

Evaluating the Effectiveness of Indonesia's Military Logistics through the 3C's of Logistics Approach

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ARTICLE INFO

Keywords: 3Cs Framework, Indonesia, Logistics Effectiveness, Military Logistics

Received : 16, June

Revised : 30, June

Accepted: 23, July

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ABSTRACT

This study evaluates the effectiveness of Indonesia's military logistics system through the lens of the 3Cs framework: Commonality, Consumption, and Capacity. As an archipelagic nation facing diversity security challenges, an integrated, agile, and resilient defense logistics system is vital. Using a qualitative descriptive methodology and secondary data, the research explores how Indonesia's logistics align with the 3Cs model. Findings reveal progress in joint logistics operations and initiatives like Kogabwilhan, SISLOGNAS, and Garuda Shield. However, persistent challenges include fragmented digital systems, infrastructure limitations, and budget constraints. The study underscores the need for greater standardization, improved demand forecasting, and sustained investment in logistics capacity. Integrating the 3Cs can enhance Indonesia's military readiness, operational efficiency, and strategic response capabilities, offering practical insights for defense partners.

INTRODUCTION

Logistics refers to managing and coordinating the movement, storage, and flow of goods, services, and information from their origin to their final destination. At its core, it focuses on ensuring that the right resources reach the correct location at the right time in the most efficient manner (Odom, 2025). Logistics is critical in shaping a military's operational readiness in today's world of rapid response, geopolitical uncertainty, and hybrid threats.

The strategic importance of military logistics is evident in historical and contemporary conflicts, where superiority in logistics has often been the decisive factor that tipped the balance in favor of one side. A notable example is Napoleon's attempt to invade Russia in 1812. Napoleon's forces were crippled by poor logistical planning. The *Grande Armée* struggled to sustain itself due to harsh weather, extended supply lines, and a lack of adequate provisions, which severely weakened his troops as they advanced deeper into Russian territory (Burnham, n.d.). This shortage of supplies led to widespread disease, starvation, and desertion. The failure to maintain an effective logistics system ultimately resulted in massive losses and a disastrous retreat. This highlighted how even one of history's most formidable military forces can collapse without proper logistical support.

On the other hand, World War II provides a clear example of how superior logistics can be a decisive advantage, enabling sustained military operations and ultimately contributing to victory. Early in the war, the United States faced significant logistical challenges, including uncoordinated production and a lack of standardization, which slowed manufacturing and complicated supply chains. However, through concerted efforts to standardize parts and streamline production processes, such as the joint American-British agreement on delivery schedules and the implementation of programs like the Work Simplification Program, efficiency dramatically improved (Reilly, 2016). These measures reduced costs, accelerated production, and ensured troops received the necessary equipment and supplies.

The United States leveraged decades of industrial mobilization planning to rapidly scale production and allocate resources during World War II (Reilly, 2016). This enabled support for its military and Allied forces through coordinated troop movements and complex supply chains. These logistics achievements laid the foundation for modern military supply systems and demonstrated logistics' vital role in victory. However, Indonesia faces distinct challenges requiring detailed exploration.

For Indonesia, a vast archipelagic nation spanning thousands of islands, managing military logistics becomes especially complex. The country faces obstacles such as vast distances, limited infrastructure in remote regions, and the necessity for seamless coordination among its Army, Navy, and Air Force. Meeting these demands requires a logistics framework that is robust, scalable, and agile enough to address dynamic threats and operational needs. Beyond geographic factors, Indonesia confronts a wide range of security challenges, from territorial disputes in the South China Sea to internal security operations.

Efficient logistics are essential for maintaining operational readiness and safeguarding national sovereignty and regional stability.

Moreover, Indonesia's growing strategic importance in Southeast Asia and its increasing participation in international peacekeeping and humanitarian missions highlight the need for a logistics system that is both resilient and adaptable. The ability to coordinate resources, cooperate with regional partners, and maintain control over supply chains directly impacts the Indonesian military's capacity to respond swiftly and effectively.

Given these complexities and the critical role logistics plays in Indonesia's defense capabilities, it is important to assess how well the current logistics management system meets these demands. This study seeks to answer the following research question: *To what extent does Indonesia's defense logistics management align with the 3Cs of logistics in addressing national challenges?*

The 3Cs of Logistics framework provides a valuable analytical tool to evaluate logistics effectiveness in such environments. This framework consists of Commonality, Consumption, and Capacity. Commonality ensures standardization and interoperability; Consumption focuses on resource use and replenishment; Capacity covers storage, transport, and distribution. These three dimensions offer a comprehensive perspective for assessing and improving military logistics performance.

