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Improvement of National Logistics Distribution in Supporting Sea Toll Cargo

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Abstract: The purpose of this literature review is to develop hypotheses for future researchers conducting research related to sea toll cargo. The research article on improving national logistics distribution in supporting sea toll cargo is a scientific literature article in the field of maritime transportation management. The approach used in this literature review is descriptive qualitative with comparative analysis techniques. The data collection technique is to use literature studies or conduct a literature review of relevant previous articles. The data used in this study are secondary data with a maximum publication of 8 years, sourced from academic online media such as Thomson Reuters Journal, Sage, Springer, Taylor & Francis, Scopus Q2-Q4 Emerald, Elsevier, Sage, Springer, Web of Science, Sinta 2-5 Journal, DOAJ, EBSCO, Google Scholar, and digital reference books. Empirical data was used to support the phenomena observed in this study. In this study, previous studies relevant to each topic were selected, with one to two articles reviewed for their findings. The results of this literature review are: 1) National logistics distribution plays a role in sea toll cargo; 2) Challenges in implementing sea toll cargo include insufficient return cargo, poor logistics connectivity in the hinterland, lack of warehouse facilities and temporary storage areas, inadequate coordination between institutions and sectors, and low awareness and logistics literacy among business actors; 3) The economic and social impacts of developing sea toll cargo include price equalization of goods, improved national supply chain efficiency, investment incentives in remote areas, and social impacts such as enhanced community welfare.

Keywords: Sea Toll Cargo, Improved Distribution, National Logistics

INTRODUCTION

Every country in the world that is active in global economic activities, particularly in export and import trade, is fundamentally inseparable from logistics distribution activities

(Mahani F,A., Nasution, 2022). Logistics distribution, in its most basic sense, is the process of moving goods or commodities from one point to another to ensure their availability at the right time, place, and quantity, thereby efficiently meeting market demand (Fidlerová et al., 2021). This distribution can take place both domestically between regions within a country and internationally across geographical and jurisdictional borders (Arianto, 2020). In the context of a developing country with complex geographical conditions such as Indonesia, national logistics distribution is a strategic focus in supporting economic stability, equitable development, and the resilience of the supply of basic commodities (Saputra & Ali, 2021).

As the world's largest archipelagic nation, Indonesia comprises over 17,000 islands stretching from Sabang to Merauke, with a coastline exceeding 108,000 km and maritime areas accounting for two-thirds of the total national territorial area (Rusdiana et al., 2021). This geospatial complexity creates multidimensional challenges for the national logistics system, including infrastructure, transportation modes, inter-island connectivity, and distribution costs (Kundori & Pranyoto, 2023). In addressing these conditions, maritime transportation has become the backbone of national logistics distribution. Maritime transport is chosen not only because of its suitability to Indonesia's geographical characteristics but also due to its advantages in terms of large carrying capacity, cost efficiency per ton/km, and extensive inter-regional reach (Saragih et al., 2020).

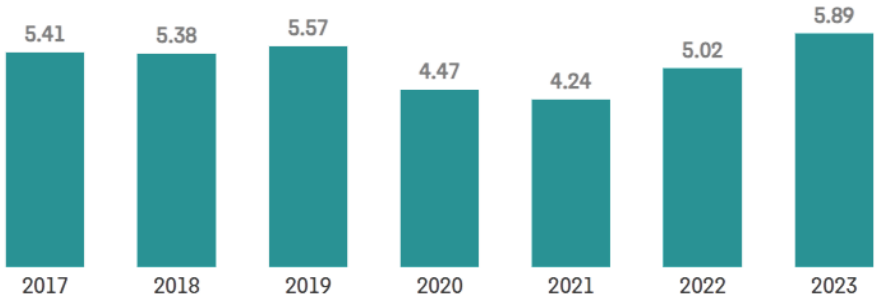

Figure 1. Transport and Storage Sector Gross Domestic Product (GDP), Share % of GDP Indonesia, Period 2017-2023

Source: (Mordor Intelligence, 2025)

Based on Figure 1 entitled “Transportation and Storage Sector of Gross Domestic Product (GDP), Percentage of Indonesia's GDP, 2017–2023,” there have been fluctuations in the contribution of the transportation and storage sector to Indonesia's Gross Domestic Product (GDP) over the past seven years. In 2017, this sector contributed around 5.41% to the total national GDP, and decreased slightly to 5.38% in 2018. However, in 2019, its contribution increased again to 5.57%, indicating the development of logistics infrastructure and increased domestic trade activity ahead of the pandemic. A significant decline occurred in 2020, when the COVID-19 pandemic hit, with the sector's contribution falling to 4.47%, and even lower to 4.24% in 2021. This can be attributed to mobility restrictions, supply chain disruptions, and a decline in economic activity due to the pandemic.

