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Determination of Sea Toll Performance, Analysis of Regional Economic Income, Investment, and Logistics Warehouses: Study Library Research

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Abstract: This study aims to analyze the influence of regional economic income, investment, and logistics warehouses on the performance of sea tolls in Indonesia. Using a *literature review* approach, this study synthesizes findings from various relevant internationally indexed academic articles. The research method used is descriptive qualitative with a literature review approach. Data were collected from reputable international indexed articles obtained through databases such as Scopus, Web of Science, Emerald, Springer, and Google Scholar. The selected literature was analyzed using reduction techniques, data presentation in matrix form, and comparative synthesis to find patterns, similarities, and differences between studies. The results of the study indicate that regional economic income, investment, and logistics warehouses affect sea toll performance. The limitations of this study lie in its nature as a literature review-based, study, so that generalization of the results still requires support from empirical research with primary data. The contribution of this study is to provide an integrative conceptual framework regarding the role of regional economic income, investment, and logistics warehouses on sea toll performance.

Keywords: Sea Toll Performance, Regional Economic Income, Investment, Logistics Warehouses

INTRODUCTION

The performance of the global maritime logistics system is indeed an important factor that affects the efficiency of international trade, interregional connectivity, and the stability of global commodity prices. Effective maritime logistics, characterized by operational efficiency, resilience, and service reliability, is essential for optimizing resource allocation and enhancing competitiveness in the global supply chain (Hye & Habib, 2025).

Although Indonesia's Sea Toll program has been in place since 2015, its performance remains suboptimal due to several persistent challenges. While the program has succeeded in reducing the prices of basic commodities in Eastern Indonesia by up to 30% and improving logistics distribution, significant price differences still exist, especially in remote areas (Wijaya, 2025b), (Pratama et al., 2025).

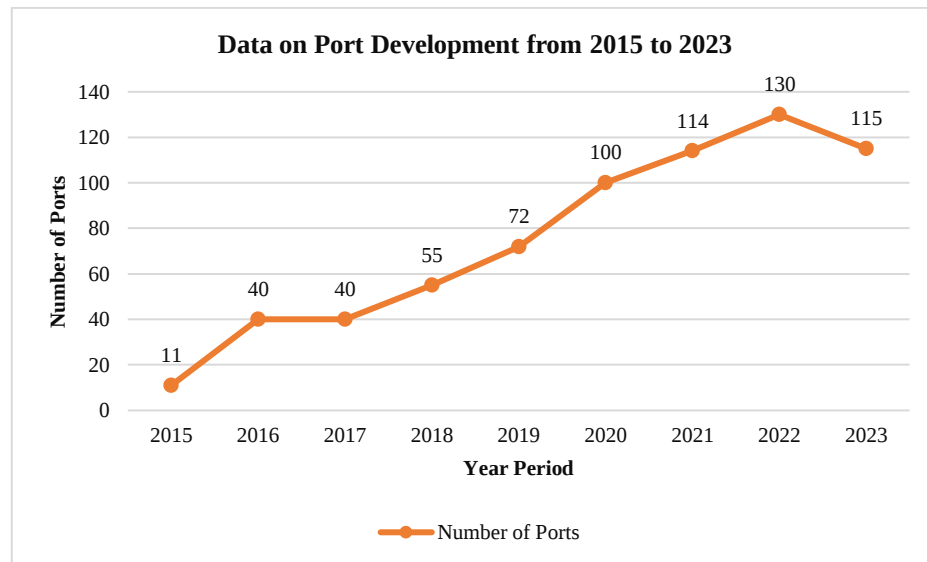


Figure 1. Data on Port Development from 2015 to 2023

Source: (Uppcalabai, 2023)

Figure 1 shows the development of the number of ports in Indonesia during the period 2015 to 2023, which in principle illustrates the dynamics of national maritime infrastructure expansion in supporting inter-regional logistics distribution. In general, the graph shows a significant upward trend in the number of ports, from only 11 ports in 2015 to 130 ports in 2022. The increase that occurred in the 2015-2022 period reflects the intensity of development, modernization, addition of physical facilities, and increased port infrastructure capacity as key instruments of the state in strengthening maritime connectivity networks and expanding inter-island economic efficiency. However, despite this seemingly progressive increase in the number of ports, 2023 saw a decline from 130 ports to 115 ports. This decline should be interpreted not merely as a statistical figure, but as an indicator of a process of selection, operational feasibility evaluation, capacity rationalization, route adjustments, and port network consolidation that directly impacts the performance structure of the sea toll road (Wibowo et al., 2025).