Applying this framework to Indonesia's defense logistics helps identify weaknesses like transport strain and skill gaps, while recognizing strengths such as interoperability. Optimizing logistics through the 3Cs supports improved readiness, reduces delays, and strengthens Indonesia's strategic defense resilience.

This study shall contribute to the academic literature on defense management and military logistics, particularly within Southeast Asia. By focusing on Indonesia's unique logistical challenges and applying the 3Cs of Logistics framework, the research offers a fresh insight that can deepen the understanding of how military logistics system function in complex, archilepagic environments. This contribution is valuable in analyzing and improving defense logistics in similar regional and operational contexts.

Furthermore, the findings provide practical, evidence-based recommendations that can enhance the effectiveness of military logistics operations. These insights are especially relevant for defense policymakers managing logistics in disaster-prone and geopolitically sensitive areas. By improving logistics performance, the study supports more efficient resource allocation, faster response times, and stronger coordination among military branches, ultimately strengthening national security and disaster response capabilities.

LITERATURE REVIEW

Overview of Indonesia's Defense Logistics Management

Defense logistics is fundamental to Indonesia's defense, enabling strategic preparation, force deployment, and sustained operations across its vast archipelago. Effective logistics ensures continuity across thousands of islands, protecting sovereignty amid threats like terrorism, separatism, and climate

challenges (G. et al., 2024). The Indonesian military is one of the few institutions globally with logistical reach that spans the entire archipelago, emphasizing its critical role in national defense and societal integration. A Historical overview demonstrates how evolving political and security conditions have shaped Indonesia’s current logistics practices, challenges, and opportunities.

Table 1. Indonesia’s Military Logistics Evolution

Period	Key Developments	Policy Basis	Challenges/Notes
Post-Independence (1945–1966)	Ad hoc logistics during guerrilla warfare; heavy reliance on local resources and improvisation.	Early practices; no formal doctrine	Lack of coordination and a centralized logistics system.
New Order Era (1966–1998)	Centralized under military rule, logistics are used for political stability. Adoption of <i>Sishankamrata</i> for total defense involving civilians.	<i>Dwifungsi ABRI</i> doctrine; Presidential Decree No. 26/1985.	Logistics militarized; overlaps with civil governance. Start of the integrated national logistics doctrine
Reform Era (Post-1998)	Military-police separation, enhanced transparency, and democratic responsiveness.	Reform agenda; separation in 1999	Need for new doctrines, professional logistics management, and institutional realignment.

Compiled by Author (2025) based on G. et al. (2024) and Sova (2013)

The table outlines key phases in Indonesia’s defense logistics development, laying the groundwork for current reforms aimed at modernizing logistics systems to meet evolving security demands. The enactment of Law No. 3 of 2002 on National Defense reinforced the universal and integrated nature of defense logistics, emphasizing the involvement of all national resources in logistics preparedness (G. et al., 2024).

Despite this approach, funding and personnel shortages have limited ongoing efforts to improve logistics processes. A notable example is the KRI Diponegoro class, guided missile corvettes for coastal defense and multi-role missions, which require a high level of integrated logistics support (ILS) to maintain combat readiness. However, ILS implementation remains incomplete due to constraints in inventory systems, technical personnel, and budget availability (Hartanto, 2016). Despite these hurdles, some recent improvements are evident, such as using private couriers and route optimization to boost delivery efficiency. However, logistics still face challenges like limited cargo budgets and irregular naval deployments. (Riyadi, 2017).

Challenges in Archipelagic Military Logistics

To better understand Indonesia's archipelagic defense logistics challenges, it is essential to compare them with similar nations with comparable geography that differ in institutional and operational effectiveness. These cases reveal common weaknesses and valuable strategies for improving Indonesia's military logistics. A case in point is Malaysia, where despite a structured logistics system with centralized planning and regional depots, the Armed Forces still struggles to sustain multi-domain operations across dispersed areas. Bottlenecks arise during crises, especially in delivering supplies to remote or flood-affected regions, due to limited transport flexibility and poor coordination among service branches (Halizahari et al., 2021). The absence of a dedicated logistics command to manage cross-service logistics planning further fragments implementation and hampers resource mobilization (Mustapa et al., 2020). In addition, Malaysia's defense logistics tends to be reactive rather than anticipatory, with underused stockpiling and deployment delays during natural disasters or external threats (Halizahari et al., 2021). These issues indicate that the challenges of archipelagic defense logistics stem from geographical factors and institutional design, integration capacity, and preparedness doctrine.

