The Role of Sorong Container Terminal in Supporting the Sea Toll Program and Distribution of Goods to Remote Areas

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ABSTRACT

Indonesia's geographical structure as an archipelagic nation poses significant challenges for the equitable distribution of goods across its thousands of islands. This study analyzes the strategic role of Sorong Container Terminal in supporting Indonesia's Sea Toll program and ensuring equitable goods distribution to remote regions in Eastern Indonesia. Using a mixed-methods approach, the research combines quantitative analysis of Key Performance Indicators (Yard Occupancy Ratio, Turnaround Time, and Berth Throughput) with qualitative evaluation of policy, infrastructure, and management strategies. Results indicate that the implementation of digital systems such as Enterprise Resource Planning (ERP) Centra, Terminal Operating System (TOS), and integrated ERP modules has improved operational efficiency, reducing ship waiting time and increasing container handling productivity. However, limited berth and yard capacity, weak multimodal coordination, and outdated land transport infrastructure remain major bottlenecks. Trend analysis projects container volume to rise to 113,802 Twenty-foot Equivalent Units (TEUs) by 2036, exceeding current capacity and underscoring the urgency of expansion. The study recommends strategic measures, including infrastructure modernization, digital integration, human resource development, and sustainable energy management, to enhance competitiveness. This finding indicates that Sorong Container Terminal demonstrates strong potential as a logistics hub, driving the success of the sea toll program and promoting balanced economic growth across Eastern Indonesia.

Keywords*: Container Terminal, Goods Distribution, Operational Efficiency, Sea Toll, Terminal Operating System, Transport Infrastructure.*

INTRODUCTION

Maritime logistics underpins national and global trade, with about 90% of global trade volume transported via maritime routes, emphasizing its role in international supply chains (Samadova, 2024). Efficient maritime logistics ensures smooth trade, cost reduction, and competitiveness (Mohiuddin et al., 2024). Cost-effectiveness, especially for bulk and long-distance shipments, allows countries to import essential resources and export surpluses competitively (Jiang, 2024). According to Nugraha et al. (2025), implementing strategic cost optimization significantly enhances crew management efficiency in maritime shipping operations, leading to reduced operational expenses and improved scheduling effectiveness.

Collaborative logistics networks enhance efficiency and adaptability, while strategic planning and risk management ensure resilience against disruptions, strengthening international trade relations. Ports are vital economic centers, generating employment in shipping, warehousing, distribution, and customs, and attracting investment (Rodrigue, 2020). Effective port management maximizes benefits and minimizes inefficiencies from congestion or infrastructure limits.

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Container terminals are crucial nodes in the global logistics network, requiring efficient handling of large vessels and cargo to maintain competitive service. Technological advancements, including automated handling systems and real-time tracking, enhance operational efficiency, reduce ship waiting times, and expedite processing (Gharehgozli et al., 2014). Inter-Terminal Transport (ITT) programs facilitate smooth container movement between terminals, essential for managing larger ships and increased traffic. The development of dry ports, as inland terminals in the extended gateway concept, strengthens port-hinterland connectivity, alleviates seaport congestion, and improves cost and service efficiency in production and distribution networks (Iannone, 2013; Cao et al., 2023). Strategic planning and advanced modeling optimize container flows, enhancing overall supply chain resilience.

The Indonesian government initiated the sea toll program to reduce goods price disparity and improve regional connectivity, particularly in eastern Indonesia, including Papua (Kurniawan et al., 2024). Sorong Container Terminal serves as the main entry hub for goods to Papua and the surrounding areas, supporting domestic and international logistics. Despite modern facilities and a handling capacity of 50,000 twenty-foot equivalent units per year with a 22,632 square meter stacking area, projected container volumes of 71,823 twenty-foot equivalent units by 2036 may exceed infrastructure capacity, risking bottlenecks. Expanding berths and stacking areas are increasingly urgent to meet growing logistics demand under the sea toll program.

