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Pioneer Shipping and Sea Toll Ships Support National Logistics Distribution Program: Study Literature Review

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Abstract: Efficiency and equitable distribution of logistics are key elements in supporting national economic development, especially in an archipelagic country like Indonesia. This article explores the contribution of pioneer shipping and sea toll ships in strengthening the national logistics system. Pioneer shipping plays a vital role in opening up access to sea transportation to hard-to-reach areas, such as remote, outermost, and disadvantaged areas, which commercial shipping lines have not served. Meanwhile, the sea toll program is present as a solution to reduce price disparities between regions through regular and low-cost delivery of goods. This study uses a descriptive qualitative approach with case studies on several pioneer shipping routes and sea toll routes. The study results show that both programs significantly impact expanding connectivity, driving the local economy, strengthening the national logistics system, and supporting equitable development. However, obstacles are still found, such as unbalanced cargo flows, limited supporting port facilities, and lack of coordination between stakeholders. To address these challenges, it is necessary to strengthen collaboration between the central government, local governments, and the private sector. This article provides relevant insights for other archipelagic countries that want to develop an inclusive, efficient, and sustainable maritime logistics system.

Keywords: Shipping Line, Logistic, Distribution, National

INTRODUCTION

As the largest archipelagic country in the world, Indonesia has more than 17,000 islands stretching from west to east of the archipelago. This geographical condition places the maritime transportation sector as a key element in supporting the distribution of goods and services throughout the region. Maritime transportation is not only a link between regions but also plays a strategic role in the national logistics system. Unfortunately, not all regions in Indonesia, especially the 3TP (underdeveloped, remote, outermost, and border) regions, are covered by an efficient and equitable distribution system. Inequality in the development of logistics infrastructure and disparities in transportation services are the main causes of high prices of goods, slow distribution, and hampered economic growth in these region(Mashuda et al., 2019; Susanto et al., 2021).

To answer this challenge, the Indonesian government initiated two main policies, namely pioneer shipping and the sea toll ship program. Pioneer shipping is intended to reach areas that are not served by commercial operators for economic reasons, while sea toll ships are focused on scheduled and affordable logistics transportation in order to reduce price gaps between regions. These two programs are expected to be an integrative solution in strengthening the national logistics network and expanding connectivity between regions (Benned et al., 2020), (Gugat et al., 2022).

However, in its implementation, various technical and structural problems are still faced. Problems such as low return loads, limited port facilities and infrastructure, lack of logistics data integration, and ineffective cross-sector coordination are still the main obstacles. In addition, the role of local governments and the use of digital technology in logistics management are still not optimal. Therefore, evaluation of the implementation of the two programs is important to measure the extent of their success in strengthening national logistics distribution fairly and sustainably. This study is here to examine the effectiveness of pioneer shipping and sea tolls as part of the national logistics solution, as well as to formulate policy recommendations that can strengthen their function in the future. Efficiency and equity of logistics distribution are crucial elements in strengthening national economic resilience, especially in Indonesia which has geographical characteristics as an archipelagic country. With thousands of islands spread from the western tip to the eastern tip, Indonesia faces major challenges in ensuring equitable logistics accessibility. This is where the Sea Toll Program plays an important role as a concrete effort by the government to overcome disparities between regions, strengthen connectivity, and realize economic justice (Gultom, 2017; Salamah, 2021).

Launched as part of the national development priority agenda, the Sea Toll is designed as a fixed and scheduled shipping network connecting major ports with remote and underdeveloped areas. Through a freight subsidy scheme, this program aims to reduce distribution costs, stabilize prices of basic commodities, and encourage economic growth in the 3TP (underdeveloped, remote, outermost, and border) areas (Indonesia, 2016).

Along with its implementation, the Sea Toll has shown a positive impact in increasing logistics access to previously difficult-to-reach areas. Reducing the price of goods in remote areas, increasing distribution flows, and opening up new market opportunities are some of the benefits that have been felt. This program also functions as a trigger for local economic activity and strengthening national economic integration (Rizqi, 2023).

However, various obstacles still overshadow the effectiveness of this program, such as imbalances in loads between routes, limited supporting infrastructure, and less than optimal coordination between stakeholders. To ensure the sustainability of this program, increased port capacity, integration of digital logistics systems, and active involvement of local governments and local business actors are needed. If continuously strengthened, the Sea Toll has great potential to become the backbone of the national logistics system as well as a strategic instrument towards inclusive and sustainable development (Cahyandi & Hendrawan, 2023).

