Proceeding of The International Conference on Global Education and Learning

E- ISSN: 3089-8072

Research Article

RoRo Ship Transportation Policy Implementation to Optimize National Logistics Distribution in Indonesia's 3T Regions

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Abstract: This study examines the implementation of RoRo ship services in Indonesia, highlighting the implementation of RoRo ships and the current national logistics framework potential strategies, particularly in the 3T region. This research employs a qualitative descriptive methodology that includes a literature review. It utilizes secondary data from previous studies, comprising books and original scientific reports published in articles or journals. The findings indicated 1) The use of RoRo ships has gone through progressive developments, like the government's initiative on "Sea Toll" designed to support the logistics sector, particularly in 3T regions. 2) Enhancing the logistics framework through the integration of National Logistic Ecosystem (NLE) alongside the Internet of Things (IoT) to increase logistics efficiency that is rapid, effective, and clear. Nevertheless, these initiatives faces challenges. Consequently. The proposed strategies focus on improving growth center development through logistics integration (shipping, port management, and intermodal) and implementing digitalization in logistics document processing.

Keywords: 3T Regions; Digitalization; National Logistics; RoRo Ship; Transportation Policy

1. Introduction

The concept of Indonesia's potential as the Global Maritime Axis has undergone notable progress, particularly in utilizing sea transportation as an effective means of logistics distribution across the region. Maritime transport is essential for the seamless operation of trade due to its significant economic value, considerable carrying capacity, and comparatively low expenses. This is noticeable across all trade sectors as maritime transport offers benefits in logistics compared to alternative modes of transport. The port was established as a hub for trade and cargo movement, allowing ships to dock, rest, and conduct loading and unloading operations (Sartono & Prakoso, 2020). A major innovation that has significantly influenced the industry is the introduction of Ro-Ro Ship transportation as a practical substitute for road transport on specific routes, aiding in the exploration of policies and incentives that could foster the growth of a sustainable intermodal transportation network.

Vessels designed for cargo transport do not require lifting at the Port; instead, the cargo is 'rolled' on and off the ship. These ships can accommodate passengers or vehicles that enter and exit using their own power, hence they are referred to as Roll On-Roll Off ships or Ro-Ro for short. Ro-Ro allows for horizontal loading and unloading at the dock, thus decreasing waiting times at the port, as containers can swiftly be taken off the ship by linking a tractor to the trailer carrying the containers. Consequently, the Ro-Ro handling method facilitates a swift transition from sea transport to ground transport while enhancing travel speed. Acts as a means of transport linking road networks separated by the sea via a floating bridge. This means of transport is highly beneficial for inland regions lacking road infrastructure and

Received: July 16, 2025
Revised: September 10, 2025
Accepted: November 5, 2025
Published: December 31, 2025
Curr. Ver.: December 31, 2025

characterized by significant rivers like Kalimantan, Sumatra, and Papua. Consequently, Ro-Ro is a vital form of public transportation required and sought after by the community to address the growing and complex needs, as well as to foster economic development in the area.

The fair allocation of logistics in Indonesia continues to face challenges, primarily due to insufficient connecting infrastructure among regions. The Indonesian government has shown its dedication to advancing this mode through multiple policies, one of which is the "Sea Toll" initiative designed to enhance connectivity among regions, particularly in underdeveloped, outermost, and border (3T) zones. The Sea Toll is an efficient maritime connectivity network consisting of ships that operate regularly and on schedule from the western to the eastern regions of Indonesia. Since 2015, the Indonesian government has implemented the sea toll policy to guarantee the availability of goods and minimize price disparities, aiming to enhance the welfare of the entire population, particularly in hard-to-access regions like remote, underdeveloped, outermost, and border areas of (3T) zones. Significant price differences have been experienced by individuals in Indonesia's Eastern Region owing to elevated logistics expenses, such as in Papua. This impacts economic development in Indonesia's western and eastern regions, as evidenced by the significant disparity in Gross Domestic Product contributions among the areas.