Operational efficiency is key to Sorong Container Terminal's success in logistics distribution. Terminal productivity has improved, reducing ship waiting time from 72 to 24 hours and raising loading and unloading to 30.34 boxes per ship per hour, but challenges remain in modernizing infrastructure. Key performance indicators, including Yard Occupancy Ratio (YOR) and Turnaround Time (TAT), reveal persistent efficiency and cost issues. Geographical and logistical constraints, such as limited road connectivity in Eastern Indonesia, hinder distribution to remote areas. To align with sustainable development, capacity expansion and operational improvements must integrate environmentally friendly technologies and energy optimization to meet international logistics standards. Research on regional container terminals in archipelagic countries is limited despite their critical role in domestic and global trade. Indonesia and Eastern Caribbean nations rely heavily on maritime transport, yet studies often focus on individual terminals rather than systemic regional impact (Syafaaruddin, 2015). Operational analyses emphasize cargo handling and ship turnaround, rarely addressing socioeconomic or environmental factors (Greco, 2021). Regional challenges include fragmented networks and dependence on inter-island feeder services. Programs like Indonesia's sea toll and port modernization in Antigua and Barbuda aim to enhance connectivity and revive cargo networks, but empirical evaluations of their broader effectiveness remain scarce (Telemaque, 2022).

This study analyzes how Sorong Container Terminal's infrastructure and operational capacity meet logistics needs for the sea toll program and explores strategies to address barriers sustainably. Unlike prior research focusing on technical aspects, it combines quantitative and strategic approaches, using key performance indicators such as yard occupancy ratio, berth throughput, and turnaround time, alongside logistics demand projections to 2036. Trend analysis and capacity simulation identify challenges and provide recommendations to enhance efficiency, competitiveness, and sustainable development, positioning the terminal as a vital hub in Eastern Indonesia's maritime connectivity and logistics supply chain.

LITERATURE REVIEW

Sorong Container Terminal Efficiency in the Sea Toll Program

Efficient container terminal operations drive economic growth in maritime-dependent regions, serving as key global supply chain nodes. Terminal efficiency reduces logistics costs, improves service quality, and enhances competitiveness. A study on Korean terminals using the stochastic cost frontier approach identified inefficiencies and

recommended integrating small operators to achieve economies of scale and sector-wide efficiency (Choi et al., 2022). Furthermore, the operational effectiveness of container terminals has a significant impact on regional economic growth. Efficient terminal operations can minimize ship waiting times (turnaround time) and reduce congestion, which are crucial factors in maintaining the reliability of the supply chain. Research focused on berth allocation models has shown that optimizing berth utilization through advanced algorithms can significantly reduce delays and improve service quality at ports. This optimization not only benefits shipping companies by reducing operational costs but also increases the volume of goods that can be handled (throughput), contributing to stimulating local economic growth (Parola et al., 2020; Akinnuwesi et al., 2021).

The relationship between efficient container terminal operations and economic growth is further strengthened by the role of these terminals in supporting trade facilitation initiatives. As highlighted in a comprehensive review of port logistics, efficient gateway operations at intermodal maritime container terminals are crucial for minimizing congestion and enhancing port connectivity with surrounding transport modes. Inefficient operations can result in significant spillover effects, such as worsening road traffic conditions and declining cargo transport service reliability (Abu-Aisha et al., 2021). Therefore, improving terminal efficiency is not only important for the terminal's performance but also has broader economic implications at the regional level.

Sea Toll

Sea toll is a maritime logistics transportation concept aimed at connecting major ports across Indonesia. According to Presidential Regulation Number 70 of 2017, sea toll refers to effective sea connectivity through ships that regularly and scheduled sail from West to East Indonesia. The goal of Sea Toll is to reach and distribute logistics to underdeveloped, remote, outer, and border regions while ensuring the availability of goods and reducing price disparities to improve public welfare. This program promotes maritime transport to enhance logistics transport processes, which ultimately impacts the ease of distribution and more equitable prices for basic goods across Indonesia. The program aims to improve maritime connectivity as part of national development (Ministry of Transportation, 2020). Through this program, logistics costs have been reduced by up to 30%, which is a key contributor to high goods prices in certain regions. With the scheduled Sea Toll routes, communities in Remote, Outer, and Border Regions (*Terdepan, Terluar, dan Tertinggal*/3T) can more easily access essential goods at more affordable prices (Susantono, 2019; Pambudi & Handayani, 2023; Ministry of Transportation, 2023). The program also benefits Small and Medium-Sized Enterprises (SMEs) by expanding their product distribution networks to broader markets.

