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ENHANCING SUSTAINABLE ECONOMIC GROWTH IN SUB- SAHARAN AFRICA THROUGH RESILIENT MARITIME INFRASTRUCTURE

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Abstract

Maritime infrastructure is essential for international trade and economic development, especially in Sub-Saharan Africa, seaports serve as the main gateways for imports and exports. However, the region's ports are often constrained by inadequate facilities, congestion, weak intermodal connectivity, outdated equipment, and low technological adoption. These challenges are worsened by climate change impacts, weak governance, and limited investment, leading to high logistics costs and reduced trade efficiency. This paper examines the role of resilient maritime infrastructure in promoting sustainable economic growth in Sub-Saharan Africa. Resilient maritime infrastructure refers to the ability of port systems and logistics networks to anticipate, withstand, adapt to, and recover from disruptions such as environmental hazards, economic shocks, and operational failures. The study adopts a qualitative and conceptual approach, relying on secondary sources including journals, policy documents, and institutional reports. Findings indicate that resilient maritime infrastructure improves trade efficiency, lowers logistics costs, attracts foreign investment, and supports industrialization and regional integration. In contrast, weak port systems continue to limit competitiveness and sustainable economic development in the region. The paper concludes that strengthening maritime infrastructure resilience is critical for sustainable economic growth in Sub-Saharan Africa. It recommends investment in modern smart ports, climate-resilient infrastructure, improved governance, and stronger regional cooperation through public-private partnerships.

Keywords: Maritime infrastructure, resilience, sustainable growth, Sub-Saharan Africa, trade efficiency.

1. Introduction

Maritime infrastructure is a fundamental pillar of global trade and economic development, providing the essential channels through which goods, services, and resources move across international borders. On a global scale, over large percentage of traded goods by volume are transported via sea routes, highlighting the crucial role of ports, shipping systems, and logistics networks in influencing economic activity. In Sub-Saharan Africa, maritime transport is particularly vital because most countries depend heavily on seaports for international trade, including the importation of finished goods and the export of raw materials and manufactured products (Prause,2024). However, despite its strategic importance, maritime infrastructure across many Sub-Saharan African countries remains underdeveloped and inefficient. Numerous ports in the region suffer from inadequate cargo-handling facilities, limited depth for large vessels, weak transport linkages between sea and land, congestion problems, and long cargo clearance delays (Eddrgash,2022). These operational inefficiencies significantly increase transportation and logistics costs, thereby weakening the global competitiveness of African

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economies. In addition, challenges such as poor institutional coordination, inconsistent policy implementation, and insufficient funding have further limited the development of effective and resilient maritime systems. Recently, the idea of infrastructure resilience has become increasingly important in discussions on sustainable development. Maritime infrastructure resilience refers to the capacity of port systems and logistics networks to prepare for, withstand, adapt to, and recover from disruptions such as economic shocks, environmental hazards, cyber threats, and operational breakdowns (Tsoulfas, G. T. (2025). This concept is especially relevant in Sub-Saharan Africa, where coastal infrastructure is increasingly threatened by climate-related risks such as rising sea levels, flooding, coastal erosion, and extreme weather conditions. The lack of resilient maritime systems does not only affect the efficiency of trade operations but also restricts broader economic development (Koray, Kaya & Keskin, 2025). Inefficient port operations create delays within supply chains, discourage foreign investment, raise production expenses for domestic industries, and slow down efforts toward regional economic integration, including initiatives such as the African Continental Free Trade Area (AfCFTA). As a result, improving the resilience of maritime infrastructure has become essential for achieving long-term sustainable economic growth in the region. In this context, this paper investigates the extent to which resilient maritime infrastructure can contribute to sustainable economic growth in Sub-Saharan Africa. It posits that investment in modern, technologically advanced, and climate-resilient port systems can enhance trade efficiency, reduce logistics costs, and support economic diversification and industrial development. The study further emphasizes the importance of coordinated policies, regional collaboration, and public-private partnerships in ensuring sustainable progress within the maritime sector.