Integration between regions in the national logistics system is a key element to ensure efficient distribution of goods throughout Indonesia. As an archipelagic country with a wide spread of islands, Indonesia faces significant geographical challenges in its efforts to create an integrated logistics network to remote areas. In this context, pioneer ships act as feeders, namely a connecting mode between the main port and small areas that have not been reached by commercial shipping, which have a vital function in supporting the smooth distribution of national logistics (Hakim, 2016).

The operation of pioneer ships is specifically aimed at serving 3TP areas (underdeveloped, remote, outermost, and border), which have often been isolated from the

national distribution system. In practice, pioneer ships transport cargo from large ports to small ports or final distribution points, and carry local products from remote areas to the main logistics nodes to then be forwarded by main ships such as sea toll ships. In this way, pioneer ships are not only physical connectors but also an important part of a complementary two-way logistics architecture (Febriansyah & Sahara, 2023).

The contribution of pioneer ships as feeders is not limited to the transportation aspect but also touches on social and economic dimensions. Regular access to necessities and essential goods can be guaranteed for people in 3TP areas, while local commodities from these areas gain access to the national market. This also supports regional economic growth while reducing disparities between regions (Widiastuti et al., 2022).

However, optimizing the role of pioneer ships still faces various obstacles. Limited transport capacity, inadequate small port infrastructure, and lack of schedule synchronization between feeder ships and mother ships often disrupt distribution efficiency. To address these challenges, a strategy is needed to improve infrastructure, utilize digital technology for logistics information system integration, and flexible and responsive route planning to local needs (Hermawan & Muin, 2025; Putri, 2020).

If supported by sustainable policies and effective governance, pioneer ships have a strategic position as a catalyst for equitable development and strengthening the national logistics system. Their existence ensures that no region is left behind in the flow of goods distribution and Indonesia's overall economic growth (Fofid, 2019; Susanto et al., 2024) .

METHOD

This article adopts a literature review approach as the main method to examine various theories, concepts, policies, and research results that are relevant to the function of pioneer ships as feeder ships in supporting the national logistics system. The purpose of this method is to develop a strong theoretical foundation while identifying gaps in the study that can be further explored. The literature identification process uses several electronic databases such as Google Scholar, ScienceDirect, and national journal portals (Garuda, Neliti), using the keywords: pioneer ships, feeder ships, Indonesian sea toll roads, maritime logistics, and 3TP areas. The selection was carried out on publications within the last ten years to ensure the relevance of information and contextual relevance. After being collected, the data was analyzed qualitatively with a thematic approach. Information is classified based on main topics such as the strategic function of pioneer ships, obstacles in implementation, integration of intermodal logistics, and contributions to connectivity and equitable development. The findings of this study form the basis for arguments and considerations in formulating conclusions and recommendations in this article. The primary rationale for doing qualitative analysis was the exploratory nature of the research (Susanto et al., 2025).

RESULTS AND DISCUSSION

Result

The findings of this study confirm that pioneer ships have a very important position in supporting the smooth distribution of national logistics, especially in reaching areas that have not been touched by regular commercial shipping services. Operating on routes that are considered economically unviable, pioneer ships are the main link between large ports and small ports in disadvantaged, remote, outermost, and border areas (3TP). Its function as a feeder ship has proven effective in filling the gap in logistics distribution and expanding the connectivity network of goods throughout Indonesia.

From the analysis of several pioneer shipping routes, it can be seen that community accessibility to basic needs has increased significantly. The price of essential goods such as basic necessities, which were previously very high, has gradually decreased after the area was

routinely served by pioneer ships. The price reduction ranged from 10 to 20 percent in several locations, which also contributed to local economic stability.

Not only in terms of the distribution of incoming goods, pioneer ships also encourage the movement of outgoing goods, especially regional commodities such as fish, agricultural products, and craft products. These products can now be reached by a wider market through connections with major ports, which ultimately has a positive impact on increasing community income and local economic growth.

Even so, the effectiveness of pioneer ships is not yet fully optimal. One of the main obstacles is the imbalance between incoming and returning cargo. In many cases, ships only carry cargo during the inbound journey, but return empty. This reduces cost efficiency and affects operational sustainability. Limited infrastructure of small ports, minimal loading and unloading facilities, and the lack of integration of pioneer ship schedules with main ships or other modes of transportation are also significant obstacles.

In addition, the weak logistics information system and the lack of standardization of distribution data in the field result in a lack of accuracy in route planning and monitoring of goods distribution. Coordination between parties, both between government agencies and with the private sector and regions, has also not been running optimally, so that program synergy is still limited.

Overall, this study confirms that pioneer ships make a real contribution to strengthening the national logistics system, especially in reaching marginal areas. However, improvements are needed in various aspects both technical, policy, and institutional so that pioneer ships are truly able to play their role optimally as connecting nodes in an efficient, inclusive, and sustainable national maritime logistics system.