The Ministry of Transportation (2020) states that the Sea Toll program, launched in 2015 under Indonesia's Global Maritime Axis vision, aims to enhance inter-island connectivity through scheduled and coordinated shipping routes, distributing Essential Goods (*Bahan Pokok dan Bahan Penting*/Bapokting) to underdeveloped 3T areas. Susantono (2019) explains that the program involves cooperation between the central government, regional governments, State-Owned Enterprises (*Badan Usaha Milik Negara*/BUMN), and the private sector, with subsidized vessels reducing operational costs and making shipping rates more affordable. The program has cut delivery times by up to 50% and lowered price disparities between western and eastern Indonesia, though challenges remain, including limited port infrastructure at destinations and poor coordination among stakeholders.

Logistics Performance Analysis

Logistics performance indicators are tools used to measure the efficiency and effectiveness of a logistics system, including container terminal operations. Key Performance Indicators (KPIs) provide an overview of operational performance, helping terminal managers identify areas that need improvement. In the context of container terminals, KPIs often include aspects of time, cost, and service quality. Some key KPIs

used in container terminal logistics include Yard Occupancy Ratio (YOR), Turnaround Time (TAT), and Berth Throughput. YOR measures the level of utilization of the stacking area, while TAT reflects the total time a ship spends at the port. Berth Throughput, on the other hand, indicates the volume of containers a berth can handle within a certain period (Christopher, 1998). The application of Key Performance Indicators in container terminals enhances operational efficiency and productivity. Yard Occupancy Ratio identifies stacking area density to optimize space, while Turnaround Time measures ship service efficiency, attracting more port users (Zhao et al., 2020). KPIs also evaluate the impact of technology and management strategies, such as digital terminal management systems, which streamline administrative and logistics processes and improve overall efficiency (Mathias & Shinoda, 2022).

SteadieSeifi et al. (2014) define logistics demand projection as the analysis of future logistics needs based on historical data, market trends, and business environment changes to support strategic supply chain planning, ensure adequate infrastructure, and prevent bottlenecks. In container terminals, such projections anticipate cargo volume growth using methods like trend analysis, simulation, linear regression, and time series, helping managers plan infrastructure expansion, acquire equipment, and optimize operations (Zhao et al., 2020). They determine berth capacity, stacking areas, and handling equipment requirements, considering external factors such as economic growth, trade policy changes, and global shipping trends, with historical container volume data guiding predictions for the next five to ten years (Notteboom et al., 2022).

RESEARCH METHODS

This study employs a mixed-methods approach, combining quantitative descriptive methods and a qualitative approach. Quantitatively, this research aims to analyze the infrastructure and operational conditions of Sorong Container Terminal based on actual data and key performance indicators KPIs such as Yard Occupancy Ratio (YOR), Turnaround Time (TAT), and Berth Throughput. This analysis provides an objective picture of the terminal's capacity to support the sea toll program. Meanwhile, the qualitative approach is used to explore logistics policies and institutional dynamics that affect terminal operational performance, through document analysis and interviews with relevant stakeholders. Additionally, logistic needs projections up to 2036 are conducted using trend analysis methods, resulting in a comprehensive understanding of the terminal's efficiency, challenges, and strategies for improving performance.

