

Research Article

Recalibrating Border Defense Strategy: A Novel Lykke's Framework Model for Integrated Military Management in Indonesia's Frontier Regions

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Abstract: The aim of this research is to develop a new strategic model for Indonesian border defense by recalibrating the Lykke Framework. It assesses the relevance of the traditional ends–ways–means framework in addressing modern border threats and proposes adding a risk pillar to improve adaptability and multi-domain integration. Using a Systematic Literature Review (SLR), the study examines policy developments, defense doctrines, surveillance technologies, and geopolitical dynamics influencing Indonesian border security. Literature was sourced from international and national databases (ScienceDirect, SpringerLink, SINTA, BRIN, etc.) for publications between 2018–2025. The findings reveal that Indonesia's border regions face complex threats such as sovereignty violations, transnational crime, cyberattacks, and ideological penetration. These challenges highlight the inadequacy of the traditional ends–ways–means framework without incorporating a fourth risk pillar. The study introduces the New Lykke Model, which enhances the strategic framework for integrated military management, considering geopolitical, operational, socio-cultural, and environmental risks. This model offers practical guidance to stakeholders like the Indonesian National Armed Forces (TNI), Bakamla, and the National Police (Polri), aiming to improve border security operations and policy planning. The study is among the first to adapt the Lykke Model to Indonesian border defense, incorporating an integrated risk pillar for a more comprehensive security strategy.

Keywords- Border Defense; Defense Strategy; Geopolitics; Integrated Military Management; New Lykke Model

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1. Introduction

Indonesia's border region is a strategic space that functions as a buffer zone, a showcase for sovereignty, and an arena for cross-border interaction. The increasing complexity of threats and geopolitical dynamics, including great power competition in the North Natuna Sea, intensified illegal fishing activities, and the infiltration of transnational organized crime networks, demand a renewed defense approach that is not solely militaristic but also grounded in cross-sectoral development. The study shows that the dynamics in the North Natuna Sea are not only related to military aspects, but also domestic political calculations and regional diplomacy. Meanwhile, the findings revealed that illegal fishing remains a serious threat to Indonesia's maritime jurisdiction, especially in vulnerable border areas.

The limitations of the old, sectoral approach make the need for integrated military management even more pressing. Lykke's framework, consisting of three pillars: ends, ways, and means, does provide a strategic analytical structure, but its classic format is not yet fully relevant to modern contestations such as the gray zone conflicts identified, rapidly evolving cyber threats as reviewed and the increasingly intense militarization of natural resources in the Indo-Pacific region. emphasizes the existence of a fortification dilemma, namely a situation where increasing the defense system actually has the potential to trigger violent actions by non-state

actors, a phenomenon that can occur in Indonesia's border areas which are vulnerable to the mobilization of armed groups.

The National Defense Law (Law No. 3/2002), the State Territory Law (Law No. 43/2008), and the Territorial Resistance Doctrine (Dopinwil TNI) emphasize the importance of border security as an integral part of national defense. However, various empirical findings indicate institutional fragmentation and overlapping authority. Arifin et al. [17], [18] emphasize that border governance, both in the context of migration and maritime formalities, still faces inter-agency coordination problems, including slow data integration and weak interoperability. Also emphasized that Southeast Asia's maritime security governance tends to be fragmented, making collective responses to cross-border threats difficult.

Updates to border defense approaches must also take into account technological developments. emphasized the importance of AIS-based anomaly detection systems to improve maritime domain awareness, while data-based security innovations were put forward. and the cross-country radar collaboration outlined demonstrates that technology integration is the main foundation of modern defense. Indonesia's efforts to build AI-enhanced border security as formulated demonstrates a progressive move toward a predictive security system based on computational intelligence. A strategic recalibration is needed through the refinement of the Lykke concept as an integrated framework that can unite military strategy, diplomacy, development, and risk management within a single, grand border defense design. This refinement aligns with the idea on the importance of adaptive defense policy design in an interconnected security environment. He added that Indonesia's border areas should be viewed not only as security objects, but as strategic areas that require integration of defense and development functions to strengthen national resilience holistically.