However, the transportation and warehousing sector showed a strong recovery in the following years, with its contribution increasing to 5.02% in 2022 and surging to 5.89% in 2023. This increase reflects the national economic recovery, particularly in the logistics sector, supported by the digitalization of distribution systems, the expansion of sea toll road networks, and improved inter-regional goods flows. The 2023 figure represents the highest contribution during the period shown, indicating that the logistics sector, particularly sea transportation as the dominant mode of transportation in Indonesia, plays a strategic role in driving post-pandemic economic recovery. This data also reinforces the argument that strengthening the national logistics distribution sector, including through the sea toll road program, is a vital step

toward improving economic efficiency and promoting equitable development across Indonesia.

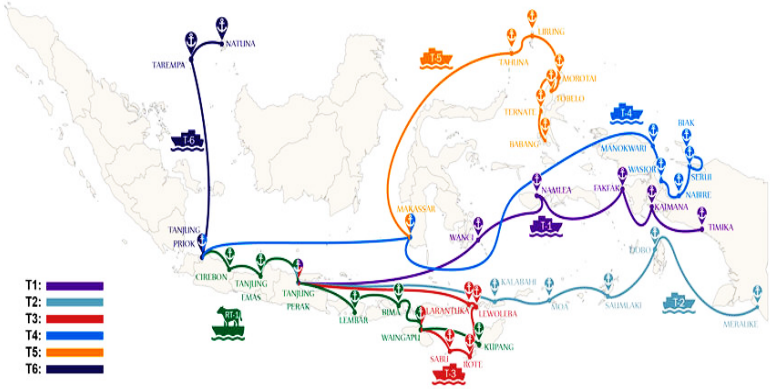

Figure 2. Support for the Sea Toll Program (Operation of 6 Fixed Freight Liner Routes)
Source: (Ministry of Transportation of the Republic of Indonesia, 2021)

Tabel 1. Rute Trayek Tol Laut Indonesia

No	Distribution Base	Route Code	Route Network	Total Distance (MIL)	Capacity
1	Tanjung Perak	T-1	Tj Perak-Wanci-Namlea-Fakfak-Kaimana-Timika-Kaimana-Fakfak-Namlea-Wanci-Tj Perak	3426	115 TEUS
2	Tanjung Perak	T-2	Tj Perak-Kalabahi-Moa-Saumlaki-Dobo-Merauke-Dobo-Saumlaki-Moa-Kalabahi-Tj Perak	3874	350 TEUS
3	Tanjung Perak	T-3	Tj Perak-Larantuka-Lewoleba-Rote-Sabu-Waingapu-Sabu-Rote-Lewoleba-Larantuka-Tj Perak	2078	115 TEUS
4	Tanjung Priuk	T-4	Tj Priok-Makassar-Manokwari-Wasior-Nabire-Serui-Biak-Serui-Nabire-Wasior-Manokwari-Makassar-Tj Priok	4644	350 TEUS
5	Makassar	T-5	Makassar-Tahuna-Lirung-Morotai-Tobelo-Ternate-Babang-Ternate-Tobelo—Morotai-Lirung-Tahuna-Makassar	2608	350 TEUS
6	Tanjung Priuk	T-6	Tj Priok-Tarempa-Natuna-Tarempa-Tj Priok	1400	3000 Ton (GC)

Figure 2 and Table 1 provide a comprehensive overview of the implementation of the Sea Toll Program by the Indonesian government, particularly in relation to support for six fixed cargo ferry routes that form the backbone of national logistics distribution by sea. The map in Figure 2 shows Indonesia crossed by various shipping routes designated as part of the Sea Toll Program. Each route is represented by a different color according to its route code (T-1 to T-6). These routes are important logistics corridors connecting major distribution centers in Indonesia from west to east and from south to north. These routes reach the 3TP region, which is a border, remote, underdeveloped, and frontier area.