This research was conducted at Sorong Container Terminal in Sorong City, Southwest Papua, a strategic port managed by PT Pelabuhan Indonesia (Pelindo) serving as the main entry and exit point connecting Indonesia's outermost regions (Rusmin et al., 2023). Its location on established shipping routes allows vessels under the sea toll program to connect southern Papua, Merauke, and Jayapura, while linking with ports such as Nabire, Bintuni, Manokwari, and Biak, creating a maritime network across Papua. Sorong functions as a major distribution hub in Eastern Indonesia, facilitating the movement of key commodities, particularly rice from Merauke, and supporting the export of local products, thereby helping reduce the historical development gap in the region (Widodo et al., 2025).

Sorong Container Terminal is a key hub in the sea toll program, receiving vessels regularly to supply remote regions and support regional economic growth, while enabling local community participation in broader economic activities (Rustan, 2023). Plans aim to expand capacity from 50,000 to 243,000 twenty-foot equivalent units, establishing a hub-and-spoke system for distribution to smaller regional ports. Challenges include cargo imbalances between western and eastern Indonesia, coordination among shipping companies, infrastructure limitations, and high logistics costs due to reliance on smaller vessels serving multiple ports.

Primary and secondary data were used in this study to analyze the issues. Primary data was obtained through direct observation of the Sorong Container Terminal to identify the actual infrastructure and operational conditions. Secondary data was obtained by

collecting data from Pelindo's official reports, terminal operational statistics, and supporting documents related to port performance and logistics distribution. The study analyzed several indicators to address the research issues, including Yard Occupancy Ratio, Turnaround Time, user satisfaction, terminal strategy, and logistics needs projection. Data were collected through observation, document review, questionnaires, interviews, and historical records, using instruments such as checklists, reports, stopwatches, and interview guides. Analysis methods included quantitative descriptive statistics, Likert scale evaluation, thematic analysis, and time series forecasting. Field observations focused on berth capacity (length and water depth), yard occupancy, the number and condition of handling equipment, and ship unloading times. The formula used to measure the Yard Occupancy Ratio as a Key Performance Index for measuring the usage level of the stacking area is:

$$YOR = \frac{\text{Total Stacking Capacity}}{\text{Stacking Volume Used}} \times 100\%$$

For measuring Berth Throughput to determine the berth capacity in handling TEUs:

$$\text{Berth Throughput} = \frac{\text{Dock Length}}{\text{Total TEUs Volume}}$$

RESULTS

Although there was a decline in 2022, both international and domestic shipments showed recovery in 2023, with the number of units and shipment volumes approaching the figures of 2021. In 2022, Sorong Container Terminal successfully implemented the Enterprise Resource Planning (ERP) system with the Financial (FI) and Material Management (MM) modules as part of a larger ERP system integration. The implementation of this ERP system aimed to improve efficiency in managing financial and logistics data, as well as integrating various operational functions that were previously managed separately. By implementing this ERP system, Sorong Container Terminal was able to optimize inventory management, procurement processes, and financial and accounting processes in a more transparent and integrated manner. This is expected to enhance overall operational performance and accelerate data-driven decision-making processes based on accurate, real-time information.

The success of the ERP implementation is also reflected in increased operational efficiency, as the system allows faster data processing based on real-time information. Additionally, the ERP system enables management to identify bottlenecks more quickly and respond to operational needs more accurately. In the future, further development of this system is expected to cover other aspects, such as analytics processing for better planning, as well as integration with other transportation and distribution systems to improve supply chain efficiency in Eastern Indonesia.

Table 1. Realization of Sorong Container Terminal Service Performance

Years	Box per Ship per Hour (BSH)	Box per Crane per Hour (BCH)
2021	-	16.50
2022	26.50	23.50
2023	30.48	23.42

As shown in Table 1, in 2023, Sorong Container Terminal achieved outstanding results in domestic container service performance, with Box per Crane per Hour (BCH) Effective Time (ET) performance reaching 23.42 bph, surpassing the 2023 RKAP target of 22.50 bph and achieving 104% of the target. This achievement was mainly driven by operational transformation efforts, including the implementation of On-the-Job Training (OJT) for several operators and planners. This OJT program expanded their knowledge of the unloading process, which improved the smoothness and speed of operational activities,

resulting in more efficient unloading operations. Additionally, the Gross BSH Berthing Time (BT) performance also achieved excellent results with 30.48 bph, or 102% of the 2023 RKAP target of 30.00 bph. The achievement of BCH ET and BSH Gross BT performance was due to the transformation at Sorong Container Terminal, where improvements in human resources, systems, and operational performance made operations more optimal. Ships that previously required up to 2 working days now only require an average of 10 to 18 hours.

