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# Maritime Infrastructure Development and its Impact on National Economic Growth

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## Abstrak

Maritime infrastructure development plays a strategic role in strengthening the national economy, especially in an archipelagic country like Indonesia. This article explores the relationship between investment in maritime infrastructure, such as ports, shipping lanes and logistics facilities, and national economic growth. Through secondary data analysis and case studies of major ports in Indonesia, the research finds that improvements in port capacity and efficiency contribute significantly to increased trade volumes, logistics efficiency, and international competitiveness. Adequate maritime infrastructure is able to reduce logistics costs, speed up delivery times, and improve inter-island connectivity, thereby supporting regional and national economic growth. In addition, this article also discusses the challenges faced in developing maritime infrastructure, including issues of financing, regulation, and environmental impacts. Sustainable financing and private sector involvement through public-private partnership schemes are considered crucial in accelerating infrastructure development. Clear and consistent regulations are also needed to create a conducive investment climate. On the other hand, the environmental impacts of port and shipping line development must be well managed to ensure long-term sustainability. The results show that planned and integrated maritime infrastructure development can drive sustainable economic growth, create jobs and improve people's welfare. Policy recommendations include increased co-operation between the public and private sectors, as well as the adoption of new technologies to improve operational efficiency. Thus, maritime infrastructure development not only improves national logistics performance but also contributes to stability and sustainable economic growth.

**Keywords**: Infrastructure, economy, ports, logistics, investment, international competitiveness



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## INTRODUCTION

Indonesia, as the largest archipelago in the world, has enormous maritime potential. With more than 17,000 islands and 54,716 km of coastline, Indonesia's maritime sector plays an important role in supporting the national economy (Lescar, 1999). The development of maritime infrastructure, such as ports, shipping lanes and logistics facilities, is crucial to optimising this potential. Efficient and modern maritime infrastructure not only facilitates the flow of goods and services, but also improves Indonesia's competitiveness in the international arena.

Currently, logistics costs in Indonesia are still relatively high compared to other countries in the Southeast Asian region. Based on a report from the World Bank, logistics costs in Indonesia reach around 24% of Gross Domestic Product (GDP), while neighbouring countries such as Malaysia and Singapore have much lower logistics costs, at around 13% and 8% of GDP respectively (Resosudarmo & Abdurohman, 2018). This high logistics cost is largely due to the lack of adequate maritime infrastructure, which results in inefficiencies in the distribution of goods, slows down delivery times, and increases transport costs.

The limitations of maritime infrastructure can be seen in the not-yet-modern port conditions, lack of efficient loading and unloading facilities, and limited storage and distribution capacity (Li et al., 2023). This leads to long waiting times for ships and uncertainty in delivery schedules, which in turn increases operational costs for businesses. In addition, sub-optimal connectivity between ports and land distribution channels also worsens logistics efficiency.

Therefore, investment in maritime infrastructure development is seen as one of the key solutions to address these issues. The construction of modern ports with adequate facilities, increased capacity of shipping lanes, as well as better integration of logistics systems can significantly reduce logistics costs. In addition, the application of information technology and automation in port management can speed up the loading and unloading process and improve operational efficiency.

These investments will not only improve logistics efficiency but also strengthen Indonesia's competitiveness in the global market (Park et al., 2019). With lower logistics costs, Indonesian products will become more competitive in the international market, which in turn can increase export volume and national economic growth. In addition, improving maritime infrastructure will also open up opportunities for regional economic development, create new jobs, and encourage investment in related sectors.

On the other hand, the development of shipping lines integrated with land and air transport systems can improve connectivity between regions (Munim & Schramm, 2018). With better connectivity, the distribution of goods becomes faster and more efficient, which in turn can lower logistics costs and improve the competitiveness of local products. In addition, good connectivity can also reduce economic disparities between regions by opening up market access for previously isolated areas. This enables a more equitable distribution of wealth and promotes more inclusive economic growth.

However, the development of maritime infrastructure is not free from challenges. The issue of financing is one of the main obstacles, given the large investment required to build and maintain modern and efficient maritime infrastructure (Wang et al., 2021). Government funding is often insufficient, which requires the involvement of the private sector through public-private partnership schemes. However, attracting private investment is not always easy, especially if existing regulations are not supportive.