The logistics price gap is still a major challenge in Indonesia's national distribution system, especially because of its geographical character as an archipelago with thousands of islands spread out. The difference in shipping costs between the western and eastern regions of Indonesia and between the center and remote areas creates a sharp price disparity, thus hampering efforts to equalize the national economy.

In an effort to overcome these problems, the presence of pioneer ships is one of the strategic policy alternatives. This ship is operated to reach 3TP (underdeveloped, remote, outermost, and border) areas that are not served by commercial shipping. By connecting these areas to large ports or sea toll routes, pioneer ships function as logistics feeders that play an important role in ensuring the supply of basic and strategic goods to the community at more affordable prices.

The positive impact of pioneer ship services is clearly visible in the decline in prices of goods in various target areas. Based on data collected from several shipping routes, the decline in prices of basic goods reached 10-30% after pioneer ships operated routinely. This shows that pioneer ships not only increase logistics accessibility, but also reduce the burden of distribution costs which have been the main cause of price disparities.

In addition to carrying supplies from the center to the regions, pioneer ships also play a role in facilitating the flow of local commodities outside the region. Agricultural, fishery, and craft products can now be sent to the main port to then be distributed more widely, opening up economic opportunities for local communities and encouraging regional economic growth.

However, there are several obstacles that reduce the effectiveness of pioneer ships in carrying out their functions. The imbalance of cargo between outbound and return trips is still a major issue. In many cases, ships return without cargo, thus decreasing cost efficiency. Other challenges include limited small port infrastructure and less than optimal synergy of schedules with other modes of transportation such as mother ships or land transportation.

To optimize the contribution of pioneer ships in reducing the logistics price gap, a systemic approach is needed that includes strengthening cross-sector policies, improving small port facilities, and digital integration in the logistics information system. With strong policy support and coordination, pioneer ships can become an important pillar in realizing a national logistics system that is equitable, inclusive, and competitive. Indonesia as an archipelagic country faces complex logistics challenges due to the geographical spread of its territory. The imbalance in the distribution of goods and the high cost of logistics, especially between the western and eastern parts, are major issues that need to be addressed systematically. To address this challenge, the government introduced the Sea Toll program as a strategic solution to strengthen connectivity between regions and reduce logistics costs nationally.

The Sea Toll is a regular and subsidized shipping network that connects major ports with 3TP (underdeveloped, remote, outermost, and border) regions. The main objective of this program is to ensure the smooth flow of goods, guarantee the affordability of basic necessities throughout the country, and reduce price disparities between regions. With scheduled and structured shipping, the goods distribution system becomes more efficient and can be predicted well.

The optimal implementation of the Sea Toll has shown a positive impact, especially in reducing the price of basic goods in areas that previously faced severe logistics constraints. Regular ship schedules increase delivery reliability, while distribution costs become more controllable. This supports regional economic stability and strengthens national market integration.

However, there are still a number of challenges that need to be addressed to optimize its function. Problems such as coordination between main ports and feeder ports, minimal return cargo from regions to the center, and limited onward transportation facilities are obstacles that affect the effectiveness of this program. In addition, digital integration in logistics management also still needs to be improved to support transparency and service efficiency.

The success of optimizing the Sea Toll also depends heavily on collaboration between the central government, local governments, business actors, and local communities. Improving small port infrastructure, synchronizing shipping schedules, and supporting the local production sector are important steps in strengthening the role of the Sea Toll in the national logistics system.

With an integrated and sustainable approach, the Sea Toll Road is not only a logistics distribution solution, but also a transformation tool to connect regions, strengthen regional economies, and realize more equitable national development.

Previous Research

Based on the problem formulation and research results above, previous research was determined as follows:

Table 1. Relevant Previous Research Results

No	Authors	Title	Result
1	(Ratnawati et al., 2021)	Sea Toll to Support the Flow of Goods: A Case Study of East Indonesia	The Sea Toll Program in Eastern Indonesia has succeeded in increasing the flow of goods distribution, reducing the price of basic necessities, and improving connectivity between islands, although it still faces challenges such as limited port infrastructure and low return loads.
2	(Kusuma & Tseng, 2019)	Analysis of the impact of the “sea toll” program for seaports: Resilience and competitiveness	This study analyzes the impact of the Sea Toll Program on the resilience and competitiveness of ports in Indonesia.

