systems (UAVs/USVs), and Artificial Intelligence-based data fusion, strengthens real-time monitoring and the detection of illegal activities and dark vessels. At the same time, regional maritime security cooperation remains essential because archipelagic states seek absolute gains through burden sharing, intelligence exchange, and capacity building. In the

Indonesian context, the Sishankamrata or Total Defense framework remains relevant for integrating military and non-military components, although its effectiveness depends on stronger inter-agency coordination, digital interoperability, and broader national participation.

Overall, effective RBDP in archipelagic states requires the synchronization of rigorous analytical methodologies, advanced maritime surveillance technologies, institutional reform, and regional defense cooperation. However, limited fiscal capacity and dependence on foreign defense technologies remain major structural constraints on sustainable defense modernization. Strengthening the domestic defense industry, improving long-term policy coherence, and integrating military and civilian defense capabilities are therefore essential to reduce operational vulnerabilities. The study concludes that the alignment of risk-based decision-making, technological capability, total defense mechanisms, and defense diplomacy provides a strategic foundation for safeguarding national sovereignty and strengthening the resilience of archipelagic states amid increasingly volatile Indo-Pacific geopolitical dynamics.

This study contributes to the theoretical development of Risk-Based Defense Planning (RBDP) by extending its application to the distinctive geographical and strategic characteristics of archipelagic states. It integrates Archipelagic Defense, Maritime Domain Awareness (MDA), and Multi-Criteria Decision-Making (MCDM), particularly Fuzzy AHP-FMEA, into the RBDP framework to explain how geographical dispersion, maritime complexity, technological capabilities, and uncertainty influence risk prioritization and defense resource allocation. Furthermore, by synthesizing Structural Realism, Neoliberalism, and Total Defense perspectives, this study demonstrates that contemporary defense planning requires the integration of national military capabilities, regional cooperation, and military-civilian defense mechanisms. The proposed conceptual perspective therefore extends existing RBDP theory by positioning risk prioritization, archipelagic geography, technological integration, and total defense as interconnected dimensions of adaptive defense planning in multidimensional and hybrid security environments.

Archipelagic states, particularly Indonesia and the Philippines, should institutionalize Risk-Based Defense Planning (RBDP) as a core framework for defense policy formulation, capability development, and resource allocation by integrating objective risk-prioritization methods such as Fuzzy AHP-FMEA and Capabilities-Based Planning (CBP). Governments should prioritize investment in integrated Maritime Domain Awareness (MDA), Low Earth Orbit (LEO) satellite surveillance, Artificial Intelligence-based data fusion, and unmanned systems to reduce sea blindness and strengthen the monitoring of strategic maritime areas and chokepoints. In Indonesia, stronger institutional coordination among the TNI, Bakamla, relevant ministries, law enforcement agencies, and the domestic defense industry is required within the Sishankamrata framework to address military, non-military, and hybrid threats. Policy makers should also strengthen domestic defense technological capabilities to

reduce dependence on foreign suppliers, ensure sustainable multi-year defense financing, and expand regional cooperation in intelligence sharing, coordinated maritime surveillance, and capacity building. These policies should be supported by an integrated national defense risk database and periodic risk assessments to ensure that defense planning remains adaptive, evidence-based, and responsive to evolving Indo-Pacific security dynamics.

This study has several limitations that should be considered when interpreting its findings. First, the geographical scope primarily focuses on Indonesia and the Philippines; therefore, the findings may not fully represent the diverse defense characteristics of other archipelagic states. Second, the study relies largely on policy documents, international defense databases, academic literature, and expert assessments, which may be affected by limited access to classified defense information and potential subjectivity in expert judgments. Although Fuzzy AHP-FMEA and triangulation were applied to reduce analytical bias, uncertainty in risk measurement cannot be completely eliminated. Furthermore, the study focuses on the 2020–2025 period and may not fully capture rapidly evolving geopolitical, technological, and hybrid threat dynamics in the Indo-Pacific. Future studies should expand comparative cases, incorporate longitudinal data, and empirically validate the proposed RBDP framework through broader stakeholder participation and operational defense scenarios.

Future research should expand the application of Risk-Based Defense Planning (RBDP) to a broader range of archipelagic states in the Indo-Pacific and other strategic regions to examine the generalizability of the proposed framework across different geopolitical, geographical, and institutional contexts. Further studies should empirically validate the integration of Fuzzy AHP-FMEA, Capabilities-Based Planning (CBP), and Maritime Domain Awareness (MDA) using larger expert samples, operational defense scenarios, and longitudinal risk data. Research should also explore the application of Artificial Intelligence (AI), machine learning, digital twins, and predictive analytics in developing dynamic and real-time defense risk assessment systems. In addition, comparative studies on military–civilian coordination, domestic defense industry resilience, and regional security cooperation are required to strengthen the Total Defense dimension of RBDP and develop a more adaptive, technologically integrated, and evidence-based defense planning model for addressing future multidimensional and hybrid threats.