Table 1 provides a detailed description of the six main Sea Toll routes, including distribution hubs, route codes, route networks, total distance (in nautical miles), and cargo capacity. For example, Route T-1, centered in Tanjung Perak, has a length of 3,426 nautical miles and a cargo capacity of 115 TEUs. Route T-2 is even longer at 3,874 nautical miles and has a larger capacity of 350 TEUs. Meanwhile, Route T-6, managed from Tanjung Priok Port, is the longest route at 14,000 nautical miles and has the highest cargo capacity of 3,000 tons of general cargo (GC).

Routes T-3 to T-5 serve eastern Indonesia, which has been considered underdeveloped in terms of distribution. The implementation of these six main sea toll routes aims to reduce price disparities between regions, facilitate the flow of goods to remote areas, and ensure equitable national economic development. These routes transport cargo from major ports to regional areas and enable reverse logistics flows.

This enables less developed regions to market their unique products to the national market. As a result, the Sea Toll Road program serves as a distribution tool and a means of regional economic empowerment and domestic market integration. The implementation of this maritime logistics map is tangible evidence that strategic maritime transportation management is crucial for building equitable national connectivity.

Problem Statements

Based on the background of the problem above, the following research questions were formulated to be used as hypotheses for further research: 1) What is the role of improving national logistics distribution in sea toll cargo in Indonesia?; 2) What are the challenges and obstacles in implementing sea toll cargo?; 3) What are the economic and social impacts of developing sea toll cargo for disadvantaged regions and archipelagic areas?.

METHOD

This study uses a descriptive qualitative approach. This method was chosen because it allows researchers to investigate and understand the characteristics related to sea tolls comprehensively. Descriptive qualitative data collection and analysis allow researchers to tailor their approach to the needs of the study and the characteristics of the subjects being studied.

The data used in this study were obtained from previous studies related to the improvement of national logistics distribution and sea toll cargo. The data used were obtained from electronic sources published within the last eight years. The technique used in this literature review was comparative analysis. By using previous studies, researchers can develop stronger, evidence-based arguments and contribute to a broader understanding of sea toll cargo (Susanto et al., 2024).

This study utilizes data from various leading academic journals, including Thomson Reuters Journal, Springer, Taylor & Francis, Scopus Q2-Q4, Emerald, Sage, Elsevier, Web of Science, Sinta 2 - Sinta 5, DOAJ, Copernicus, and EBSCO, as well as platforms such as Publish or Perish and Google Scholar. By utilizing these sources, researchers can ensure that the data they collect is valid and reliable. The use of multiple sources also enables researchers to gain a more comprehensive understanding of the content of toll roads from various perspectives.

RESULTS AND DISCUSSIONS

Results

The following are the findings of the study, taking into account the context and problem formulation:

Sea Toll Cargo

Sea Toll Cargo is a government-subsidized sea freight program aimed at improving logistics connectivity, especially in remote and island regions. Goods or commodities transported by ship under the Sea Toll program, which was launched by the Indonesian government, are referred to as Sea Toll Cargo. The program is part of the government's efforts to build national maritime connectivity. The Sea Toll program is a regularly scheduled, government-operated logistics transportation program that reaches remote, underdeveloped,

outer, and border areas (3TP). The program aims to reduce price disparities and strengthen regional economic resilience (Kurniawan et al., 2024).

Indicators or dimensions contained in sea toll load variables include: 1) Sailing Frequency: The number of sea toll ship trips per week or month on a specific route. High frequency ensures supply availability and reduces cargo accumulation; 2) Vessel Cargo Capacity: The volume of goods (in tons or TEU) that can be transported per voyage. A large capacity supports economies of scale; 3) Transportation tariffs: The cost per ton or TEU charged to sea toll users. Competitive rates attract businesses compared to other modes of transportation; 4) Schedule regularity: Consistency of ship departures and arrivals according to schedule. Punctuality affects user confidence and supply chain planning; 5) Route coverage: The number of ports connected in the sea toll network. Extensive routes expand market access and reduce interregional disparities (Triantoro, 2020).

The variable of sea toll charges is relevant to previous research conducted by: (Susanto et al., 2021), (Pambudi & Handayani, 2023), (Victoria et al., 2022).

National Logistics Distribution

The Improvement of National Logistics Distribution refers to the systematic efforts to enhance the efficiency, speed, and scope of a country's goods distribution system by integrating policies, infrastructure, and technology. The goal is to reduce logistics costs, which in Indonesia reach 23–24% of GDP (higher than the global average of 10–12%), shorten delivery times, and ensure equitable access to goods throughout the country (Karanina et al., 2020).