The decline in the number of ports in 2023 indicates that not all of the physical expansion of ports that occurred in previous years can operate sustainably in economic terms. In the context of sea tolls, the sustainability of supply routes is greatly influenced by the stability of return cargo, consistent port utilization, the strength of the region's production hinterland, and sufficient regional industrialization capable of generating regular flows of goods. When ports are eventually closed, relocated, or have their activities reduced due to minimal logistics traffic and low route utilization performance, this has a direct impact on the quality of the national sea toll performance. This means that port growth that only adds to the numbers does not guarantee the effectiveness of the sea toll program if it is not accompanied by regional production supply readiness, supporting investments, and micro-logistics structures such as warehouses and goods consolidation (Gultom et al., 2022).

Therefore, the decline in the number of ports in 2023 confirms that the performance of sea tolls cannot be measured solely from the aspect of the quantity of additional ports, but must be assessed based on how these ports are truly capable of producing productive, sustainable, and economical strategic logistics functions as a feeder system for the national distribution network (Susanto et al., 2021). Thus, the interpretation of this data reinforces the urgency of improving sea toll policy strategies based on supply-driven development, not just infrastructure-driven expansion.

Based on the above background, the research questions in this study are as follows: 1) Does regional economic income affect sea toll performance?; 2) Does investment affect sea toll performance?; 3) Do logistics warehouses affect sea toll performance?

METHOD

This study uses a qualitative design with a descriptive approach based on a *literature review*. This approach was chosen because it allows researchers to investigate, understand, and critically analyze the factors that influence the performance of sea tolls in Indonesia through a synthesis of previous studies. The *literature review* method not only focuses on presenting a summary of findings but also conducts a comparative evaluation to identify similarities, differences, and patterns of interrelationships between variables, (Boulton, M. J., & Houghton, 2021).

The research data was sourced from secondary data obtained through journal articles, digital books, research reports, and academic publications relevant to the variables of sea toll performance, regional economic income, investment, and logistics warehouses. The literature was collected from reputable international databases such as Scopus, Web of Science, Taylor & Francis, Emerald, Sage, Springer, Elsevier, DOAJ, and EBSCO. Additionally, further searches were conducted through Google Scholar to ensure broader literature coverage. Literature selection was carried out systematically by considering topic suitability, publication quality, and relevance to the research focus, (Susanto et al., 2024).

Data analysis was conducted using a comparative analysis approach. In the first stage, the literature obtained was reduced to ensure that only articles that met the criteria were used. The next stage was data presentation, in which previous research findings were arranged in a matrix or summary table to facilitate the comparison process. The analysis then focused on identifying similarities, differences, and patterns of relationships between variables. The final stage was drawing conclusions through synthesizing the analysis results to obtain a comprehensive understanding of the influence of regional economic income, investment, and logistics warehouses on the performance of sea tolls in Indonesia, (M. Dewi, 2024).

The validity of the research is maintained through the selection of literature sources from reputable international academic databases, as well as the screening of articles based on their suitability to the context and substance of the research. The reliability of the research is strengthened by the use of various sources from diverse geographical contexts and industrial sectors, so that the analysis results are not only partial but can provide a more general picture. With this approach, the research results have academic credibility and can be accounted for in the development of literature in the field of human resource management.

RESULTS AND DISCUSSION

Results

Based on the background and problem formulation above, the results of this study are theories from previous studies, indicators or dimensions as follows:

Sea Toll Performance

Sea toll performance is the effectiveness, continuity, logistics connectivity, and achievement of outputs and outcomes of the Sea Toll program in distributing goods between regions in Indonesia to reduce price disparities, improve economic connectivity, reduce national logistics costs, and accelerate equitable development between eastern and western Indonesia. Sea toll performance also reflects the quality of port network management, land mode integration, terminal handling efficiency, ship utilization, schedule accuracy, and speed in consolidating goods from the warehouse of origin to distribution to the destination market (Wiyono & Daryanto, 2020).