Like Malaysia, the Philippines also faces archipelagic defense logistics challenges, relying heavily on the 2014 Enhanced Defense Cooperation Agreement (EDCA) with the U.S., for shared infrastructure and rotational forces to boost, but political tensions and nationalism hinder full integration, complicating cohesive island defense (Blancaflor, 2019). Additionally, World War II logistics failures continue to influence Philippine defense planning. During the 1942 defense of the Philippines, failure to preposition supplies in Bataan severely weakened U.S. and Filipino forces against Japanese attacks, emphasizing the importance of logistical maneuverability, underscoring the need for adaptability and foresight in supply chain planning to sustain operational readiness in dispersed environments. (Lundberg, 2017).

The 3Cs of Logistics Management: Commonality, Consumption, Capacity

The 3C model, Commonality, Consumption, and Capacity, was developed to improve supply chain performance by integrating shared resources, demand forecasting, and capacity planning using pull-based principles that optimize resource utilization and service levels while minimizing inventory investment, proving effective in addressing demand variability and aligning logistics operations across supply chain echelons to reduce costs and lead time variability (Silva & Motta, 2004).

The first element, commonality, refers to the standardization or sharing of parts and processes across different products or supply chain operations. Leveraging commonality allows organizations to simplify logistics planning using shared materials or resources to meet diverse product needs. In practice, this enhances the capacity for mass customization, reduces procurement complexity, and enables economies of scale across supply nodes. Within supply chain integration efforts, focusing on commonality correlates with improved goal alignment and reduced duplication of effort across departments (Liu et al., 2020).

The second element, consumption, emphasizes the importance of real-time data on material usage and customer demand. It operates on the principle that improving the accuracy of consumption forecasting can help reduce overproduction and minimize excess inventory. This approach shifts supply chains from reactive to more responsive, reducing the bullwhip effect and supporting leaner inventory strategies (Silva & Motta, 2004).

The last element, capacity, refers to the logistics system's ability to meet demand within its physical and operational limitations, encompassing production capacity, warehousing, transportation, and supplier throughput. Within the 3C model, capacity is viewed as a variable that should be planned and aligned with consumption data. Integrating capacity planning with enterprise resource planning and customer relationship systems has been shown to improve order fulfillment and reduce delivery delays (Liu et al., 2020).

Although initially developed in manufacturing and commercial contexts, the 3C model has strong relevance for defense logistics, especially in complex environments like Indonesia. Applying the principles of commonality (e.g., shared spare parts across service branches), consumption (e.g., demand-driven supply for operational units), and capacity (e.g., adaptive logistics infrastructure) could help optimize defense readiness, reduce waste, and support strategic operations more effectively. These concepts offer a valuable framework for analyzing and strengthening the defense logistics systems of nations facing geographical, organizational, and operational complexity. The model also provides a structured way to assess and improve logistics efficiency across multiple supply chain tiers.

Measuring Logistics Effectiveness in Military Contexts

Measuring logistics effectiveness in military contexts involves assessing how well logistical systems support combat readiness under dynamic and resource-constrained environments. Key performance dimensions include cost-efficiency, timeliness, responsiveness, and adaptability to environmental uncertainties through lean operations and process reconfiguration. In volatile operational theaters, shifting from rigid push-based systems to demand-driven models can enhance precision and reduce bottlenecks in supply distribution (Rahman & Hamid, 2019).

Integrating dynamic capabilities and organizational learning is critical to enhancing logistics performance. Capabilities such as benchmarking, process flexibility, absorptive capacity, and organizational ambidexterity enable logistics units to sense changes, reconfigure operations, and apply knowledge effectively. This continuous adaptation and innovation are critical in military settings where logistics operations must respond to unpredictable demands and technological obsolescence. Strategic logistics alliances also enhance effectiveness by facilitating coordination and information sharing across units and partners, helping to mitigate risks like supply chain disruption or inefficient asset utilization (Rahman & Hamid, 2019).

