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The Contribution of the Maritime Sector to Economic Growth and Sustainable Welfare in Developing Countries

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A B S T R A C T

Indonesia's maritime sector holds significant potential to support national economic growth by leveraging its abundant marine resources and strategic position as an archipelagic nation. Despite these geographical advantages and rich natural resources, the sector continues to face numerous challenges, ranging from limited infrastructure to the lack of integrated maritime policies. This study explores the economic potential of Indonesia's maritime sector and analyzes the policies required to optimize its contribution to the national economy. Additionally, it examines environmental challenges, such as climate change and marine pollution, that affect the sector's sustainability. Various innovations and technologies in sustainable fisheries and the utilization of renewable marine resources are key to addressing these challenges. Integrated policy recommendations that emphasize the sustainability of the maritime sector are essential to support inclusive and sustainable economic growth

INTRODUCTION

The sea and coastal areas play a strategic role in supporting economic, social, and environmental development. The maritime sector possesses significant potential, but it is often underutilized. The concept of the blue economy offers a development approach that harnesses marine resources sustainably. Through the blue economy, coastal countries can optimize the use of maritime sectors such as shipping, ports, seafood industries, and coastal tourism to drive economic growth. However, the primary challenge in implementing this concept often lies in the absence of integrated maritime policies, limited investments in marine conservation, and the neglect of the multiplier effects that can arise from the maritime sector.

Pakistan, for instance, has a 1,050 km coastline and an Exclusive Economic Zone (EEZ) of 240,000 km², positioning it as a country with significant maritime potential in the Indian Ocean. This country possesses several key sectors that can boost its maritime economy, including shipping, port operations, seafood industries, shipbuilding, and coastal tourism. However, to fully optimize these sectors, Pakistan needs to formulate an integrated national maritime policy and improve both port infrastructure and human resource capacity in the maritime sector. Without strong policies and adequate infrastructure support, this great potential is difficult to realize.

The multiplier effect in the maritime industry also plays a crucial role in understanding the sector's economic impact. Jacobsen et al. (2022) identified direct, indirect, and induced effects that can arise from the maritime sector. According to their research, these effects tend to grow along with the geographical size and population of a region. In this context, linear regression models can be used to predict the size of the multiplier effect generated by maritime industry development across various regions. With a better understanding of these multiplier effects, governments and other stakeholders can design more effective policies to maximize the maritime sector's economic benefits.

LITERATURE REVIEW

Furthermore, the economic valuation of marine ecosystem services is crucial to ensure that the value of services provided by coastal and marine ecosystems is recognized in national development planning. Lange & Jiddawi's study in Zanzibar shows that although marine ecosystem services hold very high economic value, they are often overlooked in economic planning. Therefore, it is essential for both governments and the private sector to integrate the economic valuation of marine ecosystem services into development policies. Doing so will not only raise awareness about the importance of marine conservation but will also support more sustainable policy-making and improve long-term economic welfare, especially in developing countries.

METHODOLOGY

This study employs a qualitative-comparative approach based on literature review to explore the economic potential of the maritime sector. It draws from three main sources:

1. The case study of Pakistan by Humayun and Zafar (2021),
2. The global synthesis of multiplier effects by Jacobsen, Lester, and Helper (2022), and
3. The valuation of marine ecosystem services in Zanzibar by Lange and Jiddawi (2021).

Pakistan, with a coastline of 1,050 km and an Exclusive Economic Zone of 240,000 km², holds significant potential in maritime sectors such as shipping, port development, seafood industries, shipbuilding, and coastal tourism. However, the key challenges lie in the need for integrated maritime policy, improved infrastructure, and the development of human resource capacity to support these sectors (Humayun & Zafar, 2021).

The synthesis by Jacobsen et al. (2022) highlights that the economic impact of the maritime sector is not only direct but also includes indirect and induced effects. These multiplier effects tend to be greater in regions with larger geographic areas and populations. Their findings provide important insights for designing effective policies to maximize economic contributions from maritime sectors, with consideration for geographic and demographic factors.