It is a process of developing and improving the interregional transportation system of goods within a country to achieve cost efficiency, timely delivery, and equitable access to logistics throughout the region. In Indonesia, this improvement involves strengthening physical infrastructure, such as ports, roads, and transport vessels, as well as institutional strengthening, policy regulation, the digitalization of logistics systems, and the coordination of multi-stakeholder involvement (Putri et al., 2022).

Indicators or dimensions found in national logistic distribution variables include: 1) Logistics Cost Efficiency: The ratio of logistics costs to total product value (logistics cost-to-GDP ratio). It indicates the extent to which transportation, warehousing, and administrative costs affect the final price of goods; 2) Delivery time: The average time required to distribute goods from producers to consumers; 3) Service coverage area: The percentage of the area, especially remote and island areas, covered by the logistics network. This is related to equitable development and accessibility; 4) Transportation Mode Integration: The interconnection between modes (sea, land, and air) in the supply chain; 5) Infrastructure quality: The condition of ports, roads, warehouses, and supporting technology, such as the Internet of Things (IoT) for tracking. Adequate infrastructure reduces bottlenecks in distribution (Cui et al., 2023).

The national logistic distribution variable is relevant to previous research conducted by: (Sinaga et al., 2022), (Sudrajat et al., 2020), (Saragih & Turnip, 2024).

Relevant Previous Research

Based on the above findings and previous studies, the research discussion is formulated as follows:

Table 2. Results of Previous Relevant Research

No	Author (Year)	Research Results	Similarities With This Article	Differences With This Article
1	(Jinca & Asdar, 2024)	National Logistics Distribution Variables Affect Sea Toll Cargo in the Coastal Area of Sorong Regency	The similarity with this study is in the independent variable of National Logistics	The difference with this study is that the objects were located in the

			Distribution and the dependent variable of Sea Toll Load.	coastal area of Sorong Regency.
2	(Susanto et al., 2021)	The variable of pioneer shipping connectivity in this case is part of the logistics distribution system that influences sea toll cargo.	The similarity with this study is in the independent variable of National Logistics Distribution and the dependent variable of Sea Toll Load.	The difference with this study is in the variable of Pioneer Shipping Connectivity.
3	(Kendek et al., 2023)	Logistic Distribution Variables Play a Role in the Development of Toll Road Laur Route Loading with a Hub and Spoke Scheme in West Papua	The similarity with this study is in the independent variable of National Logistics Distribution and the dependent variable of Sea Toll Load.	The difference with this study is that the objects were conducted in West Papua.

Discussion

This literature review will be discussed based on the history of the topic, research objectives, problem formulation, indicators or dimensions, and previous related research:

1. The Role of National Logistics Distribution with Sea Toll Cargo

Based on a literature review and relevant previous studies, it is stated that national logistics distribution has an impact on sea toll cargo in Indonesia.

To increase sea toll cargo through national logistics distribution, the government and every sea logistics company in Indonesia must do the following: 1) Logistics cost efficiency: Reducing logistics costs, especially transshipment costs, stevedoring costs at ports, and warehouse costs, is very important. High costs act as a barrier for businesses to utilize sea tolls; 2) Delivery time: Speed and accuracy in delivery are key factors in the supply chain. Slow processes at ports, whether during loading and unloading or administrative procedures, can disrupt the smooth flow of goods; 3) Service coverage: Service coverage refers to the availability of routes and connectivity of sea tolls to various ports, including feeder ports and access to the hinterland; 4) Transportation mode integration: Integration between sea, land (truck and rail), and even air transportation modes is key to creating a seamless and efficient supply chain from upstream to downstream; 5) Infrastructure quality: Infrastructure quality includes the condition of ports (piers, loading and unloading equipment, warehouse facilities), road access to and from ports, and the availability of supporting equipment.