High logistics efficiency is very important for Indonesia as it is a key factor in improving a country's competitiveness. With high logistics efficiency, logistics costs can be reduced, and the products and services produced can be more competitive in the global market. In the era of globalization and increasingly competitive competition, supply chain management (SCM) is one of the key aspects that determine the success of companies in optimizing their operational performance. SCM not only serves as a tool to manage the flow of goods, information, and finance in the supply chain, but also as a strategy to improve the efficiency and competitiveness of the Company. On the other hand, technological developments offer new opportunities for optimizing logistics systems through the implementation of the National Logistic Ecosystem (NLE) application combined with the Internet of Things (IoT). This collaboration is expected to create a more efficient, faster, transparent, and integrated logistics system. However, the challenges of implementing this technology still require serious attention in the aspects of regulation, digital infrastructure readiness, and human resource skills.

Both initiatives focus on developing a stronger Indonesian economy. Nevertheless, during its execution, numerous challenges remain, including inadequate port infrastructure, insufficient supporting facilities for maritime transport, and low skill levels of human resources (HR) in logistics and maritime sectors.

This study seeks to examine how the integration of the Sea Toll program and the NLE application collaborates to enhance the logistics performance of the company. This research primarily aims to assess how the synergy between the Sea Toll program and NLE application interacts with technology integration to reach optimal operational efficiency.

2. Literature Review

Ro-Ro Shipping

Ro-Ro vessels fall under the specialized ship category, featuring ramps or dock doors that allow vehicles to load and unload directly without extra transport. This aligns with the fundamental principles of intermodality within the logistics system, specifically the capability to combine various modes of transport to speed up distribution and lower logistics expenses (Kusuma & Tseng, 2019). In this setting, Ro-Ro (Roll-on/Roll-off) ships are identified as a strategic option for meeting the demand for simultaneous transportation of vehicles and cargo between islands. This idea pertains to the effectiveness of loading and unloading durations and the adaptability of the ship's cargo, thereby offering a relative edge over traditional cargo vessels (Noor, 2017).

The presence of Ro-Ro ships contributes to the evolution of the national maritime transport system into a model that is increasingly adaptive, versatile, and connected to the inland region. The advancement of maritime transport - including Ro-Ro ships - is intrinsically linked to public policy elements and the national legal structure. Transportation policy theory highlights the significance of collaboration across sectors and the streamlining of regulations to ensure that various transportation modes can evolve effectively (Buchari & Victoria, 2020).

Sea Toll

The sea toll initiative is a key program executed by the government aimed at decreasing the price gap of goods to guarantee their availability, enhance community welfare, and maintain freight transport services through logistical integration of various transportation modes. The sea toll is a concept that offers maritime connectivity by facilitating sea transport that regularly operates from Indonesia's western region to its eastern region.

Some earlier studies on sea tolls indicate a significantly positive economic effect in eastern Indonesia Kurniawan (2023), enhancing the logistics transportation system in eastern Indonesia through the Sea Toll initiative Susanto et al. (2021), highlighting the effective execution of the Sea Toll in Indonesia Andilas & Yanggana (2017) sea tolls lower the costs of essential goods in eastern Indonesia, particularly in Papua, and demonstrate that the route and frequency of sea tolls operate steadily while the volume has grown when compared to its initial launch (Gultom, 2017).

Certain prior studies indicate that sea tolls influence logistics accessibility in the T3P area of Indonesia Selasdini (2023), yet, according to the research, while the sea toll policy successfully alleviates the challenges of expensive logistics, it does not provide a lasting enhancement in consumer price accessibility.

National Logistic Ecosystem (NLE)

Logistics is the study of the movement of products, data, and finances. Beginning with the acquisition, storage, and distribution of goods based on the type, quantity, quality, timing, and location required by consumers from the source to the destination in an efficient and effective manner. Logistics management is a component of the supply chain that organizes, executes, and oversees the efficiency and effectiveness of the movement and storage of products, services, and associated information from the origin to the consumption point to satisfy customer demands (Sudrajat et al., 2024).

Through data analysis, technology aids in the growth of the marine industry. Businesses may improve routes, save fuel usage, and make well-informed decisions by analyzing data gathered from several activities. According to a research by Kusuma et al. (2020), data analysis may assist Indonesia's marine sector in tracking important economic indicators, forecasting market demand, and predicting pricing movements in order to increase the effectiveness of supply chain management. In summary, technological integration has the potential to significantly impact the marine industry's growth. The National Logistics Ecosystem (NLE) application is one of the main modernization efforts in logistics in Indonesia.