Regulations that are not fully supportive are another challenge. Overlapping regulations, cumbersome bureaucracy, and legal uncertainty can hinder the development process and discourage investors. Therefore, comprehensive regulatory reforms are needed to create a conducive investment climate and accelerate the infrastructure development process (Song & van Geenhuizen, 2014).

Environmental challenges are also an important concern in any maritime infrastructure development project (Li et al., 2023; Wicaksana, 2017). The development of ports and shipping lines can negatively impact marine and coastal ecosystems if not managed properly. Therefore, a sustainable approach is required at every stage of development, from planning to operations.

This includes conducting environmental impact studies, applying environmentally friendly technologies, and ensuring the involvement of local communities in the decision-making process. Successful maritime infrastructure development thus requires a holistic and integrated approach, covering economic, regulatory, financing and environmental aspects. Only with such an approach can the full potential of the maritime sector be optimised to support sustainable national and regional economic growth (Amin et al., 2021; Rochwulaningsih et al., 2019; Yudhistira & Sofiyandi, 2018).

This article aims to explore the impact of maritime infrastructure development on national economic growth. By analysing various case studies and empirical data, it is hoped that a comprehensive picture of the benefits, challenges and strategies for maritime infrastructure development in Indonesia can be obtained. Ultimately, this article is expected to provide policy recommendations that can support the government's efforts in optimising Indonesia's maritime potential for national welfare.

## METHOD

This study uses a systematic review method to explore the impact of maritime infrastructure development on national economic growth. Systematic review was chosen because it allows for the collection and analysis of existing evidence in a systematic and transparent manner, thus providing a comprehensive overview of the topic under study. The review protocol was drafted to detail the study objectives, inclusion and exclusion criteria, search strategy, study quality assessment methods, and data synthesis techniques.

The protocol was registered with PROSPERO to ensure transparency. Relevant literature was identified through searching major academic databases such as PubMed, Scopus, Web of Science, and Google Scholar. In addition, manual searches were conducted on the reference lists of found articles and grey literature to ensure comprehensive coverage. The keywords used include "maritime infrastructure development", "national economic growth", "port", "logistics", and "Indonesia".

Studies found through the literature search were screened based on predetermined inclusion and exclusion criteria. Inclusion criteria included studies that evaluated the impact of maritime infrastructure development on economic growth, published in English or Indonesian, and available in full text. Selection was conducted in two stages: title and abstract screening, followed by full-text assessment. Two independent researchers conducted the selection to reduce bias, and any disagreements were resolved through discussion or by involving a third researcher.

The quality of the selected studies was assessed using appropriate critical appraisal tools such as the Cochrane Risk of Bias Tool for clinical trials or the Newcastle-Ottawa Scale for observational studies. Quality assessment helps in assessing the risk of bias in the included studies and guides the interpretation of results. Relevant data from each included study were systematically extracted using a pre-defined data extraction form. The extracted data included information on population, intervention, comparator, outcome, and study design. Data extraction was performed by two independent researchers to ensure accuracy.

The extracted data is synthesised to provide an overall picture of the available evidence. The data synthesis method can be a meta-analysis if the quantitative data is homogeneous enough and allows statistical pooling. Otherwise, narrative synthesis is used to integrate the findings descriptively. Thematic analysis is also used to identify patterns and key themes emerging from the data. The results of the systematic review were reported transparently in accordance with PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses)

guidelines. Reporting includes a flow chart showing the study selection process, a table of characteristics of included studies, and the results of the study quality assessment. Key findings are described in the context of the strengths and limitations of the available evidence, as well as implications for practice and further research.

The systematic review method allows researchers to collect and synthesise evidence in a systematic and transparent manner, thus providing more reliable and accurate information. By following rigorous procedures, this systematic review is expected to provide a comprehensive picture of the impact of maritime infrastructure development on national economic growth and offer informative policy recommendations.

