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Research Article

Toward Sustainable Coastal Management Based on the Implementation of Blue Economy

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Abstract.
Coastal areas play a crucial role in maintaining economic and ecological stability, especially for countries with extensive coastlines and rich marine resources like Indonesia. These areas support various industries, including fisheries, tourism, and aquaculture, contributing significantly to local and national economies. However, the rapid exploitation of coastal resources has led to environmental degradation, biodiversity loss, and the marginalization of local communities, making sustainable management imperative. This paper discusses blue economy as a viable approach to addressing these challenges. Blue economy promotes the efficient and equitable use of marine resources, aiming to balance economic growth with environmental conservation and social welfare. It diverges from traditional economic models by emphasizing sustainability and long-term environmental health. Key strategies of blue economy include integrating innovative technologies, implementing eco-friendly practices, and encouraging community-based management to achieve a harmonious relationship between development and ecosystem conservation. This study explores the application of blue economy principles in coastal management through case studies from various Indonesian regions. It examines policy frameworks, technology adoption, and community empowerment as essential components for sustainable development. The findings indicate that integrating blue economy principles through community engagement, sustainable technology, and cross-sector collaboration can enhance the economic value of coastal areas while preserving biodiversity. Moreover, this approach improves the stability and socioeconomic conditions of local communities. The paper's implications highlight that adopting a blue economy framework for coastal management can serve as a sustainable model for other regions facing similar challenges. This model not only addresses immediate environmental and socioeconomic issues but also ensures long-term sustainability. It offers policymakers and stakeholders a strategic framework for promoting sustainable economic growth while maintaining the ecological balance of coastal areas. By implementing blue economy-based management, coastal regions can enhance their competitiveness and resilience against global environmental and economic pressures, contributing to a balanced and prosperous future for coastal communities.

Keywords: fisheries, blue economy, coastal resources, marine resources

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1. Introduction

Coastal regions significantly influence the economic and ecological stability of numerous nations, particularly those endowed with vast coastlines and abundant marine resources, such as Indonesia. These areas are vital hubs for diverse economic activities, including fisheries, tourism, and aquaculture, making substantial contributions to both regional and national economies. Despite their importance, the rapid and often unsustainable exploitation of coastal resources has resulted in severe environmental degradation, depletion of biodiversity, and increased vulnerability of local communities. This scenario highlights the urgent need for sustainable management approaches that balance economic development with environmental protection and social welfare. Blue Economy was introduced as a strategic framework to address these multifaceted challenges. Unlike traditional economic models focusing primarily on making profits, Blue Economy advocates for the sustainable and equitable use of marine resources to improve long-term environmental health and local community resilience. It emphasizes adopting innovative technologies, environmentally responsible practices, and community-oriented management strategies to balance economic development and ecosystem protection. This study delves into the practical application of blue economy principles in coastal management to promote sustainable development. It investigates various approaches, including the development of regulatory frameworks, the integration of technological advancements, and the empowerment of local communities, using case studies from several coastal regions in Indonesia. Through an in-depth analysis, the paper seeks to provide a comprehensive understanding of how implementing blue economy-based management can serve as an effective model for sustainable and competitive coastal development, contributing to broader global efforts aimed at ensuring a balanced and prosperous future for coastal communities.

Blue economy integrates food security, economic growth, and environmental sustainability (1). Components of blue economy: fisheries, tourism, marine transportation, aquaculture, renewable energy, offshore, seabed extractive activities, marine biotechnology, and bioprospecting (2). The application of a blue economy in coastal areas has an impact on national development, economic independence and national food security (3). The blue economy is advocated in the Mid-term Development Plan for the Marine Fisheries Sector from 2013 to 2025. The Blue Economy is a national development strategy that sustainably integrates economic development based on terrestrial, coastal, and marine ecosystems and requires knowledge, technology, and innovation. The role of

universities, researchers, and academics in the Blue Economy is a milestone in research and development, open learning, community-based development, sustainability, and optimization (4). Factors that determine fisheries' economic activities include fisheries production and fish prices (5).

Previous research on the blue economy in various countries shows that aquaculture is a solution to the natural resource-based blue economy (6); analysis of the concept of blue economy from an Islamic perspective with a case study of the Jumiang marine tourism area in Pamekasan, Madura, Indonesia (7), opportunities and strategies for implementing the blue economy concept through empowering coastal communities in the Sumatra region in supporting national food security (8), empowering the blue economy: from under-utilized ecosystem to sustainable industry (9), methodological approach to investigating blue economy implementation (10), pentahelix approach to blue economy zone development strategy (11). Several previous studies can serve as a basis and reference in formulating coastal area management strategies based on the blue economy.