Operationally, logistics effectiveness is measured by structural indicators such as delivery speed, resource availability, and mission readiness. Military

supply chains require high resilience, emphasizing on minimizing downtime and ensuring continuity even under stress. Effectiveness depends on transparent command structures, clear procedures, and integrated technological systems that support real-time decision-making. Unlike commercial supply chains, measurement frameworks must account for mission-critical variables such as reliability, adaptability, and performance under high uncertainty (Grala & Jałowiec, 2020).

METHODOLOGY

This study employs a qualitative descriptive approach, which emphasizes systematic and factual examination of natural phenomena without reliance on numerical measurements (Furidha, 2023). The method is appropriate for assessing complex systems such as defense logistics due to its focus on clarity, categorization, and low interpretive bias (Sandelowski, 2000).

This study will collect secondary data through documentation review of at least 15 sources, including government policies, defense reports, academic journals, and media publications between 2013 and 2025. This approach reflects qualitative descriptive methods' flexibility, allowing researchers to combine diverse data sources to achieve comprehensive insights. The use of secondary data ensures adherence to the method's emphasis on "systematic, accurate, and factual description", while avoiding the subjectivity risks associated with primary data collection (Furidha, 2023).

The research applies thematic analysis within the framework of the 3Cs of Logistics (Commonality, Consumption, Capacity). This framework allows for a structured evaluation of defense logistics by examining:

- a. Commonality: The standardization and interoperability of logistics resources.
- b. Consumption: The utilization and efficiency of logistics supplies.
- c. Capacity: The scalability and readiness of logistics infrastructure.

Thematic analysis systematically identifies and categorizes patterns and themes related to these three aspects across the collected secondary data sources. By integrating this analytical approach, the study aims to provide an in-depth assessment of Indonesia's defense logistics system.

RESEARCH RESULT AND DISCUSSION

Commonality in Defense Logistics

a. Integration of Logistics Across Military Branches

Logistics integration among Indonesia's military branches, the Army, Navy, and Air Force, has become fundamental in facing increasingly complex defense challenges. As mentioned, Indonesia presents logistical hurdles demanding unified and adaptive supply systems. A joint logistical framework is needed to meet these demands and ensure that each military branch can support one another across domains, land, sea, and air. This integration facilitates faster mobilization, more accurate resource allocation, and consistent support during peacetime operations and conflict or disaster response scenarios. Without such coordination, overlapping supply chains and fragmented logistical efforts could hinder operational effectiveness.

In practice, this integration requires more than just physical resource sharing; it also demands institutional alignment, technological interoperability, and coordinated command structures. A significant step toward achieving integration is the establishment of a permanent joint regional defense command under the Indonesian National Military, Kogabwilhan (Komando Gabungan Wilayah Pertahanan). Designed to unify command structures and streamline joint operations, Kogabwilhan serves as a pivotal operational entity that bridges the logistical functions of the Army, Navy, and Air Force. This command structure enables unified operational planning and execution, especially in critical zones such as Indonesia's land and maritime borders. With Kogabwilhan in place, planning and execution of operations become more centralized, allowing for more synchronized movement of troops, supplies, and equipment between services (Sumadinata et al., 2022).

Operationally, Kogabwilhan improves responsiveness during complex scenarios such as military emergencies, humanitarian assistance missions, and security threats in disputed areas. For instance, through Kogabwilhan, logistic units can quickly allocate transport assets like naval vessels, airlifts, or ground convoys in a manner that supports all services involved in the mission. Despite these improvements, complete optimization of this structure remains an ongoing challenge. Kogabwilhan's effectiveness is still limited by disparities in digital systems between branches, a lack of unified logistical doctrine, and inconsistencies in policy execution. Strengthening its role will require enhancing network-centric operations, improving data-sharing platforms, and fostering a shared operational culture across all components of the Indonesian Armed Forces (Sumadinata et al., 2022). These improvements are essential if Kogabwilhan is to function not just as a command node but as a fully integrated logistical hub for Indonesia's defense posture.

Another notable example of logistics integration across military branches can be observed in the evolution of the Garuda Shield joint military exercises. These exercises, particularly from 2007 to 2022, illustrate how inter-service cooperation extends beyond strategy and tactics into logistical coordination. Initially launched as a bilateral Army-to-Army initiative between the Indonesian Army and the United States Army, Garuda Shield focused primarily on improving ground combat readiness and peacekeeping capabilities (Montolalu & Perwita, 2023). However, it has transformed into a multilateral service platform involving ground forces and naval and air force components over the years.