The indicators or dimensions contained in the sea toll performance variables include: 1) Return Load Occupancy Rate: Measures the percentage of ship capacity utilization on the return route (from 3T areas to economic centers). A high return cargo load indicates an increase in regional commodity production; 2) Price Stability of Basic Commodities: Measures the reduction or equalization of price disparities for basic commodities in 3T regions compared to prices in Java. This is a direct indicator of the program's success in reducing logistics costs; 3) Frequency of Sailing and Punctuality: Measures the consistency of schedules and the punctuality of ship arrivals/departures at ports of call. Regular and reliable frequency is very important to ensure supply chain certainty; 4) Logistics Cost Efficiency: Measures the reduction in the cost of transporting goods by sea compared to conventional or land costs. This efficiency is calculated from the subsidies provided by the government versus the impact of price reductions in the destination area (Gugat et al., 2022).

The performance variables of sea tolls have been studied by previous researchers and are relevant to the research conducted by: (Witro & Yanti, 2021), (Wijaya, 2025a), (Dewantara & Saputro, 2022).

Regional Economic Income

Regional economic income is the total income generated from productive economic activities in a specific geographical area that comes from various sources of economic added value, such as the industrial, trade, tourism, logistics, service, manufacturing, agriculture, fisheries, and creative economy sectors, which collectively reflect the region's ability to create economic value, generate employment, and improve the welfare of the local community (Yasin, 2020).

Regional economic income in the context of regional development is not only an economic outcome, but also a fundamental indicator that reflects the quality of regional governance, the effectiveness of development policies, the region's capability to attract capital, the innovation capacity of business actors, and the region's level of success in integrating logistics systems, distribution systems, transportation systems, and market access into the national economic value chain. Thus, regional economic income is a representation of the overall economic performance of a region, not merely administrative revenue (Purba & Manurung, 2023).

The indicators or dimensions contained in the regional economic income variable include: 1) Gross Regional Domestic Product Growth: Measures the percentage increase in the added value of all goods and services produced in a region within a certain period of time. High GRDP growth indicates regional economic expansion; 2) Regional Original Income: Measures the revenue obtained by the region from its own sources, such as regional taxes, regional levies, and proceeds from the management of regional assets. An increase in local revenue reflects fiscal independence and healthy economic activity; 3) Employment Rate: Measures the percentage of the working-age population absorbed by the labor market. An increase in labor absorption (a decrease in the unemployment rate) is an indicator that regional economic activity (e.g., the industrial or tourism sector) is growing; 4) Value of Regional Leading Commodity Exports: Measures the total value of goods or services typical of the region that are sold abroad or to other regions. An increase in export value indicates the competitiveness and economic specialization of the region (Sinaga et al., 2020).

Regional economic income variables have been studied by previous researchers and are relevant to the research conducted by: (Sisilia & Harsono, 2021), (Marseno & Mulyani, 2020), (Aneldus & Dewi, 2020).

Investment

Investment is any form of capital, financial resources, assets, time, technology, competencies, and other strategic resources invested by individuals, companies, institutions, or governments in an economic activity with the aim of generating added value, economic profits, income growth, new asset formation, increased production capacity, and the creation of sustainable economic benefits in the future (Nurfadilah et al., 2022).

In the context of public policy research, increasing investment is a strategic instrument to accelerate equitable development between regions, reduce disparities between regions, integrate the national supply chain system, and strengthen the regional economy by increasing added value in priority sectors in the region (Mastura et al., 2020).

The indicators or dimensions contained in the investment variable include: 1) Realization of Foreign Investment: The actual amount of funds from foreign investors that have entered and been realized to establish or develop businesses in a region. FDI is often used as a benchmark for international confidence in the investment climate; 2) Domestic Investment Realization: The actual amount of funds from domestic investors used to establish or develop businesses within the country. DDI indicates the confidence of local businesses in the domestic economic outlook; 3) Infrastructure Investment Value: The amount of capital allocated for the development of physical and digital infrastructure (roads, ports, internet networks). High infrastructure investment is a major attraction for real sector investment; 4) Ease of Doing Business: Measures the level of efficiency of regulations, bureaucracy, and licensing processes faced by investors when establishing and running a business. The easier it is, the more attractive the region is for new investment (Wulandari, 2020).