No	Authors	Title	Result
			Through a survey of key stakeholders and analysis using the Analytical Hierarchy Process (AHP) technique, it was found that this program increases port resilience through strategic alliances and increases competitiveness by increasing the frequency and reliability of ships docking.
3	(Apriani et al., 2025)	Sea tolls as Indonesia's blue economy strategy	Research on Indonesia's blue economy strategy through the Sea Toll program shows that this initiative is effective in improving maritime connectivity and reducing price disparities between regions. This program also contributes to sustainable economic growth by optimizing the use of marine resources. However, challenges such as inadequate port infrastructure and inter-agency coordination still need to be addressed to increase the effectiveness of this program.
4	(Mandi, 2017)	Development of ferry port as a complement of "tol laut": A case study on Ferry Port of Ketapang	This study examines the development of Ketapang Ferry Port as part of the "Sea Toll" program to reduce traffic congestion in Bali. Through focus group discussions with stakeholders and field observations, it was found that the development of the ferry port can divert some freight transportation from land to sea, thereby reducing congestion and road damage.

Discussion

As the largest archipelagic country in the world, Indonesia faces serious challenges in ensuring smooth logistics distribution throughout its territory. Its geographical location makes differences in access, transportation costs, and delivery times the main problems that impact the inequality of goods prices and economic distribution. To overcome this, the government designed the Sea Toll program as a strategic effort to strengthen the national logistics system through sea routes.

The Sea Toll program is a regular shipping service that connects large ports with areas that are difficult to reach commercially, especially underdeveloped, remote, outermost, and border areas (3TP). Through a subsidized and scheduled shipping network, the Sea Toll aims to reduce distribution costs, ensure the affordability of basic necessities, and increase connectivity between regions in an integrated national logistics system.

More than just the transportation of goods, the Sea Toll is part of a strategy for equitable development. Its presence allows people in the outermost areas to access essential goods at more reasonable prices while providing opportunities for local commodities to enter the national market. This program also encourages logistics efficiency through systematic and data-based shipping management.

Despite showing positive impacts, the implementation of the Sea Toll still requires a number of improvements. Challenges such as low return cargo volume, limited small port infrastructure, and minimal integration with land transportation modes are still obstacles. Therefore, cross-sector synergy, strengthening regulations, and increasing technological and human resource capacity are crucial factors in ensuring the long-term success of this program.

With sustainable development, the Sea Toll is expected to be the backbone of national logistics distribution that is fair, efficient, and reaches all corners of the country.

The sustainability and effectiveness of the Sea Toll program are not only determined by the availability of physical facilities and policy support, but are highly dependent on the quality of human resources (HR) involved in each operational stage. In a complex maritime logistics system, competent HR plays an important role in maintaining smooth shipping, efficient distribution management, and professional service.

As one of the government's initiatives to reduce price disparities between regions and ensure the distribution of goods to 3TP areas (underdeveloped, remote, outermost, and border), the Sea Toll requires the support of HR who have technical expertise in the fields of shipping and logistics, as well as adaptive capabilities to technological advances and policy changes. Individuals working in this sector from ship crews, and port officers, to logistics route managers are required to master technical and digital skills such as operating goods tracking systems, distribution planning, and integrating national logistics data.

The ability to communicate across sectors, understand supply chain flows, and apply logistics efficiency principles are important parts of the HR profile needed in this project. However, there are still challenges in the form of disparities in HR quality, especially in areas far from maritime training centers and small ports.

Therefore, investment in HR competency development through continuous training, improving the quality of vocational education, and professional certification needs to be increased. The government together with the private sector needs to create an HR development ecosystem that supports the national logistics transformation. With the existence of superior HR, the Sea Toll can run more optimally and contribute greatly to economic equality and sustainable regional connectivity.

Within Indonesia’s maritime logistics framework, pioneer vessels serve as vital connectors between major shipping hubs and remote or underserved regions not reached by regular commercial routes. Rather than functioning in isolation, these vessels operate in coordination with large-scale cargo ships that transport goods from centralized distribution points. Once delivered to main ports, these goods are further distributed by pioneer vessels to smaller, less accessible destinations.

This system adopts a *hub-and-spoke* model, where large ports act as distribution centers (hubs) and pioneer ships function as feeders (spokes), reaching islands and regions that are beyond the operational capacity of larger vessels due to infrastructural or geographical limitations. The collaboration between these two types of vessels enhances the effectiveness and reach of the national logistics network, especially in the 3TP areas disadvantaged, remote, outermost, and border regions that often experience gaps in supply chain access.

Through this integrated approach, logistics distribution becomes more streamlined, reliable, and cost-effective. It aligns with national development objectives by promoting equitable economic access, narrowing regional price differences, and strengthening overall supply chain resilience across the country. However, optimal implementation depends on synchronized shipping operations, improved infrastructure at secondary ports, and strong coordination among relevant stakeholders in the maritime logistics sector.