Table 2. Realization of Infrastructure Utilization

Year	Berth Occupancy Ratio	Yard Occupancy Ratio
2021	-	-
2022	11.96%	24.43%
2023	22.02%	24.38%

Table 2 shows that, in 2023, the realization of Berth Occupancy Ratio (BOR) reached 22.02%, or 166% of the 2023 RKAP target of 65.00%. The acceleration of unloading operations positively affected the ship's port stay time, reducing the duration. The realization of the Yard Occupancy Ratio (YOR) in 2023 reached 24.43%, or 165% of the 2023 RKAP target of 70.00%. The acceleration of cargo stays resulted in a quicker dwell time for containers at Sorong Container Terminal.

Table 3. Projection of Container Volume at Sorong Container Terminal

Year	Projected Volume (TEUs)
2024	53.802
2025	58.802
2026	63.802
2027	68.802
2028	73.802
2029	78.802
2030	83.802
2031	88.802
2032	93.802
2033	98.802
2034	103.802
2035	108.802
2036	113.802

Table 3 presents the projected container volume at Sorong Container Terminal up to 2036. To estimate future logistics volume, the Simple Moving Average (SMA) method is applied using the last two years of data. For example, if the container volume handled in 2022 was 46,595 twenty-foot equivalent units and in 2023 was 51,010 twenty-foot equivalent units, the average annual movement over these two years is (46,595 + 51,010) ÷ 2 = 48,802 twenty-foot equivalent units per year. Assuming stable growth, the projected container volume for subsequent years can be calculated by adding the average annual growth to the previous year's volume.

To address this potential bottleneck, infrastructure capacity improvements are required, such as expanding the stacking yard and enhancing unloading facilities. Additionally, investment in efficient technology and management systems is also essential to boost productivity and optimize the use of existing resources. With these measures, Sorong Container Terminal can anticipate the future increase in logistics volume and ensure smooth, sustainable operations.

Table 4 shows that the operational performance of Sorong Container Terminal is influenced by several key barriers that hinder the efficiency of goods handling and distribution. The first major challenge lies in the limited stacking yard capacity. As container volume continues to grow, the existing yard area is no longer sufficient to accommodate the increasing number of containers. This limitation causes congestion that slows down unloading activities and disrupts the smooth flow of goods. The inadequate

stacking space also contributes to longer truck and ship waiting times, ultimately reducing overall logistics efficiency. To overcome this issue, it is essential to invest in expanding the stacking yard area and adding supporting facilities that can optimize container flow and storage management. The second challenge concerns limited berth capacity. The current berths cannot adequately serve the rising number of large vessels operating on the Eastern Indonesia distribution routes. As a result, ships experience longer docking times and delays in the loading and unloading processes, which increase operational costs and reduce service efficiency. Addressing this issue requires immediate expansion of berth facilities and the introduction of new technologies capable of accelerating cargo handling and minimizing ship turnaround time (Fuady, 2023).

Table 4. Operational Barriers and Contributing Factors at Sorong Container Terminal

Operational Barrier	Contributing Factor	Description
Limited Stacking Yard Capacity	Limited Stacking Space	The stacking yard cannot accommodate the increased container volume, causing congestion and delays in unloading.
Limited Berth Capacity	Increase in Ship Arrivals	The existing berth is unable to handle the growing number of large vessels, hindering docking times and prolonging service time.
Coordination Between Transport Modes	Lack of Synchronization Between Transport Modes	Poor coordination between sea, land, and air transport causes delays in goods distribution and increases logistics costs.
Limited Technology and Management Systems	Outdated Information and Technology Systems	The use of outdated management and technology systems hampers fast and accurate information flow between port operators and cargo owners.
Delays in Goods Delivery	Limited Availability of Land Transport	Insufficient land transport facilities, such as inadequate trucks, lead to delays in goods delivery from the port to final destinations.