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References

- Ainie, R., Saputro, G. E., & Purwantoro, S. A. (2022). Defense Gap Era of the Jokowi Government and Defense Economic Focus on Indonesian Maritime. *International Journal Business Management*, 05(07).
- Alfarizi, B. Z., Bainus, A., & Sudirman, A. (2025). The Implementation of Maritime Diplomacy as Indonesia's Effort to Counter Threats in the Exclusive Economic Zone. *Journal of Public Representative and Society Provision*, 5(3). <https://doi.org/10.55885/jprsp.v5i3.640>
- Allodi, L., & Massacci, F. (2017). Security Events and Vulnerability Data for Cybersecurity Risk Estimation. *Risk Analysis*, 37(8). <https://doi.org/10.1111/risa.12864>
- Amanda, B., & Saputro, G. E. (2023). The Effect of Asset Efficiency and Growth on Financial Performance in the Defense Industry Sector. *JMKSP (Jurnal Manajemen, Kepemimpinan, Dan Supervisi Pendidikan)*, 8(1). <https://doi.org/10.31851/jmksp.v8i1.11074>
- Aslam, H. (2022). Critical Analysis on the Intersection of Technology and Human Rights: Emerging Obstacles to Justice and Accountability". *Annals of Human and Social Sciences*, 3(II). [https://doi.org/10.35484/ahss.2022\(3-ii\)83](https://doi.org/10.35484/ahss.2022(3-ii)83)
- Bhumkar, P., Pakhare, S., More, S., & Dabade, T. (2025). Ethical Intelligence: Frameworks and Guidelines for Responsible AI Implementation. *International Journal for Multidisciplinary Research*, 7(6). <https://doi.org/10.36948/ijfmr.2025.v07i06.60991>
- Danio, A., Saputro, E. G., & Suwito, S. (2025). The Role of Blue Economy in Enhancing Economic Growth. *PPSDP International Journal of Education*, 4(1). <https://doi.org/10.59175/pijed.v4i1.366>
- Darmawan, A. R. (2023). Challenging the Freedom of the Ocean: The U.S. Freedom of Navigation Program in Indonesian Archipelagic Waters. *Moscow Journal of International Law*, (4). <https://doi.org/10.24833/0869-0049-2022-4-77-91>
- Datwurina, P., & Rizkiana, I. W. (2022). Building Maritime Security in The Makassar Strait as A Choke Point on The Side of The Nusantara's Capital City. *Strategi Dan Kampanye Militer (SKM)*, 8(1). <https://doi.org/10.33172/skm.v8i1.1034>
- De Castro, R. C. (2025). The Philippines' hard-balancing policy against China's expansion in the South China Sea: The Comprehensive archipelagic Defence

Concept (CADC). Defence Studies.
<https://doi.org/10.1080/14702436.2025.2567320>

Gusriandari, W., Saputro, G. E., Sarjito, A., & Rinaldi, M. (2024). Analysis of Indonesia's Cooperation with China Through the Belt and Road Initiative (BRI) can Provide Opportunities or Challenges for Indonesia to Realize the World Maritime Axis. *East Asian Journal of Multidisciplinary Research*, 3(7). <https://doi.org/10.55927/eajmr.v3i7.8297>

Harefa, F., Purwanto, I. E. D., Irwanto, B., Supriyadi, A. A., & Saputro, G. E. (2025). The Urgency of Indonesia's National Security Act: Addressing Fragmentation in Security Sector Regulation. *Journal of Social Work and Science Education*, 6(1). <https://doi.org/10.52690/jswse.v6i1.1060>

Hubler, S., Dougherty, C., & Kasakove, S. (2022). Berkeley vs. Berkeley Is a Fight Over the California Dream. *The New York Times*, (March 10).

Hudaya, M., & Putra, A. T. (2018). Toward Indonesia as Global Maritime Fulcrum: Correcting Doctrine and Combating Non-Traditional Maritime Threats. *Jurnal Hubungan Internasional*, 10(2). <https://doi.org/10.20473/jhi.v10i2.7304>

Ifaka, J. O., Unufe, J., & Adeniyi, O. I. (2022). Weaponizing poverty: Is the target to win elections or fail democracy. *Elections and Politics in Nigeria: Issues on Economy, Management, Finance, Media, Pandemic, Security and Marginalization*.