If the government and maritime logistics companies can provide or pay attention to logistics cost efficiency, delivery time, service coverage, transportation mode integration, and infrastructure quality, it will have a positive impact on sea toll cargo, including: 1) Voyage frequency: Increased efficiency and demand will encourage shipping operators to increase their schedules. Higher frequency provides greater flexibility for shippers, reduces cargo waiting time at ports, and ultimately enhances the appeal of sea tolls; 2) Vessel cargo capacity: With increased cargo volume and operational efficiency, operators will be motivated to use larger vessels or optimize cargo space utilization. Higher capacity utilization means more goods can be transported in a single voyage, optimizing costs per unit of goods; 3) Transportation rates: While cost efficiency is a goal, increased volume and operational optimization may allow for more competitive rates without reducing profitability. Government subsidies may also influence; 4) Schedule accuracy: Efficiency in delivery times and infrastructure quality directly correlates with vessel schedule accuracy. Schedule accuracy is critical for company supply

chain planning. This builds trust and reliability, which in turn encourages more consistent use of sea tolls; 5) Route coverage: Expanding service coverage and integrating transportation modes will naturally expand the route coverage that can be served by sea tolls. The wider the route coverage, the more areas that are connected, and the greater the potential to transport goods to and from various locations in Indonesia.

The findings of this study align with previous research conducted by (Jinca & Asdar, 2024), which stated that there is an influence between national logistics distribution and sea toll cargo.

2. Challenges in Implementing Sea Tolls

Although sea tolls have enormous potential, their implementation faces various complex challenges, which are often multidimensional. These challenges include a) Lack of return cargo, with ships often returning empty from eastern regions. This results in high operational costs for operators, economic inefficiency, and continued dependence on government subsidies; b) Poor hinterland logistics connectivity, which is a significant constraint in many feeder ports. Even if sea toll ships arrive on time, inadequate road infrastructure or land transportation modes from ports to production or consumption centers in the interior result in high distribution costs and time. This negates the efficiency that sea tolls should offer and discourages businesses from using them optimally; c) Inadequate warehouse and temporary storage facilities at many feeder ports, causing goods to pile up and become prone to damage (Kurniawan et al., 2024).

Another equally important challenge is the suboptimal coordination between institutions and sectors. The implementation of sea tolls involves many parties, including relevant ministries (Transportation, Trade, ESDM), local governments, and private entities such as port operators and shipping companies. The lack of synergy often results in overlapping regulations, bureaucratic processes, and operational obstacles in the field. As a result, the flow of goods becomes disrupted, and the investment needed to support an integrated logistics ecosystem is hindered (Fauzi et al., 2024).

Furthermore, the low awareness and literacy of logistics among business actors, especially MSMEs in remote areas, also pose an obstacle. Many of them do not fully understand the economic benefits and procedures for using sea tolls and still rely on traditional modes of transportation or intermediaries that may be less efficient. Additionally, inadequate port facilities and cargo handling equipment in some remote locations slow down processes and reduce cargo handling capacity, which in turn affects schedule accuracy and the appeal of sea tolls. Competition with other transportation modes, such as land or air transport that offer greater speed, also requires sea tolls to continuously enhance their competitive advantages (Nurhidayah et al., 2022).

3. Economic and Social Impact of Sea Toll Development

The successful development of sea tolls, as a result of improvements in national logistics distribution, will have broad and transformative economic and social impacts for Indonesia. Economically, the most fundamental impact is the equalization of prices. With efficient logistics distribution through sea tolls, transportation costs for goods, especially basic necessities and essential goods, can be significantly reduced. This will stabilize and make prices more affordable in eastern Indonesia, directly reducing price disparities between the western and eastern regions and increasing the purchasing power of people in remote areas (Witro & Yanti, 2021).

Furthermore, sea tolls will also encourage greater efficiency in the national supply chain as a whole. Optimizing the movement of goods between islands by sea will significantly reduce logistics time and costs, supporting industry and trade. This creates a more competitive and

efficient business environment, enabling businesses to plan production and distribution more effectively, and reduce the risk of stockpiling or supply shortages. This increased efficiency, in turn, will boost inter-regional trade volumes, as better connectivity and lower costs will encourage more transactions between producer and consumer regions, driving regional and national economic growth (Siswoyo, 2020).

Another economic impact is the stimulus of investment in remote areas. Better logistics access and lower shipping costs will attract new investment in the production, processing, and service sectors in previously isolated areas. This will not only create new jobs and increase regional income, but also encourage economic diversification in the region, reducing dependence on just one or two commodities. In addition, the development of sea tolls will directly encourage growth in the maritime and logistics sectors themselves, from shipbuilding, shipping companies, terminal operators, to logistics and land transportation service providers, creating broader business and employment opportunities (Sykes et al., 2020).