Sub-Saharan Africa's economic development is strongly linked to the efficiency of its maritime infrastructure, as seaports handle most of the region's international trade. However, many ports across the region remain characterized by infrastructural deficits, including outdated equipment, limited capacity, poor intermodal connectivity, congestion, and inefficient cargo handling systems (Eddrgash, 2022). These shortcomings lead to prolonged clearance times, high logistics and shipping costs, and reduced competitiveness in global trade markets. In addition, weak institutional coordination, inadequate funding, and poor maintenance culture continue to hinder the modernization and effective operation of maritime infrastructure in the region.

Sounjo & Fuanyi, (2022) emphasizes the increasing exposure of coastal infrastructure to climate-related risks such as rising sea levels, flooding, and coastal erosion has intensified concerns about the vulnerability of maritime systems in Sub-Saharan Africa. Despite the recognized importance of resilient infrastructure in sustaining economic activity during disruptions, many ports in the region lack the adaptive capacity required to withstand and recover from such shocks. This persistent gap between infrastructure demand and resilience capability raises critical questions about how maritime systems can be strengthened to support sustainable economic growth, which this study seeks to address.

The main objective of this study is to examine how resilient maritime infrastructure enhances sustainable economic growth in Sub-Saharan Africa.

Specifically, the study seeks to:

1. Assess the current state of maritime infrastructure in Sub-Saharan Africa.
2. Examine the relationship between maritime infrastructure resilience and sustainable economic growth.
3. Identify strategies for improving the resilience of maritime infrastructure in the region.

Research Questions

1. What is the current condition of maritime infrastructure in Sub-Saharan Africa?

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2. How does resilient maritime infrastructure influence sustainable economic growth in the region?
3. What strategies can be adopted to enhance maritime infrastructure resilience in Sub-Saharan Africa?

2. Literature Review

Maritime Infrastructure and Economic Development

Notteboom & Rodrigue (2022) define Maritime infrastructure comprises of ports, harbors, terminals, shipping channels, navigational aids, and logistics facilities that support the movement of goods and services through waterways. As a critical component of transport infrastructure, maritime systems facilitate international trade, improve market accessibility, and promote economic growth. According to the United Nations Conference on Trade and Development, maritime transport accounts for more than 80 percent of global merchandise trade by volume, highlighting its significance to national and regional economies.

In sub-Saharan Africa, maritime infrastructure serves as a vital gateway for international commerce and regional integration. Ayesu (2026), stress that efficient port operations contribute to lower transportation costs, improved trade competitiveness, and increased foreign direct investment, However, many countries in the region continue to experience infrastructural deficiencies, including inadequate port capacity, congestion, obsolete equipment, and weak multimodal transport connections. These challenges increase logistics costs and reduce the ability of African economies to compete effectively in global markets.

The Concept of Resilient Maritime Infrastructure

Infrastructure resilience refers to the ability of physical and institutional systems to withstand, adapt to, and recover from disruptions while maintaining their essential functions (Davis, 2021). In the maritime sector, resilience encompasses the capacity of ports and shipping networks to respond effectively to environmental, economic, technological, and operational shocks.

Resilient maritime infrastructure has become increasingly important due to growing threats posed by climate change, cybersecurity risks, supply chain disruptions, and geopolitical uncertainties. Ports that possess resilient characteristics are better equipped to maintain operational continuity during adverse events and recover quickly from disruptions. Such resilience enhances trade reliability, reduces economic losses, and supports long-term development objectives.

In Sub-Saharan Africa, strengthening resilience requires investments in modern port facilities, digital technologies, disaster risk management systems, and climate-adaptive infrastructure (Bebenimibo,2025).It also involves improving governance structures and institutional capacities to ensure effective planning and maintenance of maritime assets.

Sustainable Economic Growth

Sustainable economic growth refers to a pattern of economic expansion that meets current development needs without compromising the ability of future generations to meet their own needs. It emphasizes the efficient use of resources, environmental sustainability, social inclusion, and long-term economic stability.