2. Method

The qualitative method is used in this study. This method is used to answer the questions from the problem formulation of this study. Furthermore, this study also uses a data collection technique in the form of a literature review, i.e., searching and collecting data on Blue Economy from previous research journal articles. The obtained data is processed to answer the problem formulation in the study.

3. Result and Discussion

3.1. Sosio Economics

Indonesia's marine economy is primarily driven by marine capture fisheries, aquaculture, and fish processing, which contribute up to eighty-three (83%) of the total added value across six marine economic sectors. Indonesia's 2045 vision outlines an economic transformation that aims to shift from a resource-based economy to a competitive modern manufacturing and service economy. This transformation is intended to enhance value creation for the prosperity of the people. One of the key strategies for achieving this transformation is optimizing the utilization of Indonesia's marine resources to meet

human needs sustainably (12). Developing strategic plans for advancing these sectors requires a comprehensive understanding of the current conditions of each sector within the blue economy framework. Several key sectors include:

1) Aquaculture

Aquaculture is essential to Indonesia's blue economy framework as a major contributor to the sustainable use of marine resources. As the second-largest producer of aquaculture worldwide, Indonesia offers a variety of aquaculture products, including neon tetra ornamental fish, shrimp, seaweed, tilapia, and catfish. (13), they can promote job creation, economic expansion, and food security. Its long coastline, ideal sea conditions, and export-friendly government laws contribute to the industry's explosive growth. Nevertheless, despite its potential, the industry confronts obstacles such as better disease prevention, resource management, sustainable feeding practices, climate change, a lack of funding, and tools for gauging the blue economy's performance. (14). Long-term growth and alignment with the blue economy's objectives of enhancing livelihoods and protecting marine environments depend on addressing these problems. This emphasizes the necessity of innovation and strategic planning to support Indonesia's aquaculture industry in a sustainable economic environment. An economic strategy that balances marine and terrestrial ecosystems could be considered, as well as action plans to reduce risks, threats, and hazards. (14) ; investments to lessen the use of fossil fuels are examples of climate change mitigation in the aquaculture industry; thus, the carbon footprint of fisheries and aquaculture can improve economic performance and aid in climate change mitigation. The detrimental effects on biodiversity will be lessened by reducing fishing efforts and using non-destructive fishing methods. For marine resources to be used sustainably and fairly, it is essential to strengthen regional fisheries bodies, national fisheries management agencies, organizations for the fishing community and fish workers, and private sector associations. (15).

2) Marine capture fisheries

3.2. Marine and coastal tourism

Marine tourism is one of the things that is emphasized in the implementation of the blue economy. Some of the applications of the blue economy in the field of marine tourism in Indonesia include:

1) Makasar

The assessment of implementing the Blue Economy Framework is based on four main elements: ecological cleanliness (zero waste), community participation, economic spillovers, and creativity and flexibility. The community-managed coastal tourism sector in Makassar City has the potential to make the region a center for the development of the Blue Economy, thereby improving the standard of living of coastal communities. The spread of the concept of a Blue Economy in the coastal tourism sector in Makassar City deepened the understanding of participants. Understanding the principles of sustainable management of coastal and marine resources is essential to address the challenges posed by environmental degradation and climate change. (16).

2) Kampung Mandar Banyuwangi

The implementation of the blue economy concept in tourism development based on local wisdom in Plengsengan Beach, Kampung Mandar, Banyuwangi, is achieved through the promotion of seafood culinary tourism and the establishment of the Kampung Mandar Fish Market as a visitor destination. The area has been designed to offer a unique coastal experience where tourists can enjoy grilled fish while taking in the scenic view. Additionally, Kampung Mandar hosts various festivals, such as the Village Mural Festival, Banyuwangi Art Week, and Mandar Food Festival, which the regional government organizes to attract more visitors. Efforts have been made to enhance infrastructure by providing selfie spots and involving the community, such as local tourism awareness groups/Kelompok Sadar Wisata (POKDARWIS), in coastal area management to ensure long-term sustainability and prevent environmental degradation. Future initiatives include establishing a fresh fish auction centre, considering that most residents are fishermen, based on survey data and observations. The sustainable implementation of the blue economy policy aligns with Article 2 and Article 3 of the Republic of Indonesia Law No. 32 of 2014 on Marine Affairs, Article 3 Points A, 4, and 5, and Article 23 of Law No. 1 of 2014 on Amendments to Law No. 27 of 2007 on Coastal and Small Islands Management, as well as Article 2 Point K of Law No. 45 of 2009 on Amendments to Law No. 31 of 2004 on Fisheries (17).