Socially, sea tolls have a significant impact on efforts to improve community welfare. More affordable goods and better availability of commodities directly improve the quality of life of the community, especially in remote areas that previously had difficulty accessing basic needs. This contributes to reducing regional disparities, as sea tolls seek to balance development and the economy across all regions of Indonesia, realizing more equitable social and economic inclusion. Access to essential public services such as medical equipment, medicines, and construction materials has become easier and cheaper, improving the quality of health services, education, and basic infrastructure (Garlock et al., 2024).

Ultimately, the development of sea toll cargo not only creates new jobs, both directly in the maritime and logistics sectors and indirectly through the stimulation of economic activity in connected areas, but also strengthens national integration. Closer inter-island connectivity through efficient sea routes strengthens national unity and solidarity, as regions that were once isolated now feel more connected and become an integral part of a larger national economic and social system. This is a strategic step toward a more just and equitable Indonesia (Martínez-Vázquez et al., 2021).

Conceptual Framework

The conceptual framework is determined based on the problem formulation, research objectives, and previous studies relevant to the discussion in this literature review:

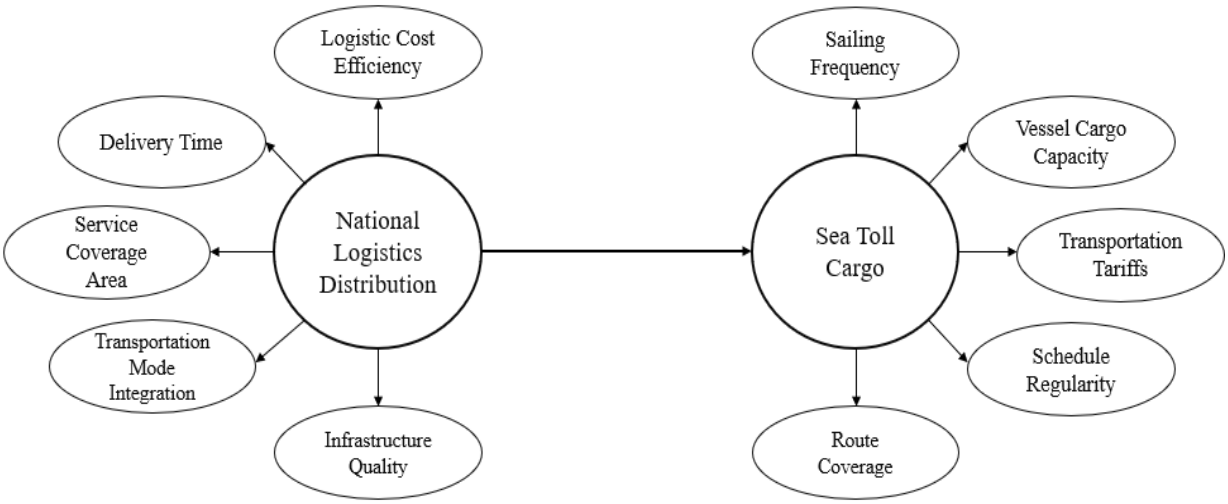

Figure 2. Conceptual Framework

Based on Figure 2 above, the improvement in national logistics distribution has an effect on supporting sea toll freight. However, in addition to the national logistics distribution variable, there are other variables that influence sea toll freight, including:

1) Government Policy: (Kazancoglu et al., 2021), (Rahman & Rahman, 2021), (Letunovska et al., 2023).
2) Information Technology: (Satriawan et al., 2024), (Widodo, 2021), (Ali et al., 2024), (Widjanarko et al., 2023).
3) Infrastructure: (Luthfiyah, 2024), (Tukan & Fatlolon, 2022), (Mahani F,A., Nasution, 2022).

CONCLUSION

Based on the problem statement, results, and discussion above, the conclusions of this study are as follows:

1. National logistics distribution plays a role in sea toll cargo. Strengthening the national logistics distribution system as a whole is a fundamental strategy in promoting the effectiveness and sustainability of the sea toll program as the backbone of inter-island connectivity in Indonesia.
2. Challenges in implementing sea toll cargo include insufficient return cargo, poor hinterland logistics connectivity, inadequate warehouse facilities and temporary storage areas, suboptimal coordination between institutions and sectors, and low logistics awareness and literacy among business operators.
3. The economic and social impacts of developing sea toll cargo include price equalization of goods, improved national supply chain efficiency, investment stimulus in remote areas, and social impacts such as enhanced community welfare.

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