This transformation signifies more than just expanded participation; it highlights the increasing complexity and necessity of integrated logistics planning in joint operations. The logistical demands escalated proportionally as Garuda Shield grew in scale and strategic importance. This required precise coordination of diverse support elements, such as joint transport arrangements, cross-service medical and engineering units, and supply chain harmonization to ensure timely fuel, ammunition, and provisions delivery across different terrains and operational theaters. The logistical integration demonstrated in Garuda Shield exercises also provides a valuable testing ground for interoperability

initiatives, allowing the Indonesian military to simulate real-world scenarios involving combined air-sea-land deployments. It reflects the broader strategic intent of ensuring that its logistical infrastructure can support unified and rapid-force projection when required (Montolalu & Perwita, 2023).

b. Standardization of Inventory and Equipment

Standardization of inventory and equipment within the Indonesian National Armed Forces has become a critical objective in improving operational logistics across all branches. The effort to unify equipment specifications, shooting ranges, and material systems is not merely technical; it directly supports the Indonesian Armed Forces' ability to execute its primary functions more efficiently. Discrepancies in weapon specifications and non-standardized shooting ranges hinder the effectiveness of unit-level training and reduce the overall capability of personnel to operate under consistent combat conditions. As a result, the formulation of Ketentuan Standar Umum (KSU) and technical specifications is essential to ensure that all materials, whether domestically produced or imported, meet reliability and compatibility requirements across Army units (Siswanto et al., 2024).

From a logistical standpoint, the Navy has also faced challenges caused by a lack of standardization in materiel development and procurement. The absence of uniform operational requirements and technical specifications often leads to inefficiencies in maintenance and repair activities (Saputra et al., 2024). In addition, reliance on foreign-produced strategic equipment such as ships and maritime patrol aircraft has limited control over spare parts availability and extended maintenance timelines. To address these issues, the Navy stresses the importance of building its logistics system around clearly defined operational requirements, comprehensive technical documentation, codification, and standardized procurement plans. This initiative not only enhances interoperability with other branches but also streamlines maintenance, inventory management, training, and lifecycle support (Saputra et al., 2024).

In both Army and Navy contexts, the benefits of standardization are apparent: simplified procurement processes, improved cost-efficiency, easier training programs due to equipment familiarity, and reduced logistical burden during deployments. Moreover, standardized systems enable joint operations to be more seamless, as units from different branches can utilize shared resources and support infrastructure. This leads to a more agile and responsive defense logistics system in the long run.

Consumption Patterns and Logistics Distribution

a. Demand Patterns and Logistics Distribution in Military Supply Chains

In Indonesia's military logistics environment, demand patterns vary significantly based on operational type, regional deployment, and the branch of service involved. Unlike commercial supply chains that can rely on relatively stable consumer trends, military supply chains must anticipate fluctuating demands driven by both predictable routines and unpredictable contingencies. For instance, regular training exercises, peacetime base operations, and

scheduled maintenance generate steady logistical needs. However, sudden deployments, natural disasters, or combat scenarios can trigger rapid surges in consumption, requiring logistics teams to mobilize additional resources within narrow timeframes (F. M. Arifin, 2024).

The Indonesian military's archipelagic geography adds further complexity to distribution efforts. Supplies must be delivered to major urban bases and remote outposts across thousands of islands. This decentralization poses significant transportation and coordination challenges. Each military branch, such as the Army, Navy, and Air Force, faces unique distribution requirements based on its operational environment. Naval operations, for example, depend heavily on shipborne logistics and port accessibility, while Army units operating inland require overland convoys and often contend with rugged terrain. Without a synchronized system for monitoring and forecasting demand across services, there is a risk of overstocking in some areas and shortages in others, reducing overall efficiency (Iskandar & Arifin, 2023).

To manage this variability, effective demand forecasting becomes crucial. Accurate forecasting in military logistics involves analyzing historical data, mission profiles, and real-time operational conditions to predict what supplies will be needed, where, and when (F. M. Arifin, 2024). The adoption of digital technologies plays a vital role in enhancing these capabilities. Indonesia's current military logistics still faces limitations due to its partial reliance on manual processes. The slow adoption of integrated digital systems restricts real-time visibility over inventory and movement, particularly for critical resources such as fuel and medical supplies. Efforts are being made to overcome these barriers through programs like the Food Estate initiative, which seeks to sustainably decentralize supply reserves and create regional stockpiles supporting defense logistics. This model supports improved distribution and responsiveness by reducing the burden on central supply chains. It also aligns with the broader defense economic strategy, emphasizing logistics integration with regional development and infrastructure planning (A. Arifin et al., 2022).