Additionally, the economic valuation of marine ecosystem services by Lange and Jiddawi (2021) emphasizes the importance of recognizing marine ecosystem contributions in national economic planning. Despite their significant economic value, these services are often neglected in policy development. By integrating marine ecosystem valuation into development strategies, coastal countries can improve awareness and promote sustainability. This analysis suggests the need for holistic policy interventions that align the maritime sector with national economic policies, including enhanced maritime coordination, infrastructure development, and targeted human resource investment.

RESULTS AND DISCUSSION

1. Development of Maritime Infrastructure

Enhancing Port Infrastructure and Logistics Routes

As the world's largest archipelagic nation, Indonesia has over 17,000 islands, which presents a significant challenge in distributing goods and facilitating mobility across regions. Existing port infrastructure continues to face various constraints, such as limited capacity, outdated facilities, and congestion at major ports. Ports such as Tanjung Priok, Makassar, Surabaya, and Belawan play a crucial role in linking Indonesia to global markets and facilitating domestic trade.

Therefore, modernizing and expanding port facilities is essential to improve the capacity and efficiency of shipping and logistics sectors. Initiatives such as constructing new terminals, upgrading cargo handling facilities, and adopting digital technologies in port management can reduce vessel waiting times and speed up goods distribution. Strengthening port capacity will enhance

Indonesia's maritime competitiveness in international markets and improve logistics flow across the archipelago.

Additionally, developing integrated logistics routes between ports, airports, and inland distribution hubs is equally important. Efficient logistics networks reduce distribution costs and shorten delivery times, contributing to more balanced economic development across regions. Reliable logistics infrastructure acts as a vital connector that fosters an integrated economy at both national and international levels (Taufiq & Darmawan, 2023).

Improving Inter-Island Maritime Transportation

Given Indonesia's archipelagic nature, improving inter-island maritime connectivity is critical for equitable goods distribution and regional development. Currently, domestic sea transport is often insufficient, with under-equipped vessels unable to meet the demand for goods and passenger movement between islands.

Upgrading the domestic shipping fleet, introducing more efficient vessels, and building ports in remote or underdeveloped regions can boost local economic growth. Improved maritime transportation will help reduce regional economic disparities, enabling remote coastal areas and small islands to access national and international markets.

In turn, better transport networks will open up opportunities in sectors such as tourism, fisheries, and creative industries. Efficient maritime transport also supports the tourism sector, particularly in coastal destinations far from major cities. Investing in fast and safe passenger vessels and tourism port facilities can increase both domestic and international tourist arrivals, creating jobs and attracting investment.

2. Human Resource Development in the Maritime Sector

Maritime Education and Training

Indonesia's maritime sector relies heavily on the quality of its human resources. Structured and integrated maritime education and vocational training programs are essential. Universities with marine-related programs and vocational training institutions must adapt their curricula to meet industry needs.

Introducing new technologies in navigation, port management, and marine ecosystem monitoring through GIS systems should be incorporated into academic and vocational training. Skilled labor in areas such as sustainable fisheries, naval engineering, and maritime logistics is crucial to meet global industry standards (Wiyanto & Sulaiman, 2022).

Enhanced maritime education will not only produce competitive professionals but also contribute to research and development (R&D), raising awareness of marine sustainability and conservation.

Strengthening Local Workforce Skills

Empowering local coastal communities through relevant and demand-driven training can significantly boost the productivity of the maritime industry. Training in environmentally friendly fishing techniques, sustainable marine resource management, and seafood processing skills will expand employment opportunities.

Programs emphasizing renewable marine energy (e.g., wave and wind energy), and sustainable marine tourism, will help locals participate in emerging sectors. These initiatives foster environmental stewardship and long-term economic sustainability.

3. The Role of Government Policy in Marine Resource Management

Formulating Integrated Maritime Policies

Effective maritime governance demands coordinated policies across sectors and government levels. Improved coordination between ministries—such as Marine Affairs and Fisheries, Transportation, and Tourism—is crucial for synergy.

Creating a national maritime policy board could streamline cross-sectoral policy-making, avoiding overlap and fragmentation. This approach ensures that economic development and coastal ecosystem sustainability are balanced, while encouraging local community involvement in resource management and supervision (Rachmawati & Prasetyo, 2020).