NLE's guiding principles include information technology support, data interchange, business process simplification, and the abolition of redundancy and repetition. NLE streamlines logistical procedures including document processing, products tracking, and payment by integrating a variety of digital platforms and systems. Through three primary objectives, the NLE program is focused on fostering collaboration between public and private sector entities. Facilitating end-to-end probis logistics inside the importation framework is the first tactic. Facilitating end-to-end probis logistics in the context of exporting is the second tactic. Facilitating the flow of domestic commodities is the third tactic.

3. Research Method

This study employs a qualitative approach to analyze different literature regarding the design and execution of the sea toll program and the NLE application. The data for this paper comes from library resources, including written works like books, journals, newspaper articles, and online media that the author gathers. Techniques for data analysis are performed descriptively and interpretatively, specifically by ideographically highlighting diverse phenomena and social realities, ensuring that the produced theory is firmly grounded in reality, contextual, and historical (Somatri, 2005: 64). The goal is to analyze the effectiveness of the sea toll program in diminishing price inequalities as a means of fair economic growth in Indonesia and to investigate the NLE application that has been put into place.

4. Results and Discussion

The Effectiveness of RoRo Vessels in Logistics Transport

Sea transportation is critical to optimizing logistics distribution in Indonesia, a maritime country, particularly for inter-island connection. Two common types of ships used for this are pioneer ships and roll-on/roll-off (RoRo) ships. RoRo ships are designed to load and unload cars and products without the use of heavy equipment, whereas pioneer ships provide a link to remote places that do not yet have suitable port infrastructure.

Over time, RoRo ships have demonstrated greater efficiency in distribution across several areas including operations, costs, and delivery speed. Their logistics system allows for the transfer of goods using vehicles like trucks and cars through ramp doors, eliminating the need for extra heavy equipment such as cranes or other large machinery to handle the cargo. Multipurpose ships designed for operation in the waters of Eastern Indonesia are usually built using Ro-Ro technology, which allows vehicles and cargo to be loaded and unloaded efficiently based on the type of goods and the capabilities of the ports. This type of ship is designed to transport a variety of goods and needs, including passengers, general cargo, and wheeled vehicles (Siahaya, 2015). Considering the community needs vary greatly in the three regions, there is a need for a transportation approach that can effectively move goods through local and feeder ports. As time progresses, the volume of wheeled cargo continues to increase, making the inclusion of Ro-Ro vessel designs an essential factor in the planning and development of multi-purpose ships.

In terms of cost, it has been shown to be more efficient than other transportation methods. The movement of products does not necessitate their removal from the transport vehicle, indicating that heavy machinery such as cranes is unnecessary for loading and unloading. Additionally, the reduced damage to goods during the logistics process leads to lower insurance expenses. This matches the research findings Wicaksana (2017) which indicate that Roro ship transportation offers the lowest cost per unit for cargo volumes between 5,000 and 49,000 units annually, regardless of the origin and destination, taking into account the sensitivity to distance.

In terms of distribution speed, RoRo ships have a shorter time for the journey between islands compared to other forms of transportation. The RoRo ships operate by transporting vehicles and private cars through ramp doors located at the front (bow), back (stern), or sides of the ship. This results in a shorter time spent at the port. As shown by the research Pamungkas (2024), RoRo transport remains more efficient compared to land transport, even when considering the loading and unloading time, which is still better than that of trucks.

The Sea Toll Program's Power to Reduce Price Inequalities

The Sea Toll policy started in 2015 with the goal of reducing the price difference for goods, especially basic needs, between western and eastern Indonesia and the remote islands. The Sea Toll Program has contributed positively to lowering the prices of staple foods in several areas of eastern Indonesia, though the extent of this impact depends on the specific location and the state of the local distribution system, which is gradually becoming more aligned with prices in the western region. Since its launch in 2015, the Ministry of Transportation set up six distribution routes as the first step to support the logistics distribution initiative. However, due to time and fleet limitations that lasted only two months, the implementation of the Sea Toll Program was only able to operate three routes, which are:

a. Route T–1 serve Tanjung Perak – Tual – Fak fak – Kaimana – Timika – Kaimana – Fak fak – Tual –Tanjung Perak. (Operated by KM. Caraka Jaya Niaga III - 32).
b. Route T–4 serve Tanjung Priok – Biak – Serui – Nabire – Wasior – Manokwari – Wasior – Nabire – Serui – Biak – Tanjung Priok. (Operated by KM. Caraka Jaya Niaga III – 22).
c. Route T–6 serve Tanjung Priok – Kijang – Natuna – Kijang – Tanjung Priok. (Operated by KM. Caraka Jaya Niaga III - 4).