Despite these advancements, significant logistical disparities remain across regions. Infrastructure constraints, such as limited port facilities, underdeveloped road networks, and inconsistent storage capacity, hinder smooth distribution. Combined with bureaucratic fragmentation and a lack of unified logistics doctrine, these issues impair the ability to deliver supplies efficiently across all theaters of operation (Iskandar & Arifin, 2023). Addressing these gaps requires improved forecasting tools, better institutional coordination, and long-term investment in digital systems and transportation infrastructure.

b. Demand Forecasting during Emergency and Crisis Situations

Effective demand forecasting during emergencies is a cornerstone of military logistics preparedness. In crisis scenarios, whether triggered by natural disasters, armed conflict, or sudden geopolitical shifts, the ability of military logistics systems to anticipate supply needs can determine the success or failure of a mission. Emergencies often require a rapid surge in the distribution of critical supplies such as food, water, medical aid, fuel, and equipment to remote or

under-resourced areas. Without an efficient forecasting mechanism, delays in supply chain responsiveness can severely hinder operations and compromise humanitarian efforts and national security objectives (F. M. Arifin, 2024).

Forecasting models must adapt to rapidly changing variables such as terrain access, communication breakdowns, shifting troop movements, and population displacement during crises. Unlike routine military supply chains that can rely on historical consumption patterns, crisis logistics depend on real-time intelligence, predictive analytics, and scenario-based planning. However, in practice, much of Indonesia's current logistics forecasting still relies heavily on manual systems, especially for items like fuel and lubricants, which are vital during large-scale operations (F. M. Arifin, 2024). This reliance limits the military's ability to process data quickly and respond to unexpected needs.

The Indonesian military's experience during the COVID-19 pandemic further illustrated the urgent need for agile forecasting tools. As the pandemic disrupted national supply chains, military logistics had to pivot rapidly to support defense operations and civilian emergency responses (A. Arifin et al., 2022). This required the swift distribution of medical equipment and food supplies and coordination across ministries and civilian infrastructure. One significant lesson was the importance of cross-sector collaboration in data sharing and logistics planning. The Food Estate program, led by the Ministry of Defense, is one example of linking forecasting to national resilience planning, aiming to establish regional supply hubs that can quickly respond to food and resource shortages during crises (A. Arifin et al., 2022).

The country's archipelagic layout and uneven road and port development create logistics blind spots that complicate the rapid deployment of goods and personnel. In emergencies, delays can stem not from lack of supplies, but from the inability to move them efficiently to where they are needed. The 2023 Logistics Performance Index reflected this, with declines in key indicators such as timeliness, international shipment reliability, and tracking capabilities, all of which are essential in emergency forecasting and logistics execution (Iskandar & Arifin, 2023)

Indonesia's military logistics systems must adopt more integrated digital technologies and real-time data platforms to enhance forecasting effectiveness. These tools allow for the dynamic modeling of demand scenarios, enabling planners to adjust inventory allocations based on live operational inputs. Digital dashboards, predictive algorithms, and geospatial tracking can collectively inform more agile and accurate responses. Yet, the full integration of such technologies remains incomplete, partly due to institutional fragmentation and limited technical infrastructure in certain regions (F. M. Arifin, 2024).

For Indonesia, improving this capability means investing in digital transformation, strengthening inter-agency coordination, and decentralizing logistics capacity. As the military faces various threats, ranging from natural disasters to asymmetric warfare, forecasting must evolve into a core strategic function supporting military operations and national resilience and disaster response goals.

Capacity Planning and Constraints

a. Capacity Planning for Transportation and Storage Facilities

Effective capacity planning for transportation and storage facilities is essential to ensure military logistics readiness during peacetime and operations. This task is particularly complex in Indonesia due to the country's archipelagic nature, which necessitates extensive coordination across land, air, and maritime domains. Indonesia's military logistics system, managed by the Defense Logistics Agency (Badan Logistik Pertahanan), relies on capacity planning that integrates airstrips, ports, warehouses, and road networks to support the rapid movement and storage of personnel, supplies, and equipment (Sarjito, 2024).