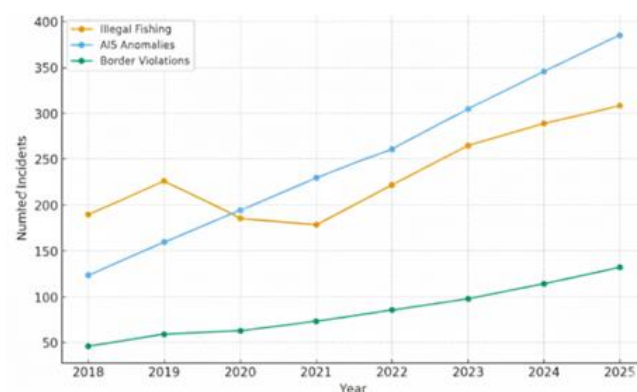


Figure 1: Trends in Indonesian Border Security Incidents (2018-2025).

Figure 1 above shows a consistent increase in three categories of Indonesian border security incidents from 2018 to 2025. AIS anomalies were the category with the sharpest increase, moving from 120 cases in 2018 to 390 cases in 2025. This trend illustrates the increasing prevalence of irregular shipping patterns, AIS blackouts, and suspicious maneuvers by foreign vessels in border areas, particularly in waters adjacent to international shipping lanes. Such activities are generally related to grey-zone operations, smuggling, and attempts to obscure vessel identities, potentially threatening the stability of Indonesian maritime security. On the other hand, territorial violations also showed a gradual increase, from 45 incidents in 2018 to 130 in 2025. This increase reflects geopolitical pressures in the border area, particularly in the North Natuna Sea, as well as the intensification of foreign vessel maneuvers that challenge Indonesia's jurisdictional boundaries. The illegal fishing category exhibited a fluctuating pattern but generally showed an upward trend in the 2022–2025 period. From 175 cases in 2021, this figure rose to 305 in 2025. This phenomenon indicates that Indonesia's border waters remain a target for exploitation by foreign vessels due to their rich fishery resources. The increase in incidents in the recent period also reflects economic pressures, the migration of fishing activities across borders, and limited oversight at several border points whose vast areas are not commensurate with monitoring capacity. Overall, the graph shows that threats to border security are increasingly diverse and complex, necessitating a more integrated, technology-based defense approach supported by solid cross-sectoral governance.

2. Research methodology

This study uses a Systematic Literature Review (SLR) approach to examine the dynamics of border defense strategies and the urgency of updating the Lykke Model in integrated military management. This approach was chosen because border issues are multidimensional, involving geopolitics, maritime security, defense diplomacy, surveillance technology, and cross-sectoral governance. In line with the findings, which emphasizes the importance of a holistic approach in strengthening sovereignty in frontier regions, as well as which highlights the complexity of Malacca Strait security, the need for strategic integration becomes increasingly important. On the other hand, studies demonstrate that advances in surveillance technologies such as AIS, radar, and data governance have transformed the nature of border threats. This SLR approach aims not only to map current knowledge but also to critically identify research gaps related to how the Lykke Model can be recalibrated to address grey-zone threats, overlapping authorities, and the geopolitical complexities of the Indo-Pacific.

Research Questions

- a) How is Lykke's concept conceptualized and applied in modern defense strategy, particularly in the context of Indonesia's borders?
- b) What are the reasons for and against influencing the effectiveness of integrated military management in border areas?
- c) What conceptual models or frameworks have been developed, and what research gaps still need to be filled to build a new version of the Lykke Model for border defense governance?

Search Strategy

The databases used include Elsevier (ScienceDirect), SpringerLink, Wiley Online Library, Taylor & Francis Online, IEEE Xplore, ACM Digital Library, JSTOR, SAGE, DOAJ, Google Scholar, and national literature through SINTA, GARUDA, and BRIN. Inclusion criteria were set for articles published between 2020–2025, in Indonesian or English, peer-reviewed, and relevant to the themes of border security, defense strategy, border governance, the Lykke Model, maritime security, and integrated defense management. Search keywords included border security, the Lykke Model, integrated military management, maritime governance, strategic defense planning, grey-zone threats, risk-based border strategy, and smart border surveillance.