Investment variables have been studied by previous researchers and are relevant to the research conducted by: (Mastura et al., 2020), (Burhanudin et al., 2021), (Yuliati et al., 2020).

Logistics Warehouse

A logistics warehouse is a physical facility that functions as a center for storage, consolidation, grouping, handling, distribution, and management of the flow of goods along the supply chain from producers to end consumers, designed to support the smoothness, efficiency, and connectivity of the national logistics distribution system (Sandita, 2023).

Logistics warehouses also play a strategic role in national programs such as the Sea Toll, as warehouses are an element that ensures goods shipped between regions can be effectively consolidated before departure and effectively redistributed upon arrival. Logistics warehouses are not merely storage facilities, but the backbone of supply chain efficiency that influences the national economic structure, regional connectivity, and the government's ability to achieve equitable distribution of goods throughout Indonesia (Afifah & Cahyana, 2024).

The indicators or dimensions contained in the logistics warehouse variable include: 1) Space Utilization Rate: Measures the percentage of warehouse space capacity filled with goods compared to the total available capacity. Optimal utilization indicates efficient inventory management; 2) Inventory Accuracy: Measures the conformity between the physical quantity of goods in the warehouse and the records or data in the information system (WMS). High accuracy is very important to avoid *stockouts* or *overstocking*; 3) Stock Turnover Rate: Measures how often inventory is sold or used within a certain period of time. A high turnover ratio (depending on the industry) indicates sales efficiency and minimal dead stock; 4) Order Cycle Time: Measures the total time required from when an order is received until the goods are ready to be shipped from the warehouse (including *picking*, *packing*, and *staging*). A fast cycle time indicates warehouse operational efficiency (Allo, 2025).

Logistics warehouse variables have been studied by previous researchers and are relevant to the research conducted by: (N. T. Putri & Saputra, 2023), (Dharma & Setiawan, 2025), (Anam, 2023).

Previous Research

Based on the above problem formulation, the following previous studies relevant to this research were obtained:

Table 1. Previous Research

No	Author	Research Results	Similarities with this study	Differences with this study
1	(Fitria, 2023)	The variables of Regional Economic Income and Regional Economy influence the Performance of Sea Tolls	Similarities with this study in the independent variable of Regional Economic Income and the dependent variable of Sea Toll Performance	Differences with this study in other independent variables, namely Regional Economy
2	(I. M. Dewi, 2023)	The Investment variable affects Sea Toll Performance and the Maritime Sector	Similarities with this study in terms of the independent variable Investment and the dependent variable Sea Toll Performance	The difference between this study and other dependent variables is the Maritime Sector
3	(Pratama et al., 2025)	Logistics warehouse variables and the effectiveness of sea toll program implementation affect	Similarities with this study in terms of the independent variable, namely logistics warehouses, and the dependent variable, Sea Toll Performance	The difference between this study and other independent variables is the effectiveness of implementation

Discussion

Based on the research questions and relevant previous studies, the discussion of this study is as follows:

1. The Influence of Regional Economic Income on Sea Toll Performance

Based on the results of relevant previous studies, it is known that regional economic income affects sea toll performance in Indonesia.

To improve the performance of sea tolls in Indonesia, the government or stakeholders can pay attention to regional economic income, which includes: 1) Growth in gross regional domestic product: The government or stakeholders can focus on productive sectors. By channeling subsidies and assistance programs to the agriculture, fisheries, and small processing industries in 3T areas. RGR growth must be driven by an increase *in output* that has the potential to become return cargo (commodities transported to economic centers); 2) Local revenue: Local governments should encourage the use of a portion of the increased local revenue to improve road access to ports and build commodity storage facilities (cold storage/storage). This infrastructure is crucial to maintain the quality of return cargo; 3) Employment rate: Conduct skills training focused on post-harvest handling and processing as well as supply chain management; 4) Export value of leading regional commodities: Provide technical assistance and quality certification costs (e.g., SNI, HACCP) for leading regional commodities. Increased exports directly create demand for return cargo that is guaranteed in terms of quality and quantity, thereby increasing the profitability of the route.