Conceptual Framework

The framework of thinking has been determined based on the research results, past research, and the aforementioned debate.

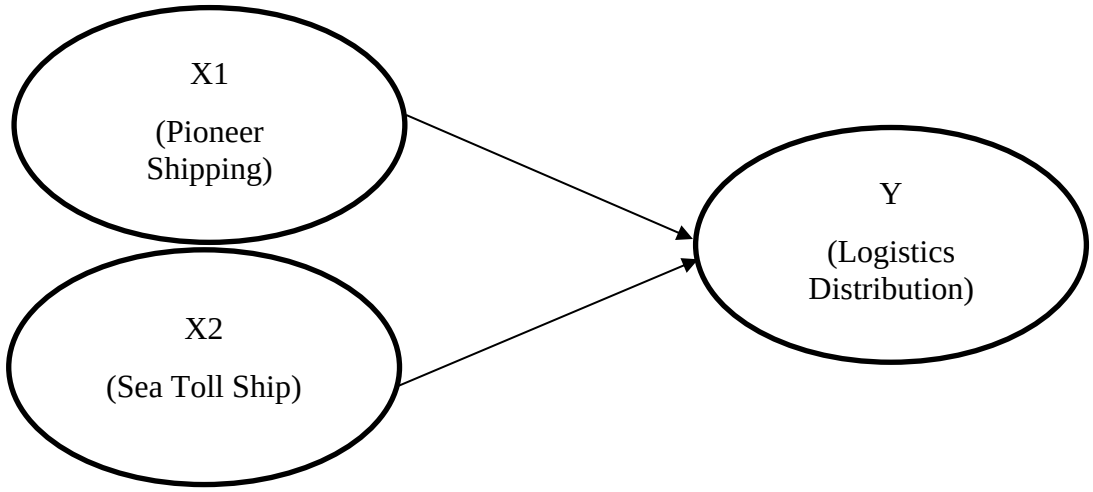

Figure 1. Conceptual Framework

CONCLUSION

As the world's largest archipelagic nation with over 17,000 islands, Indonesia faces immense logistical challenges, particularly in reaching remote and underdeveloped regions. To address these issues, the government has implemented two strategic programs: pioneer shipping routes and the sea toll program, both aimed at creating a more equitable and efficient national logistics distribution system.

Pioneer vessels play a crucial role in connecting major ports with 3TP regions disadvantaged, remote, outermost, and border areas which are often inaccessible to commercial shipping lines. These ships function as feeder vessels, transporting goods from central hubs to end-point destinations. Their presence ensures that even the most isolated areas receive essential supplies.

Meanwhile, sea toll vessels serve as the backbone for large-scale goods transportation across the archipelago through fixed and scheduled routes. This model allows for reduced logistics costs and helps narrow price disparities between the western and eastern regions of Indonesia. The sea toll system acts as a primary distribution network, covering major inter-island routes.

The integration between sea toll and pioneer vessels creates a complementary logistics system. Sea toll ships deliver cargo to major ports, and pioneer vessels extend that distribution to smaller, hard-to-reach locations. This mirrors a hub and spoke model, ensuring that logistics reach every level of the nation, not just urban centers.

However, implementation challenges remain. These include imbalanced return loads, limited infrastructure at smaller ports, insufficient vessel fleets, and a lack of integrated logistics data systems. Furthermore, the current human resources in the maritime logistics sector still require improvement to enhance operational capacity.

The use of information technology and digital logistics systems is also underutilized. Integrated and real-time logistics information systems are crucial to improving efficiency, accuracy, and transparency. Therefore, digitalization should become a key priority in maritime sector development.

The success of these programs also depends heavily on cross-sector and multilevel coordination. Effective collaboration among ministries, government agencies, local

authorities, and private actors is essential to ensure the programs address actual community needs. Strengthening local participation and encouraging the private sector to support reverse logistics and local production networks are also vital for long-term sustainability.

Looking ahead, the development of pioneer shipping and the sea toll program should move beyond subsidy-based models and evolve into a robust, independent, and sustainable maritime logistics system. This requires greater investment in human capital, modernization of small ports, adaptive regulations, and increased use of digital technology.

Overall, both pioneer shipping and the sea toll program have significantly contributed to improving national connectivity, expanding logistical access, and reducing regional price gaps. Although challenges remain, there is strong potential for further progress.

With full support from all stakeholders including government institutions, private companies, local communities, and academic institutions Indonesia has the opportunity to build a resilient, inclusive, and globally competitive maritime logistics system.

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