In 2016, the Sea Toll program added six new routes. The expansion of routes continued each year. In 2017, thirteen new routes were introduced, followed by eighteen more in 2018. In 2019, the program saw an increase of twenty routes. In 2020, twenty-six additional routes were added, connecting remote areas such as Papua, Maluku, East Nusa Tenggara (NTT), and West Nusa Tenggara (NTB). In 2021, the Ministry of Transportation introduced four new routes. As a result, by 2025, the total number of routes operating under the program will reach thirty-nine route lines.

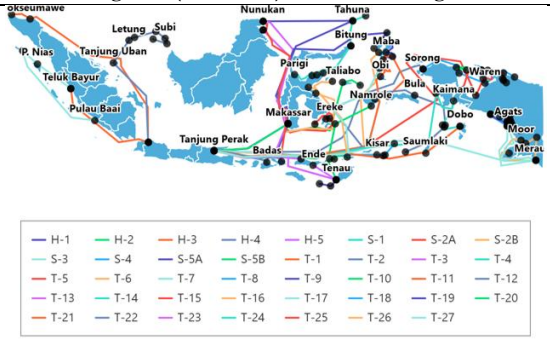

Figure 1. Sea Toll Routes Map 2025
Source: https://geraimaritim.kemendag.go.id/trayek

The Sea Toll policy has made a noticeable difference by lowering logistics costs in different regions. According to data from the Ministry of Trade, areas that use the Sea Toll route saw a reduction in the cost of goods ranging from 20 to 30 percent. This indicates that the Sea Toll program has effectively decreased the price gap that has been a burden for the local communities, particularly in Eastern Indonesia and regions categorized as Disadvantaged, Remote, Outermost, and Border (3TP). The author also discusses findings from several studies that support the successful execution of the Sea Toll program, which is specifically aimed at benefiting these 3TP areas.

Table 1. Findings from Several Studies

No	Authors	Title	Result
1	(Purba et al., 2025)	Evaluation of Sea Toll Policy on Staple Food Prices in the Anambas and Natuna Islands	The Sea Toll policy, introduced in 2015 as part of the government's plan to decrease price disparities and enhance logistics distribution in the 3T areas underdeveloped, remote, outermost, and border regions has shown positive results in lowering the cost of basic needs and boosting the availability of essential goods. Notable price drops for essential items like shallots, garlic, and cayenne pepper in the Anambas Islands, along with stable food prices and consistent supplies in Natuna, suggest that logistics efficiency is beginning to improve, though it has not yet reached its full potential.
2	(Pratama et al., 2025)	Analysis of the Implementation Effectiveness of the T-26 Sea Toll Program in 2024 in Reducing Price Disparities in Fakfak Regency, West Papua	The Sea Toll Program at Fakfak Port in West Papua, spanning from 2018 to 2024, has successfully improved the efficiency of logistics distribution, helped keep the prices of essential goods stable, and enhanced access to community needs in the 3TP region. This has been particularly evident in lowering the costs of five key commodities: medium rice, sugar, 12 kg LPG gas, broiler chicken meat, and bottled cooking oil. The program's success is mainly attributed to better distribution practices and reduced logistics expenses, thanks to transportation subsidies, which have effectively minimized price differences between different regions.
3	(Kurniawan et al., 2025)	Economic Impact Analysis of Sea Toll Program Implementation in Eastern Indonesia: A Review in Papua, Maluku, and East Nusa Tenggara Regions	The economic impact of the Sea Toll Program in Papua, Maluku, and East Nusa Tenggara has been found to be effective in decreasing the price of basic goods by up to 30% in these regions, as per an economic analysis.Additionally, the program has improved connectivity by linking 115 ports through 39 operating routes, which has sped up the transportation of goods to distant regions. However, challenges such as insufficient port facilities and poor coordination between agencies still require attention to enhance the program's effectiveness.