Capacity planning is not limited to military assets alone. It involves integrating and optimizing civilian infrastructure, particularly maritime ports, which play a central role in defense logistics. As Indonesia aspires to become a global maritime axis, modern port infrastructure with advanced handling and storage facilities becomes indispensable for efficient logistics operations. Ports serve as key nodes where supplies are consolidated, stored, and dispatched, both for military and humanitarian missions (Afpriyanto et al., 2023).

Indonesia has pursued long-term strategic development to address infrastructure gaps through its recent National Logistics System (SISLOGNAS) framework plan. This plan emphasizes the need for an integrated multimodal logistics network that improves capacity and reduces national logistics costs, which remain above 20% of GDP. SISLOGNAS outlines the development of major port hubs and integrated logistics centers to enhance storage and transportation capabilities (UN.ESCAP, 2021). Furthermore, the use of floating concrete docks is being considered as a flexible and cost-effective solution to extend maritime infrastructure in remote or rugged areas, enabling temporary or mobile staging and storage areas for military operations (Afpriyanto et al., 2023).

On the operational level, the Indonesian Army Logistics and Transportation Centre is critical in coordinating logistics planning, including moving material and personnel across terrain types. This centre ensures interoperability across service branches and maintains operational readiness during peacetime and wartime by managing storage, distribution, and combat logistics (Sarjito, 2024). Digital platforms are also being introduced to support logistics capacity planning. The INALOG system, as part of SISLOGNAS, is designed to provide real-time visibility into storage availability and transportation flows. This allows the military to better anticipate needs and allocate resources dynamically (UN.ESCAP, 2021). Thus, it could be said that strategic investment and planning, combined with civilian-military integration, are key to sustaining logistics performance in routine and emergency military operations.

b. Infrastructure Limitations and Budget Constraints Affecting Logistics

Limitations heavily influence the effectiveness of defense logistics in Indonesia, including transportation infrastructure and persistent budget constraints. A primary concern lies in the uneven transportation infrastructure development, especially in remote islands and border areas. Inadequate road networks, limited port capacity, and underdeveloped airstrips impede the timely movement of personnel and critical supplies. For instance, the National Strategic

Development Plan recognizes that remote and border regions suffer from minimal intermodal connectivity, which leads to high logistics costs and reduced operational efficiency (UN.ESCAP, 2021).

Even in more economically active regions, congestion and outdated infrastructure at major hubs like Jakarta and Surabaya create bottlenecks affecting civilian and military logistics. The lack of seamless multimodal integration, such as railway connections to ports and airports, further hampers the rapid deployment and distribution of military assets. (UN.ESCAP, 2021). In maritime logistics, the availability of modern ports remains a critical issue. Although Indonesia has made strides in developing international hub ports such as Kuala Tanjung and Bitung, many other areas still rely on basic docking facilities that cannot accommodate large defense or commercial vessels. The limited investment in maritime logistics infrastructure, especially in the eastern parts of Indonesia, restricts naval mobility and compromises the efficiency of sea-based military supply chains (Afpriyanto et al., 2023).

Budget constraints further exacerbate the problem. Building and maintaining high-quality infrastructure across a dispersed territory requires substantial long-term investment. However, defense logistics often competes with other national priorities for limited resources. Funding gaps delay infrastructure projects, hinder modern transport asset procurement, and limit existing facility upgrades. As a result, the Indonesian Armed Forces are often required to operate within outdated systems and adapt civilian infrastructure for military use, which is not always optimal for defense readiness (Sarjito, 2024).

As previously noted, solutions like INALOG and floating concrete docks offer flexibility, but remain limited due to fiscal limitations and fragmented policy execution (Afpriyanto et al., 2023). These challenges illustrate how infrastructure limitations and budget constraints represent significant barriers to achieving a resilient and responsive defense logistics system in Indonesia. Without significant improvements in infrastructure investment and more strategic budget allocation, the capacity of the Indonesian military to respond swiftly and efficiently, especially in remote, maritime, or conflict-prone areas, will continue to be challenged.

Integration of the 3Cs to Enhance Effectiveness

In archipelagic military logistics, the relationship between commonality, consumption, and capacity (3Cs) is essential to achieving systemic efficiency. Rather than viewing each element separately, understanding how they integrate reveals how logistical effectiveness can be optimized through synergy. Each “C” supports the others: commonality reduces complexity, streamlining consumption patterns, and this alignment matches available capacity. This is especially important in Indonesia’s dispersed geographic environment, where coordination and adaptability are constant operational challenges.