If the government or stakeholders can pay attention to these four aspects of regional economic income, it will have a positive and significant impact on the performance of sea tolls, which include: 1) Return cargo occupancy rate: Increased exports of leading commodities and GDP growth in 3T regions directly result in cargo volume available for transport back to central regions. This transforms routes that initially only transported goods from Java (*front haul*) into efficient two-way routes; 2) Stability of prices for basic necessities: When return cargo is filled, operational costs per container become lower because they are divided between two directions. Operators no longer need to bear the entire cost of *front haul* cargo. This allows for the sale of

basic necessities at more stable and lower prices in 3T areas; 3) Frequency of voyages and punctuality: The guaranteed existence of return cargo (*driven by commodity exports*) makes the route more commercial and sustainable. Operators will be more motivated to maintain or even increase sailing frequency, which improves schedule reliability; 4) Logistics cost efficiency: Increased PAD invested in port logistics infrastructure, coupled with increased return cargo occupancy, reduces the overall need for government subsidies and improves the efficiency of the national supply chain.

The results of this study are in line with previous research conducted by (Fitria, 2023), which states that there is an influence between regional economic income and sea toll performance.

2. The Impact of Investment on Sea Toll Performance

Based on relevant previous research, it is known that investment affects the performance of sea tolls in Indonesia.

To improve the performance of sea tolls in Indonesia, the government or stakeholders can pay attention to investment, which includes: 1) Realization of foreign investment: Provide fiscal and non-fiscal incentives (such as *tax holidays* or special permit facilities) for foreign direct investment (FDI) companies that build processing facilities (e.g., fish processing, CPO, or agricultural products) near sea toll ports; 2) Realization of domestic investment: Provide assistance and low-interest working capital loans to MSMEs and local companies to increase the scale of production of leading commodities. Encourage domestic investment in post-harvest technology that supports product durability during sea transportation; 3) Infrastructure investment value: Prioritize investment in the improvement and connectivity of land infrastructure (toll roads/provincial/district roads) connecting production centers with Sea Toll port of call; 4) Ease of doing business: Implement a fast and integrated investment licensing system (e.g., through an effective OSS) for projects related to logistics and manufacturing in eastern Indonesia.

If the government or stakeholders can pay attention to these four investment aspects, it will have a positive and significant impact on the performance of sea tolls, which includes: 1) Return cargo load rate: The realization of foreign direct investment (FDI) and domestic direct investment (DDI) in the processing sector in the destination area will fundamentally increase the volume and quality of commodities ready for return transport. Investment transforms consumption areas into production centers that generate return cargo (export commodities or raw materials to Java); 2) Stability of basic commodity prices: Increased return cargo occupancy (triggered by investment) significantly reduces ship operating costs. This eliminates the need for operators to pass on all costs to *front haul* cargo (Bapok), making the prices of basic commodities in 3T regions more stable and affordable; 3) Frequency of voyages and punctuality: When the Sea Toll route becomes more commercial (because return cargo is guaranteed by investment), operators will be motivated to maintain and increase the frequency of voyages. This is also supported by Infrastructure Investment, which speeds up the loading and unloading process at ports, ensuring punctuality; 4) Logistics cost efficiency: Improved EoDB accelerates the supply chain. Infrastructure Investment eliminates transportation *bottlenecks* from production centers to ports. Overall, this integration shortens ship *turnaround* times and reduces operating costs, improving the total efficiency of national logistics.

The results of this study are in line with previous research conducted by (I. M. Dewi, 2023), which states that there is an influence between investment and sea toll performance.

3. The Influence of Logistics Warehouses on Sea Toll Performance

Based on relevant previous research, it is known that logistics warehouses influence sea toll performance in Indonesia.