Another important obstacle is the lack of coordination between transport modes. Delays in the delivery of goods are frequently caused by weak synchronization between sea, land, and air transportation systems. Goods arriving at the port often face bottlenecks due to traffic congestion, limited truck availability, or unsynchronized flight schedules. These issues result in higher logistics costs and longer delivery times. Therefore, improving intermodal coordination and developing integrated scheduling systems are crucial to ensuring that goods can reach their destinations efficiently and reliably. In addition, the use of outdated technology and fragmented management systems significantly hampers operational performance. The existing systems do not provide real-time data, making it difficult for port managers and operators to make timely and accurate decisions. The lack of integration between stakeholders such as terminal operators, shipping agents, and logistics providers further exacerbates inefficiencies. Investments in digital transformation, including the implementation of integrated management platforms and real-time monitoring systems, are necessary to streamline operations and enhance decision-making accuracy (Olayinka, 2021).

Delays in goods delivery remain a persistent issue due to inadequate land transport facilities. A shortage of trucks, vehicle maintenance problems, and poor road infrastructure contribute to slow cargo movement from the port to final destinations. Additionally, adverse weather conditions often further disrupt delivery schedules. To mitigate these problems, it is important to strengthen the land transportation network, improve road quality, and promote investments in more reliable and energy-efficient transport vehicles. These operational barriers, ranging from physical infrastructure constraints to technological and coordination inefficiencies, demonstrate the urgent need for comprehensive modernization at Sorong Container Terminal. Through strategic investments, digital integration, and intermodal coordination, the terminal can significantly enhance its role in supporting Indonesia's Sea Toll program and ensuring the efficient distribution of goods to remote regions.

DISCUSSION

Sorong Container Terminal plays a strategic role in supporting the sea toll program, which aims to reduce price disparities in Eastern Indonesia by improving maritime connectivity and lowering logistics costs. The program enables large-capacity vessels to transport goods in bulk, thereby reducing per-unit shipping costs and improving access to essential and industrial commodities from major ports in Java and Bali (Fuady, 2023). This is consistent with Susantono (2019), who observed a declining price gap between western and eastern Indonesia, although distribution efficiency still requires improvement. In terms of logistics connectivity, Sorong functions as a key node linking domestic and international routes (Panayides & Song, 2013). Increased sea toll operations have reduced transit times, expanded market access to remote regions, and stimulated trade flows. Furthermore, improved inter-port connectivity supports access to diverse goods, aligning with the Ministry of Transportation's (2020) objective of serving 3T regions, although coordination challenges persist (Ministry of Transportation, 2023).

The sea toll program's success has attracted investment in trade, industry, and tourism by making goods distribution faster and more cost-effective. Improved inter-regional connectivity enables local entrepreneurs to access broader markets, stimulating regional economic growth and enhancing Eastern Indonesia's economic competitiveness. Infrastructure modernization at Sorong Container Terminal concretely supports this program: upgraded loading and unloading facilities, along with better management systems, allow handling of larger cargo volumes more efficiently (Sudrajat et al., 2024). Technologies such as cargo tracking and warehouse management improve speed and accuracy, addressing limitations in berth and unloading capacity previously noted by the Ministry of Transportation (2020). Additional infrastructure development, including longer berths and expanded warehouse facilities, remains essential to accommodate growing container volumes and ensure smooth goods distribution (Denktas-Sakar & Karatas-Cetin, 2012).

Limited infrastructure capacity, particularly in container stacking yards and berth capacity for larger vessels, remains the primary operational challenge at Sorong Container Terminal (Malau et al., 2024; Ensslin et al., 2024). Expanding this capacity is critical to accelerating cargo handling, reducing logistics costs, and broadening access to global markets. In Eastern Indonesia, where remote areas predominate, port development is central to ensuring more efficient and affordable goods distribution consistent with the Sea Toll program's mission to stabilize regional economies and reduce structural inequality between regions.