Commonality, such as standardized parts, fuel types, and modular platforms, directly supports consumption efficiency. For example, when logistics units operate with interoperable systems, the variety of consumables like spare parts and ammunition is minimized. This uniformity simplifies inventory management and facilitates faster response times and more predictable resupply

needs. These factors are crucial in archipelagic contexts with complex delivery routes and long lead times.

When monitored and forecasted effectively, consumption provides important commonality and capacity planning data. Understanding usage patterns helps identify which items or systems should be standardized. It also informs how much logistical capacity, such as shipping tonnage or warehouse space, is necessary. Conversely, high variability in consumption may indicate a need for increased commonality to prevent inefficiencies or excess stock.

Capacity, including transport platforms, storage facilities, and human resources, enables supplies' physical movement and storage. Its efficiency improves when supported by commonality and predictable consumption. For example, when standard equipment is used across units, the required transport capacity can be optimized because fewer spare parts and supplies need delivery. Predictable consumption patterns also allow for better allocation of limited logistical assets. This is critical in areas with restricted infrastructure, such as outer islands or disaster-prone zones.

Integrating the 3Cs creates a feedback loop that improves operational readiness and resource optimization. However, successful integration requires institutional commitment, reliable information systems, and a defense logistics culture prioritizing long-term sustainability rather than short-term fixes. In Indonesia, where logistical resources are limited and spread across thousands of islands, applying an integrated 3Cs framework offers strategic advantages. It reduces waste, accelerates response times, and ensures defense operations remain effective even in geographically isolated regions.

CONCLUSIONS AND RECOMMENDATIONS

The analysis of Indonesia's defense logistics system reveals that the effectiveness of military logistics is heavily influenced by the integration of the 3Cs: Commonality, Consumption, and Capacity. The current state of logistics in the Indonesian Armed Forces shows notable progress in joint operations and supply coordination, particularly through structures like Kogabwilhan and initiatives such as Garuda Shield. However, challenges persist in fragmented digital systems, inconsistent standardization, uneven infrastructure development, and constrained logistics capacity, particularly across Indonesia's remote and maritime regions.

The archipelagic geography of Indonesia adds complexity to logistics distribution and highlights the need for synchronized logistics planning. While programs like SISLOGNAS, INALOG, and the Food Estate initiative are steps toward modernization and decentralization, the logistics system still lacks full digital integration, efficient demand forecasting, and standardized inventory management across military branches. Budget constraints and underdeveloped infrastructure remain critical bottlenecks to rapid deployment and effective disaster response.

Based on the findings and discussion above, several key recommendations can be proposed to enhance the effectiveness of Indonesia's defense logistics system:

a. Accelerate Digital Integration and Data Sharing

Invest in integrated digital logistics systems that support real-time inventory tracking, demand forecasting, and inter-branch coordination. Systems like INALOG should be further developed and scaled nationwide to close visibility gaps and improve responsiveness, especially during emergencies.

b. Strengthen Forecasting Capabilities

Develop predictive analytics tools tailored for military logistics that account for crisis scenarios, terrain constraints, and fluctuating demand. These tools should be integrated with national resilience programs like the Food Estate initiative to create adaptive supply chains.

c. Ensure Sustainable Budget Allocation for Logistics Development

Allocate adequate and sustained defense budgets to support long-term logistics modernization. Fiscal planning should prioritize logistics infrastructure, digital systems, and capacity-building initiatives to overcome current structural and budgetary limitations.

ADVANCED RESEARCH

This study is limited by its reliance on publicly available information and secondary sources, which may not fully capture the nuanced operational details and classified aspects of Indonesia's defense logistics. Direct access to internal military documents, personnel, and operational data would provide a more in-depth analysis. Furthermore, the comparative analysis was limited to selected archipelagic nations (Malaysia and the Philippines), and a broader regional or global comparison might reveal additional insights or best practices. The focus was predominantly on formal structures and stated policies, thus not extensively exploring informal practices or specific unit-level challenges beyond general observations.

Overall, achieving an integrated defense logistics network that is agile, interoperable, and sustainable is crucial for enhancing Indonesia's national security and operational readiness, especially in times of emergency or conflict. Integrating the 3Cs, commonality, consumption, and capacity, offers a strategic framework for reforming logistics practices in alignment with the country's geographic challenges and operational demands. With institutional commitment and investment in infrastructure, technology, and joint capabilities, Indonesia can build a logistics system that supports military effectiveness and national resilience.

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