The progress in developing the Sea Highway has contributed to lowering the cost of basic necessities and improving the availability of essential goods. Efficient logistics distribution has started to be realized, but it is not yet fully optimized. The next step involves creating a planning process that can be measured in terms of procedures, timeframes, and objectives.

Ensuring timely delivery of goods is crucial for the success of the Sea Toll program, particularly in supporting the smooth movement of logistics to underdeveloped, remote, and outermost (3T) regions. Accurate scheduling plays a key role in maintaining a stable supply, avoiding shortages, and controlling price changes in these areas. As a result, various strategic measures have been implemented to guarantee precise shipping schedules throughout the execution of the Sea Toll program.

The National Logistic Ecosystem's Integration

As the sea toll program's implementation progressed quickly, the government, along with the Ministry of Transportation, started creating a computerized system to help in its execution. Enhancing the global supply chain's efficiency, transparency, and safety requires the use of technology to facilitate marine connection. The marine logistics sector has embraced a number of digital solutions to streamline the management of ships, ports, and product distribution in response to the quick advancement of information and communication technology. According to Liu et al. (2024), technology is essential to resolving the different issues the maritime transportation supply chain faces. Among these is better logistics management, which may cut down on delays and streamline processes to save operating expenses.

Sade (2024) research also found that the maritime logistics sector may considerably increase its competitiveness by implementing new technologies like as the Internet of Things (IoT), Artificial Intelligence (AI), and automation. Djalante (2024) also claimed that using IoT into marine logistics may considerably enhance operational efficiency. Better resource management and prompt decision-making are made possible by real-time tracking of containers and cargo, which is essential to preserving the flow of international trade. Additionally, by using data analytics, technology can support the growth of the marine industry. Businesses may improve routes, save fuel usage, and make well-informed decisions by analyzing data gathered from several activities.

The National Logistics Ecosystem (NLE) application is one of the main modernization efforts in logistics in Indonesia. The government is attempting to unify all supply chain participants, including ports, logistics firms, and customs, on a one digital platform by implementing the NLE application (Hidayat & Arimbhi, 2024). The administration and monitoring of logistics may go more swiftly, effectively, and transparently with the use of NLE. Due to a lack of clarity between the participants, the handling of import duty paperwork experienced several delays prior to the implementation of NLE. All stakeholders may access information simultaneously using a digitally connected system, which expedites the validation and verification process. A digital platform that facilitates interaction between the many logistics process participants can also save expenses resulting from delivery and document management delays. Figure 2 illustrates how the NLE's structure has resulted in several beneficial effects following the application's deployment.

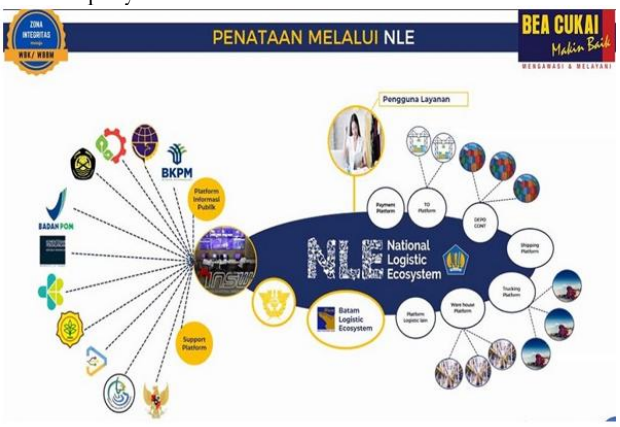

Figure 2. Organization via NLE

NLE Implementation at Sea Toll Ports

Four key pillars form the foundation of NLE's participation in port logistics flow services. Naturally, the four pillars increase the logistics process's efficiency, which lowers expenses and time. NLE's four pillars are:

a. Simplifying company processes is the first pillar. This pillar focuses on streamlining government service business processes, such as implementing single submission for licenses, manifests, and domestic carriers. Reducing bureaucracy and expediting administrative procedures are the goals.

b. Logistics platform collaboration is the second pillar. Collaboration across different logistics platforms, including shipping, transportation, and warehousing companies, is part of this pillar. Better coordination and data interchange are made possible by the NLE's integration of many logistical services onto a single platform.
c. Payment convenience is the third pillar. By using a single billing system, this pillar seeks to streamline the payment process. This speeds up transactions and lowers hidden costs by enabling users to make payments more effectively and openly.
d. Port spatial planning is the fourth pillar. This pillar entails rearranging the pathways for the delivery of products and the port's spatial organization. Enhancing port operating effectiveness and guaranteeing the seamless flow of cargo are the goals.