Inclusion/Exclusion Criteria

- a) Including:
 - Empirical articles, reviews, and theoretical models that discuss border defense strategies, cross-sector security management, or defense doctrine evaluation.
 - Publications that touch on the implementation of surveillance technology (AIS, radar, satellite), maritime diplomacy, or coordination between border actors.
- b) Excluded:
 - An article that only discusses surveillance techniques without any relevance to defense policy.
 - Purely civilian study of borders with no connection to national security.

Data analysis

A total of 73 articles were identified in the initial literature search through various international and national databases. After screening based on inclusion and exclusion criteria, including thematic suitability, relevance to border defense issues, and relevance to the development of the Lykke Model, 31 articles qualified for further analysis. All articles were then analyzed using a thematic coding approach to identify patterns, relationships, and thematic differentiation within the literature.

The thematic coding process focuses the study on several core themes, namely:

- The evolution of border defense strategies in the Indo-Pacific geopolitical context,
- Limitations and opportunities for adaptation of the Lykke Model in dealing with multi-domain threats,
- The role of military–civilian integration and inter-institutional interoperability in border governance,
- Grey-zone threat dynamics, including AIS anomalies, unconventional activities, and cross-border infiltration,
- As well as the need for a more adaptive risk-based defense management model.

The results of this thematic analysis serve as a conceptual basis for formulating the Lykke Model Recalibrated, a refined version of the Lykke framework designed to address strategic and institutional complexities in Indonesia's border regions.

3. Thematic Findings and Synthesis

Limitations of the Classical Lykke Model in the Indonesian Context

Lykke's framework is classically built on the concept of a balance between Ends, Ways, and Means. However, various studies have shown that this paradigm is no longer adequate to address the complexity of threats in Indonesia's border regions, which are multi-domain and involve diverse international actors. emphasizes that modern border control is no longer just a military issue, but also involves socio-political dynamics that influence internal stability. This finding is reinforced by which emphasizes that current border control practices face a legitimacy dilemma, particularly when states must balance security and mobility rights. shows that the dynamics in the North Natuna Sea are influenced by multi-actor geopolitical competition, so that the Lykke framework requires additional dimensions in the form of risk governance and interagency coordination. It even reveals that modern border data demands technological integration, interoperability, and predictive capacity beyond the scope of the classic Lykke. Thus, Indonesia's border regions demand a paradigm shift toward a Recalibrated Lykke Model, which incorporates elements of risk, technical diplomacy, and regional development to strengthen comprehensive border resilience.

Threat Dynamics in Indonesia's Border Regions

Thematic findings indicate that threats to Indonesia's borders are not isolated but intertwined across six categories. First, the increase in maritime and airspace violations by foreign vessels and surveillance aircraft signals an increasingly intense threat to sovereignty, particularly in the North Natuna region, as noted by And. Second, cross-border crimes such as narcotics smuggling, firearms, and human trafficking remain major challenges, especially on the Indonesia–Malaysia and Indonesia–PNG land borders, as identified Third, cyber threats to radar, AIS, and maritime navigation systems are increasing. shows that AIS manipulation is a grey-zone technique often used to obscure a vessel's identity. Fourth, exploitation of natural resources such as illegal fishing is still rampant, as shown by And. Fifth, ideological infiltration in border areas is a latent threat, in line with the analysis Regarding the politics of identifying separatist groups. Sixth, grey-zone operations, such as the use of research vessels disguised as scientific instruments, are increasingly becoming a geopolitical strategy that is difficult to handle conventionally. These six threat categories demonstrate that Indonesia needs a more integrative, technology-based, and cross-domain-oriented border defense strategy.

Imperatives of Integrated Military Management in Border Defense Systems

To respond to the complexity of threats, integrated military management is an urgent need. emphasized the importance of cross-border radar integration as a collective strategy in air security. This is in line with which emphasizes the urgency of multinational collaboration in securing the Malacca Strait, one of the world's strategic chokepoints. These findings demonstrate that institutional integration between the Indonesian National Armed Forces (TNI), Bakamla (Labor and Maritime Security Agency), the Indonesian National Police (Polri), Immigration, and local governments is a non-negotiable element in strengthening border security. System interoperability is another crucial point. Drone technology, surveillance satellites, and Maritime Domain Awareness systems must be able to share data in real time, as noted in the findings. related to security-as-a-service. On the other hand, This demonstrates that maritime Southeast Asia has a fragmented security governance structure, making strategic and technological integration absolutely necessary. Furthermore, security-development integration is another crucial pillar. emphasized that security-based economic development not only enhances regional stability but also reduces social vulnerability to transnational infiltration. Therefore, integrated military management of Indonesia's borders must operate on four dimensions: institutional integration, technological interoperability, development-security connections, and strengthened border diplomacy.