Improvements in port service quality also represent a tangible outcome of Sea Toll operations at Sorong. Infrastructure upgrades, human resource training, and the implementation of better management systems have collectively contributed to reduced ship waiting times and accelerated unloading processes (Widiastuti et al., 2022). These improvements not only drive operational efficiency but also enhance customer satisfaction and facilitate distribution to previously hard-to-reach areas. This reinforces Susantono's (2019) argument that a reduction in delivery times by up to 50% on certain routes constitutes a significant indicator of program success.

Operational modernization through the adoption of Terminal Operating Systems (TOS), automated yard management, and IoT-based sensor technologies for real-time container monitoring has demonstrated measurable improvements in productivity and error reduction (Ilin et al., 2019). Sustainability considerations have also received serious attention. The adoption of renewable energy sources such as solar panels, alongside the replacement of diesel-powered equipment with electricity or natural gas-based alternatives, has significantly reduced the terminal's carbon footprint and decreased its dependence on increasingly scarce fossil fuels (Acciaro et al., 2014; Lu et al., 2016). Energy efficiency measures, including the replacement of conventional lighting with LED systems, the installation of energy-efficient air conditioning, and the real-time monitoring of energy consumption, further reduce both environmental impact and long-term operational costs (Sadiq et al., 2021; Resende et al., 2023). These initiatives also enhance

the terminal's reputation among environmentally conscious business partners and customers.

The development of skilled and sustainability-oriented human resources complements operational improvements by ensuring efficiency and alignment with sustainability principles. Managerial competencies, including technical, safety, and environmental skills, are critical in enhancing port sustainability performance (Tezcan & Kuleyin, 2019; Tezcan & Kuleyin, 2021). Training programs focused on technical expertise, sustainability management, and emerging technologies are essential to prepare the workforce for future operational demands. Sorong Container Terminal illustrates that infrastructure modernization, technology integration, sustainability practices, and human resource development are interdependent factors supporting the sea toll program success. Collectively, these achievements strengthen Sorong's competitiveness and reaffirm the program's role in advancing equitable maritime connectivity in Indonesia.

CONCLUSION

Sorong Container Terminal plays a strategic role in ensuring smooth goods distribution in Eastern Indonesia, particularly in supporting the sea toll program. Operational improvements in 2023, including increased container volume, Higher Crane Unloading Rates (BCH), and enhanced efficiency through modern technology, demonstrate its growing impact. However, challenges remain, such as limited port infrastructure, restricted berth capacity, suboptimal coordination between transport modes, and growing logistics demand. Addressing these issues requires expanding stacking yard capacity, extending berths, modernizing unloading equipment, and implementing efficient, environmentally friendly technologies. Investments in supporting infrastructure, such as upgraded warehouses and improved land transport connectivity, along with integrated digital management systems, are critical to reducing delays, improving documentation accuracy, and optimizing operational efficiency. Human resource development through training programs is equally essential to ensure personnel can manage advanced technology and sustainable logistics practices effectively. Policy support, including government incentives for renewable energy use and collaboration among stakeholders, state-owned enterprises, the private sector, and regional authorities, further strengthens port operations and intermodal connectivity.

The implications of these strategies are significant: improved port efficiency reduces logistics costs, accelerates goods distribution to remote regions, and enhances regional economic competitiveness. Sorong Container Terminal has the potential to become a major distribution hub in Eastern Indonesia, contributing to broader economic growth while promoting sustainable port management. Limitations of this study include a focus on current infrastructure and operational data without long-term monitoring of environmental impacts or stakeholder behavior. Future research should examine the integration of emerging technologies, such as Internet of Things (IoT) monitoring, automated handling systems, and predictive logistics modeling, as well as the socio-economic effects of improved connectivity on local communities. By addressing these aspects, policymakers and port operators can ensure that Sorong Container Terminal continues to support efficient, sustainable, and inclusive maritime logistics in the region.

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