Juliana, J., & Saputro, G. E. (2022). The Policy of PT Len As a Main Integrator on Increasing National Income. *JMKSP (Jurnal Manajemen, Kepemimpinan, Dan Supervisi Pendidikan)*, 7(2). <https://doi.org/10.31851/jmksp.v7i2.8923>

Keristanta Ginting, R., & Statistika STIS, P. (2024). the Role of Leading Subsectors on Provincial Own-Source Revenue in Eastern Indonesia with Archipelagic Characteristics in 2015-2023. *Jurnal Pajak Dan Keuangan Negara (PKN)*, 6(1).

Kurnia, R. R., Saputro, G. E., & Murtiana, S. (2023). Management of human resources in national defense depend on defense economics point of view. *International Journal on Social Science, Economics and Art*, 13(1). <https://doi.org/10.35335/ijosea.v13i1.201>

Maolana, P., & Wicaksana Prakasa, S. U. (2023). Unraveling the Depths: Exploring Maritime Terrorism through International and National Legal Perspectives. *Journal of Judicial Review*, 25(1). <https://doi.org/10.37253/jjr.v25i1.7722>

Narahara, S., Prakoso, L. Y., & Sutanto, R. (2024). The Concept of Multi-track Diplomacy in Indonesian Coast Guard to Strengthen the International Maritime Relationship. *Journal of Political Issues*, 6(1). <https://doi.org/10.33019/jpi.v6i1.178>

- Nurjanah, I., Perwita, A. A. B., & Hendarwoto, Y. (2025). Safeguarding Maritime Critical Infrastructure: Indonesia's Defense Diplomacy in the Indo-Pacific Security Architecture under the Joko Widodo Administration (2014–2024). *Asian Journal of Science, Technology, Engineering, and Art*, 3(5).
- Sa'bani, S. R., Saputro, G. E., & Suwito, S. (2025). The Role of Local Governments in Optimizing Regional Original Revenue: A Role Theory Perspective on Fiscal Autonomy. *PPSDP International Journal of Education*, 4(1). <https://doi.org/10.59175/pijed.v4i1.412>
- Sani, F., Sundari, S., & Saputro, G. E. (2025). PT. Pindad Cooperation Synergy with Private Owned Enterprises in Defense Sector. *East Asian Journal of Multidisciplinary Research*, 4(4). <https://doi.org/10.55927/eajmr.v4i4.23>
- Saputro, G. E. (2021). Implementation of Economic Policies Facing Covid 19 in Supporting Nonmilitary Defense. *International Journal of Social Science and Human Research*, 04(04). <https://doi.org/10.47191/ijsshr/v4-i4-11>
- Saputro, G. E. (2022). Implementation of Defense Industry Policy in Supporting National Economic Growth. *International Journal of Social Science and Human Research*, 05(03). <https://doi.org/10.47191/ijsshr/v5-i3-53>
- Shidqi Divreda Sulaeman, I Nengah Putra A, & Imanuel Dindin. (2024). Literature Review on Fast Missile Ships (KCR) In the Context of Military Modernization: A Historical Review and Challenges to Indonesia's Contribution to Maritime Defense. *International Journal of Humanities Education and Social Sciences (IJHESS)*, 3(5). <https://doi.org/10.55227/ijhess.v3i5.825>
- Susanti, A. D., Silaban, F., Aritonang, L. F., & Sitompul, Y. T. Y. br. (2025). Coral Reef Bleaching Crisis: Impacts on Indonesia's Marine Ecosystems and Coastal Economy. *Journal of Maritime Policy Science*, 2(1). <https://doi.org/10.31629/jmps.v2i1.7351>
- Tedyansyah, T., Saputro, G. E., & Suwito, S. (2025). The Role of Local Government in Improving the Regional Economy Through the Tourism Sector. *PPSDP International Journal of Education*, 4(2). <https://doi.org/10.59175/pijed.v4i2.429>
- Wicaksono, Y. K. (2020). Strengthening the Indonesia Archipelagic Vision: New Map of the Unitary State of the Republic of Indonesia. *PalArch's Journal of Archaeology of Egypt / Egyptology*, 17(9).
- Wildan Akbar Hashemi Rafsanjani, Herlina Juni Risma Saragih, & Guntur Eko Saputro. (2025). Utilization of Artificial Intelligence to Address Nutritional Challenges and Productivity Towards Indonesia Emas 2045. *Proceeding of International Seminar Enrichment of Career by Knowledge of Language and Literature*, 12(1). <https://doi.org/10.25139/eckll.v12i1.9606>