The Urgency of Establishing a Recalibrated Lykke Model

Various studies indicate that the Lykke Model requires structural updates to fit the contemporary threat context. emphasized that grey-zone conflicts require a simultaneous response between military, diplomatic, and maritime law elements. revealed that immigration governance and border formalities need to be placed within a comprehensive security framework. Regional perspectives from And The analysis demonstrates that Indo-Pacific dynamics are moving toward a cooperative security model based on interoperability. The need to expand the Lykke Model to include Ends–Ways–Means–Risk–Integration–Development

emerged as a consequence of this analysis. This model not only emphasizes military objectives but also incorporates geopolitical risk, interagency coordination, and economic development as determinants of border resilience.

4. New Lykke Framework Model

The transformation of the strategic environment and the escalation of multi-domain threats in Indonesia's border regions require adjustments to the classic Lykke concept. The SLR findings indicate that the Ends–Ways–Means framework is no longer sufficient to manage geopolitical complexity, overlapping authorities, and the dynamics of grey-zone threats. Therefore, this article proposes a New Lykke Model built on four main pillars: Ends, Ways, Means, and Risk. The integration of the risk pillar is intended to ensure that the design of border strategies not only focuses on operational objectives but also anticipates the uncertainties and strategic frictions that arise in the implementation of defense policies. This model does not change the essence of Lykke's strategic balance, but expands its scope to align with the reality of Indonesia's hybrid borders: military, political, economic, sociocultural, and environmental. These four pillars are interconnected and form the foundation for building a more comprehensive border defense architecture.

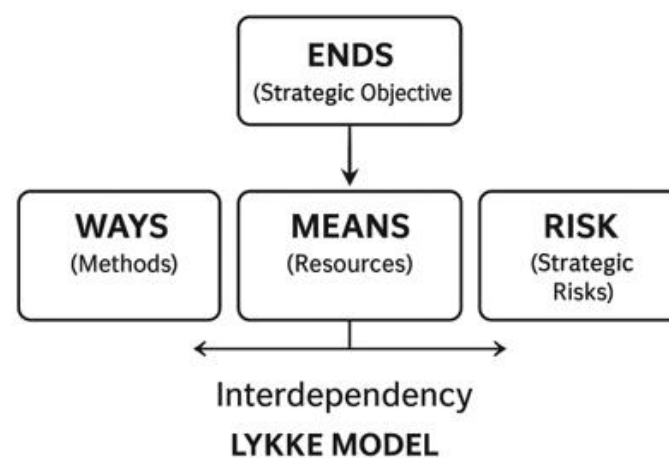


Figure 2: New Lykke Model: Ends – Ways – Means – Risk.

Figure 2 above illustrates the conceptual structure of the New Lykke Model in the context of Indonesia's border defense strategy. This model is based on four main pillars: Ends, Ways, Means, and Risk, which are interrelated in building a modern, adaptive, and sustainable border defense architecture. At the top of the diagram is the ENDS (Strategic Objectives) component. This pillar explains the main goals the country wants to achieve in border management, such as upholding sovereignty, cross-border security stability, improving the welfare of border communities, and protecting strategic resources. Ends serves as the general direction and orientation of all defense efforts. From the Ends component, arrows point to the other three main pillars that serve as the strategy's implementation instruments: WAYS, MEANS, and RISK. These three pillars are parallel because they have an interdependent relationship in implementing the strategy in the field.