Numerous NLE services have been shown to significantly increase productivity while cutting expenses and time. Digitally enabled logistics systems can expedite administrative procedures, such as customs and goods clearing, in addition to increasing operational efficiency. Single Submission technology, which is used in Indonesia's customs administration process, enables shippers or entrepreneurs to finish many processes at once with a single submission for ports, customs, and quarantine. This has been demonstrated by one of the NLE services, Quarantine Customs Single Submission (SSm QC), which successfully reduced overall process time by 22.37 percent and costs by 33.48 percent, resulting in Rp191.32 billion in savings (Coordinating Ministry for Economic Affairs, 2023).

Sea Toll and NLE Synergy as a Benchmark for Equitable Development

The advantages of the NLE application and the cooperation between the two Sea Toll schemes have been felt by all Indonesians. Before the NLE, different agencies processed paperwork manually and independently. However, following the NLE, export-import and inter-island documents were streamlined on a single platform. In order for the appropriate authorities to automatically access and be aware of the schedule, the ships' capacity and timetable are then effectively organized digitally. Digital records and transparency are maintained for all transactions, container tracking, ship positioning, and licensing procedures. hence the system can tell companies if there is a delay in the process and businesses may independently check the status of items. High operating expenses, which are frequently brought on by delays in administrative procedures, are among the operational obstacles that this efficiency may remove from Indonesia's logistics process (Mawardi et al., 2024).

In the end, technology may be used to improve port capacity, streamline transportation routes, and shorten port processing times, which will cut prices and provide a more equal supply of commodities in Indonesia's marine sector. The equitable distribution of commodities throughout Indonesia is facilitated by advancements in logistics technology, such as digitally assisted sea tolls, particularly in regions that were previously inaccessible by effective maritime transportation (Mangeswuri & Budiyanti, 2024). Thus, with more development, the NLE might be a vital starting point for initiatives aimed at maximizing Indonesia's supply chain efficiency.

Digital technology may increase productivity, and NLE can synchronize data in real-time, however the best use of technology is hampered by some supply chain participants' restricted access and lack of knowledge. This is consistent with study findings Mawardi et al. (2024), which show that where technical infrastructure is lacking, there are still some notable gaps in the use of technology. Thus, in order to guarantee that the implementation of NLEs meets the objectives set forth by the government, more funds should be set aside for the advancement of technical infrastructure in regions that are still falling behind (Algani & Gross, 2023). Increasing staff training is currently the best course of action to ensure that they are able to fully utilize the program and comprehend its capabilities. This is pertinent to Amrin & Darwis (2022) assertion that the NLE has the capacity to operate at its best and have a greater influence on import duty income and the logistics system overall with more vigorous training and infrastructure upgrades.

5. Comparison

Research on maritime logistics in Indonesia has generally been conducted in partial and sectoral ways. Previous state of the art studies trend to examine RoRo shipping, the Sea Toll program, or logistics digitalization as separate domains rather than as an integrated national logistics system. This study positions itself beyond that fragmented approach by analyzing the policy, operational, and digital dimensions simultaneously, with a specific focus on distribution performance in 3T regions.

In the area of RoRo transportation, earlier works mainly emphasize technical efficiency, vessel design, and cost comparison with other modes. These studies show that RoRo vessels reduce loading and unloading time and lower cargo handling costs, making them suitable for inter island freight movement. However, most of them stop at the operational or engineering level and do not link RoRo deployment with broader national logistics policy or regional equity goals. The present research extends this perspective by embedding RoRo services within the Sea Toll framework and national distribution strategy, showing that RoRo is not only a transport mode but also a policy instrument for spatial economic integration in remote regions.