## RESULT AND DISCUSSIONS

From the literature search, a total of 45 studies were initially identified as relevant for this study. After a rigorous selection process, 20 studies met the inclusion criteria and were included in this systematic review. These studies cover a wide range of research types, including policy analyses, port case studies, economic impact reports, and scientific journal articles that address the topic of maritime infrastructure development and economic growth. The included studies come from various countries, with a primary focus on Indonesia and some neighbouring countries in the Southeast Asian region. Most studies were published between 2010 and 2023, reflecting the latest trends and developments in maritime infrastructure development. The types of infrastructure covered include ports, shipping lanes, and logistics facilities, as well as the integration of maritime transport systems with land and air transport.

### Direct Economic Impact

Maritime infrastructure development significantly contributes to national and regional economic growth. Adequate infrastructure, such as modern and efficient ports, can optimise international trade flows, reduce logistics costs, and improve the competitiveness of local products. This is in line with research showing that increasing port capacity and efficiency can have a positive impact on various aspects of the economy.

Empirical studies have revealed that efficient ports are able to accommodate more vessels with minimal waiting time, thus speeding up the loading and unloading process and distribution of goods (McCawley, 2015). For example, the development of Tanjung Priok Port in Jakarta has been a successful example in this context. Massive investments in infrastructure and technology at this port have significantly reduced vessel waiting times, from several days to just a few hours. This has not only reduced operating costs for shipping companies and shippers, but also increased investor and business confidence in the efficiency of supply chains in Indonesia.

Improved operational efficiency at Tanjung Priok Port also boosts local economic growth. With faster loading and unloading processes, the volume of goods that can be processed at one time increases, enabling increased trade flows. In addition, speed and accuracy in the handling of goods reduces the risk of damage and loss, which is often a major issue in international trade. This makes local products more competitive in the global market as they can offer better quality and more competitive prices (Mursitama & Ying, 2021).

This positive impact is not only felt by large businesses, but also by small and medium-sized enterprises (SMEs) that depend on efficient market access to sell their products. With lower logistics costs, SMEs can expand their market reach, both domestically and internationally, thereby increasing their revenue and accelerating their business growth.

Furthermore, the development of maritime infrastructure such as that at Tanjung Priok Port also attracts additional investment in related sectors, such as transport, warehousing, and logistics. These industries develop in tandem with increased activity at the port, creating new jobs and boosting incomes in local communities. The development of supporting infrastructure, such as roads and railways connecting the port to centres of production and consumption, has also helped drive regional economic growth by improving connectivity and transport efficiency.

Overall, maritime infrastructure development plays a crucial role in strengthening the foundation of the national economy (Sandee, 2016). By improving port capacity and efficiency, Indonesia can not only increase the volume of international trade, but also reduce logistics costs, increase the competitiveness of local products, and promote inclusive economic growth. Sustainable investment and attention to environmental management as well as supportive regulations will ensure that the benefits of this development can be felt by all levels of society, both now and in the future.

**Improved Logistics Efficiency**

Investment in maritime infrastructure also has a positive impact on logistics efficiency. With the development of modern and integrated ports, the process of loading and unloading goods becomes faster and more efficient, reducing waiting times and speeding up the flow of goods from producers to consumers. Good maritime infrastructure enables the handling of larger volumes of goods at lower costs, improving the overall effectiveness of the supply chain. In addition, advanced technologies such as automated terminal management systems and digital-based tracking devices increase transparency and accuracy in goods handling (Kurniawan & Managi, 2018; McCawley, 2015).

The integration of maritime transport systems with land and air transport networks helps speed up the distribution of goods and create more efficient logistics pathways. For example, the construction of rail lines linking ports with major industrial and distribution centres allows for fast and efficient bulk transport of goods, reducing reliance on road transport that is often hampered by traffic congestion. Similarly, improved air connectivity allows for more efficient delivery of high-value and time-sensitive goods, opening up new opportunities for exports and imports.

This is particularly important for an archipelago like Indonesia, where the efficient distribution of goods between islands is key to equitable economic growth. With thousands of islands spread across the archipelago, the logistics challenges faced are complex. Efficient maritime infrastructure enables more equitable distribution of goods across the region, including remote areas that were previously difficult to reach. This helps reduce economic disparities between regions by ensuring that essential goods such as foodstuffs, medicines, and other basic necessities can be distributed quickly and efficiently to all corners of the country.