- **WAYS (Methods of Achievement)** describes the approaches, operational concepts, and work patterns used to achieve strategic objectives. These include integrated defense strategies, multi-agency operations, active state presence, and border diplomacy.
- **MEANS (Resources)** contains all the capabilities and assets that a state can use, including military strength, modern surveillance technology, border infrastructure, the role of local communities, and budgetary and political support.
- **RISK (Strategic Risk)** is a new pillar that functions as a corrective mechanism. This component encompasses geopolitical, institutional, operational, socio-cultural, and environmental risks that can impact strategy implementation. The Risk pillar ensures that strategy implementation remains stable even in the face of uncertainty.

The diagram below emphasizes the interdependence between Ways, Means, and Risk. This means that achievement methods cannot be implemented without adequate resource support, and both must be continuously evaluated based on emerging risk levels. Overall, this diagram demonstrates that the New Lykke Model not only establishes a strategic planning structure but also provides an adaptive balancing mechanism so that border defense strategies can be implemented effectively in complex and dynamic environments.

5. Strategic Implications for Indonesian Defense



Figure 3: Strategic Implications for Indonesian Defense.

Figure 3 illustrates five main pillars that have strategic implications for Indonesia's defense in border areas. These five components complement each other and form an integrated policy ecosystem to create adaptive, modern, and national development-oriented border security. First, the Regulation and Standardization of Border Operations emphasizes the importance of developing uniform national SOPs so that all security actors the military, police, and technical agencies work under the same guidelines. This standardization ensures more effective coordination in addressing cross-border threats. Second, Strengthening the Institutional Ecosystem highlights the need for institutional integration through a collaborative command platform. Border management is no longer carried out sectorally, but rather coordinated within a responsive network.

Third, Border Defense Digitalization focuses on the use of technologies such as surveillance systems, data fusion, and AI-based intelligence analytics to enhance situational awareness and respond quickly to dynamic threats. In addition to the security aspect, this diagram also emphasizes the development dimension. Economic Development as a Defense Strategy emphasizes that the welfare of border communities is a strategic force in creating stability and reducing vulnerability to illegal activity. Finally, Border Security Diplomacy positions bilateral and regional cooperation as a crucial instrument for managing cross-border issues such as trade, migration, and transnational crime. This diplomacy serves as a preventive mechanism while strengthening regional stability. Overall, these five pillars demonstrate that Indonesia's border defense must be built through a holistic approach that integrates security, technology, institutions, economic development, and diplomacy.

6. Conclusions and Future Directions

This article emphasizes that the threat dynamics in Indonesia's border regions have evolved into increasingly complex, multidimensional forms, involving interactions between state and non-state actors. In this context, the classical Lykke Model (ends–ways–means) is no longer adequate to address contemporary geopolitical challenges characterized by grey-zone conflicts, cross-border criminal infiltration, geopolitical tensions in the North Natuna Sea, and the race for maritime and air surveillance technology. Through issue mapping, systematic literature analysis, and thematic synthesis, this article proposes a New Lykke Model that incorporates a fourth pillar, namely risk, so that border defense strategies can be placed within a risk-informed defense planning framework. This approach emphasizes that the success of a strategy depends not only on the ability to achieve objectives and manage resources, but also on the ability to identify, measure, and balance risks arising from geopolitical, institutional, environmental, social, and technological factors.

Going forward, strengthening Indonesia's border defense system must be directed toward five strategic orientations. First, the integration of intelligent sensor-based defense technologies, including adaptive radar, observation satellites, MALE–HALE drones, and predictive AI systems, which are the backbone of early detection superiority. Second, inter-agency interoperability must be built through a digital-based Border Command Center to ensure faster, more consistent, and more coordinated decision-making. Third, accelerating the development of basic border infrastructure needs to be positioned as a long-term defense strategy to strengthen the capacity of the community as the nation's frontline. Fourth, strategic diplomacy with neighboring countries must be prioritized through coordinated patrol mechanisms, improved border delimitation, and confidence-building measures. Fifth, integrated risk management must become a new foundation in defense policy design, so that strategies are not only responsive to current threats but also adaptive to future dynamics. With this updated paradigm, border defense is no longer understood solely as an instrument of military

power, but as the foundation of national resilience that holistically integrates security, economic development, social welfare, and geopolitical stability. The recalibrated New Lykke Model is expected to be a more relevant, adaptive, and applicable strategic framework in guiding Indonesia's defense policy towards 2035 and beyond.

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