Regarding the Sea Toll program, state of the art literature largely measures success through price disparity reduction and route expansion. These studies confirm that Sea Toll services help lower the cost of essential goods in Eastern Indonesia and improve connectivity to outer islands. Nevertheless, they often treat the program as a standalone maritime connectivity initiative, with limited discussion on how port processes, documentation flow, and inter agency coordination influence overall logistics performance. This study contributes a more systemic view by arguing that maritime connectivity alone is insufficient without synchronized land side and administrative systems. By linking Sea Toll operations with logistics process integration, this research provides a more measurable explanation of why some routes achieve stronger price stabilization than others.

In the field of logistics digitalization, prior research on the National Logistic Ecosystem focuses on business process simplification, data exchange, and institutional coordination. These works highlight reductions in processing time and improved transparency, but they are usually discussed in the context of ports, customs, and trade facilitation, rather than maritime distribution to disadvantaged regions. The novelty of this study lies in connecting NLE implementation directly with Sea Toll and RoRo operations, demonstrating how digital document flow, cargo tracking, and scheduling transparency strengthen the reliability of government subsidized shipping services. This creates a bridge between digital governance and physical connectivity, which is rarely addressed together in earlier studies.

From a theoretical standpoint, the state of the art often treats maritime transport policy, supply chain management, and digital logistics as separate analytical frameworks. This research integrates those perspectives under the concept of a policy driven logistics ecosystem, where vessels, routes, ports, regulations, and digital platforms function as interdependent components. Such an approach offers a clearer illustration of research contribution by showing that logistics equity in an archipelagic country is achieved not only through infrastructure expansion but through synchronization between transport assets and information systems.

Compared with existing studies, the main contribution of this research is threefold. First, it moves beyond single program evaluation toward a multi layer comparison of transport mode, national policy, and digital ecosystem. Second, it shifts the focus from efficiency alone to equitable logistics distribution in 3T regions as a measurable development outcome. Third, it demonstrates that the combination of RoRo services, Sea Toll routes, and NLE digitalization forms a state of the art model of integrated maritime logistics governance that is more comprehensive than approaches discussed in most prior literature.

6. Conclusion

This study concludes that the integration of the three programs RoRo ships, sea tolls, and the NLE application is a step toward creating a more efficient supply chain. The findings show that introducing RoRo ships has sped up and made the movement of goods easier. Additionally, the Sea Toll program has positively affected logistics across Indonesia, especially by helping to maintain consistent delivery schedules and lowering the cost of essential goods, particularly in remote, isolated, outer, and border regions (3TP). In order to expedite the verification process and enhance the efficiency of managing import duty paperwork, the National Logistic Ecosystem (NLE) application was used as a media support. Therefore, it is anticipated that the outcomes of these two sustainable initiatives would fulfill the concept of Indonesia as the World Maritime Axis.

Nevertheless, the primary barriers to maximizing these two initiatives remain infrastructural limitations and staff undertraining. To guarantee the programs function at their best and offer more advantages in terms of national logistics distribution, port infrastructure, technology, and human resource training must be improved. The necessity of more funding for infrastructural and human resource development is hence the study's primary recommendation.

Author Contributions: Conceptualization: G.S.N.; Methodology: G.S.N.; Software: Not applicable; Validation: G.S.N.; Formal analysis: G.S.N.; Investigation: G.S.N.; Resources: G.S.N.; Data curation: G.S.N.; Writing original draft preparation: G.S.N.; Writing review and editing: G.S.N.; Visualization: G.S.N.; Supervision: G.S.N.; Project administration: G.S.N.; Funding acquisition: Not applicable. The author has read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Data Availability Statement: This study is based entirely on secondary data derived from published literature, policy documents, government reports, and academic sources. No new primary datasets were generated or analyzed during the study. Therefore, no additional data are available.

Acknowledgments: The author expresses appreciation to academic colleagues and institutional peers who provided general academic insight and discussion during the development of this study. No administrative or technical assistance requiring formal attribution was received. No generative AI tools were used in the analysis or interpretation of research data.

Conflicts of Interest: The author declares no conflict of interest. Since this research received no external funding, there was no funder involvement in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

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