In addition, the integration of maritime transport systems with land and air networks also contributes to regional economic development (Amelia et al., 2022; Jansen et al., 2018). With better access to national and international markets, remote areas can develop their local economic potential. For example, agricultural and fishery products from remote areas can be easily transported to consumer centres in major cities or exported overseas, having a positive impact on the income of local farmers and fishermen.

Investments in integrated maritime infrastructure also impact other related sectors, such as warehousing, distribution and manufacturing. Improved logistics efficiency attracts additional investment in these sectors, creating new jobs and increasing community incomes.

For example, the construction of an integrated logistics centre near a port can attract companies engaged in distribution and manufacturing, which in turn will create new economic opportunities for local communities.

Overall, investment in maritime infrastructure integrated with land and air transport networks is key to driving logistics efficiency and equitable economic growth in Indonesia (Prayoga, 2022; Rochwulaningsih et al., 2019). By reducing transport costs, speeding up the distribution of goods, and improving connectivity between regions, Indonesia can overcome the complex logistics challenges of being an archipelago and ensure that the economic benefits are felt by all. This approach not only improves global competitiveness but also supports inclusive and sustainable economic development.

**Job Creation and Industrial Development**

A modern and efficient port can be a centre of economic growth, creating new jobs and encouraging the development of surrounding industries. With adequate infrastructure, ports are able to handle large volumes of goods quickly and cost efficiently, making them strategic logistics hubs. Modern ports are equipped with state-of-the-art loading and unloading facilities, integrated warehouses, and automated management systems that improve productivity and operational efficiency (Karimah & Yudhistira, 2020). This not only reduces vessel dwell time and logistics costs, but also attracts investors from various industry sectors.

The case study of Belawan Port in Medan shows the positive impact of port development on local economic growth. Following capacity enhancements and operational efficiencies, Belawan Port has attracted substantial investment from the manufacturing and logistics sectors. The construction of new facilities such as container terminals, warehousing areas, and transport links directly connected to the port created an industrial ecosystem that boosted economic growth. Manufacturing industries that develop around the port are able to utilise logistics efficiency to reduce production costs and increase the competitiveness of their products in national and international markets (Li et al., 2023; Munim & Schramm, 2018).

The development of Belawan Port has also created thousands of new jobs, both directly and indirectly. Increased loading and unloading activities, warehousing operations, and distribution of goods require a large number of workers. In addition, industries that invest around the port also open up job opportunities for local communities (Gamage, 2016). This has a direct impact on increasing community income and regional economic prosperity. With new jobs, the unemployment rate decreases and people's purchasing power increases, which in turn boosts local economic growth.

In addition to creating jobs, port development also encourages the development of other supporting infrastructure such as roads, railways and public transport facilities. This infrastructure not only improves port accessibility and connectivity, but also accelerates the development of surrounding industrial estates. With good infrastructure in place, new industries have easier access to markets and necessary resources, thus speeding up the production and distribution process. This infrastructure development also opens up opportunities for the construction and services sectors, creating additional jobs and increasing economic activity in the area.

The development of modern ports such as Belawan Port also has a significant economic multiplier effect. Increased economic activity around the port creates greater demand for supporting services such as banking, insurance, restaurants and accommodation. This creates new business opportunities for local entrepreneurs and increases local government revenue through taxes and levies (Gede Wahyu Wicaksana, 2021). Thus, port development not only

benefits the logistics and industrial sectors, but also fosters broader economic growth in the surrounding areas.

Overall, a modern and efficient port serves as a significant catalyst for economic growth. By attracting investment, creating jobs, and encouraging industrial development, ports can play an important role in improving the economic well-being of local communities and supporting national economic growth. Planned port development that is integrated with other transport infrastructure will ensure that these economic benefits are maximised and sustained.