To improve sea toll performance in Indonesia, the government or stakeholders can pay attention to logistics warehouses, which include: 1) Space utilization rate: Invest in the construction of adequate *cold storage* and storage warehouses near ports. This allows for the storage of large quantities of regional commodities, ensuring consistent availability of return cargo; 2) Inventory accuracy: Mandate and facilitate the use of a simple and integrated Warehouse Management System (WMS). Inventory accuracy allows *stakeholders* to accurately predict ship cargo volumes and plan *loading* schedules without delays; 3) Stock turnover rate: Conduct intensive coordination between warehouse management, business actors, and Sea Toll operators. The goal is to ensure goods are delivered to the warehouse at the specified time to meet the ship's schedule, minimizing dead stock and *perishable* goods; 4) Order cycle time: Simplify and automate the *picking, packing, and staging* processes at the port warehouse. A fast order cycle time is crucial to ensure that *front haul* goods are promptly dispatched from the port and *back haul* cargo is promptly loaded onto the ship according to schedule.

If the government or stakeholders can pay attention to these four aspects of logistics warehousing, it will have a positive and significant impact on the performance of sea tolls, which include: 1) Backhaul load occupancy rate: Efficient space utilization and stock rotation ensure that regional commodities (such as fishery or agricultural products) can be collected and maintained in good quality before being transported. This fundamentally improves the availability and reliability of backhaul cargo; 2) Price stability of basic necessities: Inventory accuracy reduces damage (especially to basic necessities) and *stockouts*. In addition, as Return Load Fill Rates increase, vessel operating costs per container become lower, allowing the prices of basic necessities in the destination area to become more stable and affordable; 3) Voyage frequency and punctuality: Fast Order Cycle Times and high Inventory Accuracy greatly reduce vessel *dwelling* time at port. Ships can be unloaded, loaded, and depart on schedule. This improves schedule reliability and sailing frequency, which are vital to market confidence; 4) Logistics cost efficiency: Increased Stock Turnover and Space Utilization mean that capital (goods) does not remain idle for long. Increased *loading/unloading* speed (Order Cycle Time) saves on vessel rental costs at port. All of this contributes to overall logistics cost efficiency.

The results of this study are in line with previous studies conducted by (Pratama et al., 2025), which state that there is an influence between logistics warehouses and sea toll performance.

Conceptual Framework

Based on the problem formulation, previous studies, results, and discussion, the conceptual framework for this study is determined as follows:

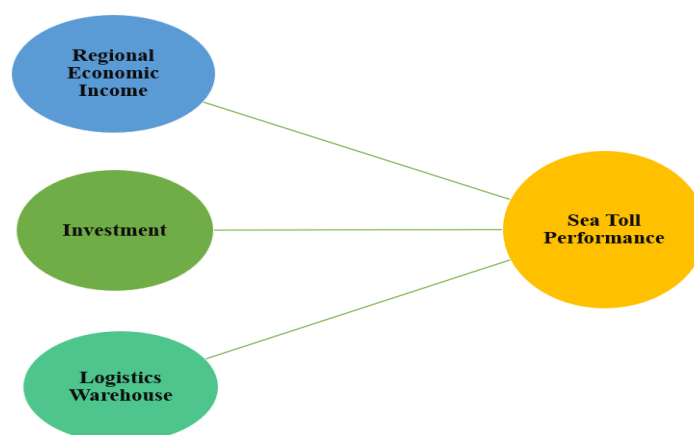


Figure 2. Conceptual Framework

Based on Figure 2 above regarding the conceptual framework, regional economic income, investment, and logistics warehouses affect sea toll performance. However, in addition to the variables of regional economic income, investment, and logistics warehouses that affect sea toll performance, there are other variables that affect sea toll performance, including:

- 1) Logistics Management System: (Kurniajati & Susanto, 2024), (U. A. Putri et al., 2023), (Simbo et al., 2024).
- 2) Regulations: (Palippui, 2024), (Murshed et al., 2021), (Rakhmawati et al., 2020), (Agada et al., 2022).
- 3) Logistics Human Resource Quality: (Lorenzo, 2023), (Kurniawan et al., 2023), (Mashudi et al., 2021).
- 4) Logistics Infrastructure: (Maisharoh & Ali, 2022), (Prasidi & Rifni, 2020), (Fajar et al., 2023), (Ali et al., 2024).

CONCLUSION

Based on the research questions, results, and discussion above, the conclusions of this study are: 1) Regional economic income influences the performance of sea toll roads; 2) Investment influences the performance of sea toll roads; 3) Logistics warehouses influence the performance of sea toll roads.

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