The maritime sector contributes significantly to sustainable economic growth through employment generation, revenue creation, industrial development, and trade facilitation. Efficient maritime infrastructure supports supply chain performance, enhances export competitiveness, and promotes regional economic integration. Conversely, inadequate infrastructure can create bottlenecks that hinder productivity and increase the cost of doing business (Akhtaruzzaman, Md Abul Kalam,, Mohammad & KM, 2024)



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In Sub-Saharan Africa, sustainable economic growth depends largely on the ability of governments and stakeholders to develop resilient transport systems capable of supporting expanding trade volumes while adapting to changing environmental and economic conditions.

Maritime Infrastructure Resilience and Sustainable Economic Growth

The relationship between maritime infrastructure resilience and sustainable economic growth is rooted in the role of transport systems as enablers of economic activity (Okolo., Etukudoh, Ogunwole, Osho & Basiru, 2023). Resilient ports improve operational efficiency, reduce cargo delays, lower logistics costs, and enhance supply chain reliability. These outcomes contribute to increased trade volumes, greater investor confidence, and improved economic performance. Furthermore, resilient maritime infrastructure supports regional integration initiatives by facilitating the seamless movement of goods across borders, strengthens economic adaptability by reducing vulnerability to disruptions caused by natural disasters, climate-related events, and global economic shocks. As a result, countries that invest in resilient maritime systems are better positioned to achieve sustainable growth, attract investment, and enhance their participation in international trade (Barbieri, & Capovani, 2025)

The literature therefore suggests that resilient maritime infrastructure is not merely a transport asset but a strategic driver of sustainable economic growth in Sub-Saharan Africa. Investments in modernization, digitalization, climate adaptation, and effective governance are essential for maximizing the economic benefits of the maritime sector and ensuring long-term development across the region.

Theoretical Review

Infrastructure-Led Growth Theory

The infrastructure-Led Growth Theory posits that investment in infrastructure serves as a catalyst for economic growth by enhancing productivity, reducing transaction costs, and facilitating the efficient movement of goods and services. The theory is largely associated with the works of David Aschauer, who argued that public infrastructure investment significantly contributes to economic performance and national development.

According to this theory, transportation infrastructure, including ports, harbours, and logistics facilities, provides the foundation for trade expansion and industrial development. Efficient maritime infrastructure reduces shipping costs, improves supply chain efficiency, attracts foreign direct investment, and enhances regional and international trade competitiveness. In the context of Sub-Saharan Africa, the theory suggests that investments in resilient maritime infrastructure can stimulate economic activities, facilitate trade, and promote sustainable economic growth. The theory is therefore relevant to this study because it explains how improved maritime infrastructure can serve as a driver of long-term economic development.

The theory provides a basis for understanding how resilient maritime infrastructure contributes to sustainable economic growth through enhanced trade facilitation, improved logistics performance, and increased economic productivity.

Resilience Theory

Resilience Theory originated from the work of C. S. Holling in 1973 and has since been widely applied in infrastructure and development studies. The theory emphasizes the ability of systems to anticipate, withstand, adapt to, and recover from disruptions while maintaining their core functions and structures.

Applied to maritime infrastructure, the theory suggests that ports and logistics networks should possess the capacity to respond effectively to challenges such as climate change, natural disasters, operational failures, cyber threats, and economic shocks. A resilient maritime system is one that can continue functioning during adverse conditions and quickly restore operations after disruptions.



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In Sub-Saharan Africa, where maritime infrastructure is increasingly exposed to environmental and economic uncertainties, resilience is essential for ensuring uninterrupted trade and economic activities. The theory highlights the need for adaptive planning, technological innovation, risk management, and sustainable infrastructure investment.

Resilience Theory is relevant because it explains the importance of developing maritime infrastructure that can withstand and recover from disruptions, thereby ensuring continuous trade operations and supporting sustainable economic growth in Sub-Saharan Africa.