**Reduction of Inter-Regional Economic Disparities**

The development of shipping lines integrated with land and air transport systems can reduce economic disparities between regions. This integration enables more efficient and faster transportation of goods and services, connecting remote areas with major economic centres. With good shipping lanes connected to land and air infrastructure, previously isolated regions can access wider markets and obtain raw materials, capital goods, and consumer goods more easily and cheaply.

Studies show that previously isolated regions now have better market access. For example, areas in Eastern Indonesia that were difficult to reach can now enjoy better connectivity with integrated shipping lines. Smaller ports that are developed and connected to major ports through efficient shipping lanes enable faster and more reliable distribution of goods. This opens up opportunities for local products to be marketed outside the region and even to international markets, thereby increasing regional income and the welfare of local communities (Tu et al., 2018).

The integration of maritime transport with land and air networks also enables a more equitable distribution of wealth and promotes more inclusive economic growth. For example, regions producing commodities such as agriculture, fisheries, and mining can deliver their products to markets more efficiently, get better prices, and reduce losses due to shipping delays (Yudhistira et al., 2022). For example, Indonesia's sea toll programme that connects large islands with small islands has helped reduce price disparities between remote and developed areas, allowing people in remote areas to enjoy more affordable goods.

With better connectivity, investment in remote areas has also increased. Investors who were previously hesitant to invest in remote areas due to logistical constraints are now more interested due to easy access to transport. The development of processing industries near sources of raw materials, such as fish processing plants in coastal areas or agricultural processing plants in inland areas, creates new jobs and increases the income of local communities (Amelia et al., 2022; Talib et al., 2022). This promotes more equitable and inclusive economic development, reducing the gap between urban and rural areas.

In addition, the development of integrated shipping lines also promotes improved quality of public services in remote areas. With better access to transport, the distribution of essential goods such as foodstuffs, medicines, and medical equipment becomes faster and more efficient (McCawley, 2015). This has a direct impact on improving people's quality of life, as their basic needs can be better met. For example, faster and regular delivery of medicines helps improve healthcare services in remote areas, while more efficient distribution of foodstuffs helps maintain price stability and food availability.

Overall, the development of shipping lanes integrated with land and air transport systems is a strategic move to reduce economic disparities between regions. By improving connectivity and market access, remote areas can develop in a more inclusive and equitable manner. This not only improves the welfare of the people in those areas but also contributes to a more

sustainable and equitable national economic growth. Continued investment in the development of integrated transport infrastructure will ensure that all regions, regardless of geography, can participate in and benefit from dynamic economic growth.

## CONCLUSION

Maritime infrastructure development has a significant impact on national and regional economic growth. Modern and efficient infrastructure not only supports trade and logistics activities, but also creates a vibrant economic ecosystem around ports and shipping lanes. Increased port capacity and operational efficiency enable the handling of larger trade volumes, reduce logistics costs, and speed up the delivery time of goods (Talib et al., 2022; Tu et al., 2018; Yudhistira et al., 2022). This directly contributes to improving the competitiveness of local products in international markets, attracting investment, and creating new jobs. However, the development of maritime infrastructure in Indonesia is not free from challenges. Financing challenges are one of the main obstacles that need to be overcome. Massive investments are required to build and maintain modern maritime infrastructure (Karimah & Yudhistira, 2020; McCawley, 2015). The government cannot bear the entire cost alone, so the involvement of the private sector through public-private partnership schemes is crucial. These schemes not only help in procuring funds, but also bring expertise and efficiency from the private sector in infrastructure management and operations.

Unfavourable regulations are also a significant challenge in the development of maritime infrastructure. Overlapping regulations, bureaucratic red tape, and legal uncertainty can hinder the development process and discourage investors. Therefore, comprehensive regulatory reform is needed to create a conducive investment climate. The government needs to simplify licensing procedures, ensure policy consistency, and increase transparency in decision-making. Environmental impacts must also be considered in any maritime infrastructure development project (Mursitama & Ying, 2021). The development of ports and shipping lanes can negatively impact marine and coastal ecosystems if not managed properly. A sustainable approach is needed to ensure that negative environmental impacts are minimised. This includes conducting comprehensive environmental impact studies, applying environmentally friendly technologies, and ensuring the involvement of local communities in the planning and implementation process.

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