Sustainable Marine Resource Regulations

The government must adopt regulations that enforce sustainable management of marine resources. This includes ocean conservation, reducing marine pollution, and applying sustainable fisheries principles. For instance, coral reef and fish stock management based on sustainability principles ensures long-term marine viability.

Regulations encouraging low-emission fishing and maritime transport industries will also preserve marine environmental quality. Such policies incentivize eco-friendly technologies, such as low-emission vessels and waste treatment systems for fishery and plastic waste.

4. Opportunities and Challenges in the Maritime Tourism Sector

Potential of Coastal and Marine Tourism

Indonesia is home to some of the world's most renowned marine tourism destinations, such as Bali, Raja Ampat, and Labuan Bajo, offering immense potential to attract both domestic and international tourists. The country's rich marine biodiversity enables the development of eco-friendly and sustainable coastal tourism. Developing tourism infrastructure in coastal areas with stunning natural beauty—such as accommodations, transportation, and public amenities—will support the growth of the maritime tourism sector. According to Sagala and Kurniawan (2021), marine tourism generates significant multiplier effects on the local economy by creating jobs in hospitality, transportation, and service industries.

When properly managed, the maritime tourism sector can become a major source of national revenue and help improve the welfare of coastal communities that rely on it. In addition, this sector plays an important role in raising global awareness about the importance of marine ecosystem protection.

Challenges to Sustainable Tourism Development

Despite its vast potential, maritime tourism faces serious challenges, such as coral reef damage, plastic pollution, and environmental degradation caused by over-tourism. Addressing these issues requires making sustainable tourism management a top priority. Strict policies are needed to regulate coastal

destination management, control tourist numbers, and increase awareness among local communities and tourism operators about the environmental impacts of tourism activities (UNDP, 2020). These measures are crucial to ensuring long-term environmental sustainability.

Sustainable maritime tourism also requires private sector involvement, particularly in investing in green infrastructure—such as efficient water and waste treatment systems—and the use of renewable energy in tourism facilities. With joint efforts from the government, private sector, and communities, sustainable tourism principles can be implemented effectively, allowing the sector to remain a reliable and eco-conscious source of income for Indonesia.

5. International and Regional Partnerships in the Maritime Sector

Regional Cooperation for Maritime Security

Cooperation among countries in the Southeast Asia and Indian Ocean regions is crucial for maintaining maritime security and protecting marine resources from threats such as illegal fishing, resource theft, and marine pollution. Indonesia can strengthen its role in international collaborations, such as those under ASEAN, to promote a safer and more stable maritime region.

A secure maritime environment ensures the smooth movement of goods and people across the region and reduces threats that could hinder the growth of the maritime industry (Humayun & Zafar, 2021). Moreover, international cooperation is essential to address climate change-related challenges, such as rising sea levels and the destruction of marine ecosystems due to global warming. Indonesia can also leverage international platforms to build partnerships in tackling environmental issues that affect the maritime sector and to advocate for sustainable marine development at the global level (World Bank, 2020).

Technology Transfer and Maritime Innovation

International partnerships in marine technology—including the transfer of renewable ocean energy technologies, sustainable resource management systems, and advanced marine ecosystem monitoring tools—can accelerate the development of Indonesia's maritime sector. Countries with advanced maritime technology can support Indonesia in adopting innovations such as coral reef monitoring, early warning systems for marine disasters, and other oceanographic tools to strengthen marine resource governance (OECD, 2020).

These collaborations allow Indonesia to benefit from global research and development, speeding up the implementation of cutting-edge technologies that improve the efficiency and sustainability of the sector. In the long term, such international collaboration can be a key driver in building a resilient and sustainable maritime industry in Indonesia.

6. Addressing Environmental Challenges in the Maritime Sector

Impact of Climate Change on Marine Ecosystems

Climate change is one of the most significant threats to Indonesia's marine ecosystems, affecting multiple aspects of ocean life. Rising sea levels, increasing sea surface temperatures, and changing rainfall patterns are disrupting the balance of coastal ecosystems, particularly coral reefs and seagrass beds, which serve as critical habitats for numerous marine species (UNDP, 2020).