Empirical Review

Sahoo et al. (2025) examined the impact of port infrastructure development on economic growth in Senegal using a Computable General Equilibrium (CGE) model. The study found that improved port infrastructure enhanced trade efficiency, reduced logistics costs, increased export competitiveness, and contributed positively to economic growth. The authors concluded that investment in modern and resilient port infrastructure is essential for sustainable economic development. Mlambo (2021) investigated the relationship between port performance and trade competitiveness in selected African countries using secondary data analysis. The findings revealed that efficient port operations reduced trade costs, improved cargo movement, and strengthened economic integration. The study concluded that improved port infrastructure and operational efficiency are critical for promoting trade and economic growth in Africa.

3. Methodology

This study adopts a qualitative and conceptual research design. The paper relies on secondary sources of data obtained from scholarly journal articles, books, conference proceedings, policy documents, and reports from international organizations relating to maritime infrastructure, resilience, and economic growth in Sub-Saharan Africa. Content analysis was employed to examine existing literature and identify the relationship between resilient maritime infrastructure and sustainable economic growth. The study synthesizes relevant findings and perspectives to provide insights and recommendations for enhancing maritime infrastructure resilience in the region.

4. Results and Findings

The review of existing literature revealed that maritime infrastructure remains a crucial driver of trade facilitation and economic growth in sub-Saharan Africa. The findings indicate that efficient ports and maritime transport systems contribute significantly to reducing logistic cost, improving cargo movement and enhancing regional and international trade, this is in accordance with Olabosinde, Taiwo and Oludele (2025). However, many countries in the region continue to face challenges such as inadequate port facilities, congestion, poor maintenance practices and limited technological adoption, which may constrain trade efficiency and economic performance (Elferjani, 2024).

Findings from Barbieri & Capoani (2025) shows that resilient maritime infrastructure enhances the capacity of ports and logistics system to withstand and recover from disruption caused by climate changes, economic shocks and operational challenges. Investment in modern port facilities, digital technologies, climate-adaptation infrastructure and effective governance frameworks were identified as key factors for strengthening resilience.

The review also revealed that resilient maritime infrastructure promotes sustainable economic growth by attracting investment, supporting industrial development, improving supply chain and fostering regional economic integration (Sibali & Jainuddin, 2024). These findings underscore the importance of prioritizing maritime infrastructure resilience as a strategic tool for achieving long-term economic sustainability in Sub-Saharan Africa.



5. Conclusion and recommendations

This paper examined the role of resilient maritime infrastructure in enhancing sustainable economic growth in Sub-Saharan Africa. The study established that maritime infrastructure is a critical component of trade facilitation, regional integration, and economic development. However, challenges such as inadequate port facilities, congestion, weak intermodal connectivity, limited technological advancement, and climate-related vulnerabilities continue to hinder the performance of maritime systems across the region.

The findings further revealed that resilient maritime infrastructure improves trade efficiency, reduces logistics costs, strengthens supply chain reliability, and enhances the ability of ports to withstand and recover from disruptions. Consequently, investing in resilient maritime infrastructure is essential for promoting sustainable economic growth, attracting investment, and improving the competitiveness of Sub-Saharan African economies in the global marketplace (Prause, 2024). Therefore, strengthening maritime infrastructure resilience should be prioritized as a strategic pathway to long-term economic sustainability and development in the region.

Based on the findings of this study, the following recommendations are proposed:

1. Governments should increase investment in maritime infrastructure to modernize port facilities, expand capacity, and improve operational efficiency.
2. Port authorities should adopt smart port technologies such as automation, digital tracking systems, and data-driven logistics management to enhance productivity and resilience.
3. Climate-resilient infrastructure measures should be integrated into port development projects to mitigate the effects of flooding, coastal erosion, and other climate-related risks.
4. Public–private partnerships (PPPs) should be strengthened to mobilize the financial and technical resources required for sustainable maritime infrastructure development.
5. Regional cooperation among Sub-Saharan African countries should be enhanced to improve maritime connectivity, facilitate trade, and support the objectives of regional integration initiatives such as the African Continental Free Trade Area (AfCFTA).
6. Institutional and regulatory frameworks should be strengthened to promote effective governance, maintenance, and long-term sustainability of maritime infrastructure assets.

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