Coral reefs are especially vulnerable. Higher sea temperatures can lead to coral bleaching, which results in the loss of biodiversity and negatively impacts

the fisheries and tourism sectors. As an archipelagic nation with immense marine biodiversity, Indonesia must prioritize mitigating the impacts of climate change on its oceans.

Efforts should include implementing sustainable marine resource management policies that focus on protecting and rehabilitating coral reefs and other coastal ecosystems. Establishing marine conservation zones and strengthening ecosystem restoration programs are vital steps. In addition, continued investment in research and development on climate adaptation technologies—such as the use of mangroves to prevent coastal erosion—must be supported (Lange & Jiddawi, 2021).

Preventing Marine Pollution and Managing Ocean Waste

Marine pollution, particularly from plastics, is a serious environmental issue that threatens the health of marine ecosystems and the livelihoods of people who depend on them. Single-use plastics and marine debris pollute Indonesia's waters, damage habitats, and endanger marine species.

As a country with an extensive coastline, Indonesia is especially vulnerable to this problem. Tackling marine pollution requires holistic policies, beginning with national-level restrictions on plastic use. Public awareness campaigns must also be strengthened to encourage responsible waste management and ocean conservation behavior (BPS, 2021).

The government should collaborate with private sectors and non-governmental organizations to introduce more efficient recycling technologies and improve waste collection systems in coastal areas. Outreach programs in fishing communities are also essential to ensure that local populations understand the negative consequences of ocean waste and actively participate in preserving their environment.

7. Innovation in the Fisheries and Marine Industry

Sustainable Fisheries Technology

Indonesia's fisheries sector requires deep innovation to enhance sustainability and efficiency. One of the key technological advancements involves environmentally friendly fishing gear, designed to minimize ecological damage such as coral reef destruction and the capture of non-target or undersized species. This approach also includes the use of data-driven technologies to monitor fish stocks and predict migration patterns, enabling more controlled and planned fishing operations. By reducing overfishing and allowing marine populations to recover, these technologies support long-term marine resource conservation (Putri & Nugroho, 2022).

Furthermore, post-harvest technologies in seafood processing, storage, and distribution must be improved to increase the added value of Indonesian fisheries products. Efficient technologies can minimize waste, improve product quality, and enhance competitiveness in international markets. Therefore, research and development in this field should be a national priority, emphasizing sustainability and global competitiveness.

Utilizing Renewable Marine Resources

As an archipelagic nation rich in natural resources, Indonesia has vast potential to develop renewable marine energy sources such as wave and wind energy. These resources remain largely untapped but could play a crucial role in supporting Indonesia's maritime sector while reducing dependency on fossil fuels and mitigating climate change. Wave and wind energy offer more stable and environmentally friendly alternatives to traditional sources. Accelerating the development and implementation of these technologies requires strong collaboration between the private sector, research institutions, and government (Wiyanto & Sulaiman, 2022).

Infrastructure investments, such as the construction of wave or offshore wind power plants, should be prioritized as part of Indonesia's effort to achieve long-term energy security and sustainability.

CONCLUSION AND RECOMMENDATION

This study highlights the vast potential of Indonesia's maritime sector in driving national economic growth. However, numerous challenges remain. The development of port infrastructure, the enhancement of human capital, and the implementation of integrated and sustainable policies are essential to maximizing the sector's contribution to the economy.

At the same time, environmental challenges—including climate change and marine pollution—require serious attention to preserve the ecosystems that sustain maritime industries. Innovation in sustainable fisheries technology and the use of renewable marine energy can significantly strengthen the long-term resilience of the sector. If these strategic priorities are addressed, Indonesia is well-positioned to become a global leader in the maritime economy, contributing not only to national welfare but also to sustainable development goals.

FUTHER STUDY

This research still has a delay, so it is necessary to conduct further research related to the topic of The Contribution of the Maritime Sector to Economic Growth and Sustainable Welfare in Developing Countries to improve this research and add insights for readers

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