3) Kulonprogo, Jogjakarta

The blue economy emphasizes resource efficiency by adopting a zero-waste system, where production waste is reused as raw materials or energy for subsequent processes, promoting sustainable and clean production. It also focuses on social inclusiveness by creating equitable employment opportunities, especially for disadvantaged groups. Additionally, it supports innovation and adaptation based on natural principles and aims

to generate broad economic benefits that are less dependent on a single product. In Kulonprogo, although the blue economy is not widely known, the government has empowered communities through fish processing training for fishermen and integrated "mina padi" farming, which combines rice and fish cultivation. This system enhances agricultural productivity and helps prevent the conversion of food-producing land to non-agricultural uses (18).

4) Seribu Islands, Jakarta

Focusing on managing the blue economy potential, where marine tourism represents the largest industry, we developed a smart island model tailored for the Seribu Islands. The model integrates the management of destination attributes (attractions, amenities, accessibility) and blue economy resources to create a smart destination supported by blockchain technology for transparency and efficiency. Key elements such as smart society, environment, living, administration, mobility, and economy are essential for building a smart island. Adopting blockchain technology and improving digital literacy can add significant value, attract tourists, and enhance the island's uniqueness. We highlight the impact of digital literacy and the blue economy on blockchain technology and the development of smart destinations and suggest further research on sustainable tourism concepts such as biomimetics, conservation, and marine cooperation (19).

3.3. Research and Development and Education

1) Information Technology

Big Data, the Internet of Things (IoT), and mechanization have become crucial components in enhancing port efficiency and productivity. The implementation of Big Data in port operations provides valuable insights from the complex data generated by various systems, enabling stakeholders to make more timely and accurate decisions. IoT allows the integration of sensors in port equipment, containers, and vehicles, facilitating real-time monitoring and management to prevent issues and improve safety. Mechanization, through the use of automation and robotics, further optimizes loading and storage processes. In Indonesia, the adoption of these technologies enhances the competitiveness of its ports on a global scale, improving capacity, reducing waiting times, and minimizing human errors. Additionally, Big Data technology is playing an increasingly vital role in the fisheries sector, assisting in resource monitoring and sustainable development (20).

2) Education/College

Sidoarjo Marine and Fisheries Polytechnic is a clear illustration of applying the blue economy within the Ministry of Marine Affairs and Fisheries educational unit. This polytechnic has adopted a system for cultivating fish and shrimp through aquaculture activities by leveraging artificial mangrove forests at the Pulokerto field practice station in Pasuruan, East Java, which the Mangrove Study Center manages (21)

3.4. Coastal Management

Fisheries and marine development strategies must be structured and systematized to create synergy among stakeholders and the government. To improve the structure of fisheries and marine development, all sectors need to be strengthened, for example, by establishing monetary and fiscal policies that promote fisheries and marine development and general ecosystem conservation for the sustainability of the blue economy, which will later strengthen the resilience of the natural environment; and investing in the real sector to secure resources, improve performance and development, and maintain foreign exchange stocks across the province (12). Examples of implementation of blue economy strategies in some Indonesian cities include:

1) Sabang City, Aceh Indonesia

Sabang City has diverse marine potential that can be developed by applying the concept of a blue economy. Fishing and underwater beauty are catalysts to improve the welfare of coastal communities. Agencies such as the Aceh Provincial Marine and Fisheries Department and Panglima Raot support implementing the blue economy by preventing overfishing and implementing marine conservation to maintain environmental sustainability. Customary regulations on the use of environmentally friendly fishing gear help maintain the sustainability of fishing resources. Furthermore, marine protected areas provide opportunities for local communities to develop marine tourism destinations that contribute to improving public welfare. (22).

2) Community empowerment in Sumatra

Community empowerment can be achieved by implementing appropriate policies that consider the potential of fisheries resources and market-oriented community interests. The development of the National Food Reserve should prioritize the Blue Economy sector. As a region rich in fisheries resources, Sumatra has the potential to lead the adoption of the Blue Economy. Collaboration among stakeholders across Sumatra can be consolidated to guide, supervise and mobilize coastal communities to promote their

well-being. The welfare of these coastal communities plays a key role in ensuring the sustainability of the Blue Economy program that supports the fisheries sector in establishing the national food reserve (8).

Integrating the Blue Economy into coastal management is essential to promote sustainable development and ensure long-term environmental stewardship. By focusing on the sustainable use of marine resources, the Blue Economy promotes economic growth and strengthens the resilience of coastal ecosystems and communities. Effective coastal management based on Blue Economy principles can reduce the negative impacts of overfishing and environmental degradation while ensuring food security and economic self-sufficiency. Cooperation among stakeholders and adopting innovative technologies are key to achieving these goals. As demonstrated in various regions, including Indonesia, the Blue Economy offers a viable path to balanced, sustainable coastal development that benefits both the environment and society.

4. Conclusion

Implementing the Blue Economy concept in coastal management is crucial to promote sustainable development and maintain environmental integrity. Through the sustainable use of marine resources, Blue Economy can promote economic growth, strengthen the resilience of coastal ecosystems, and improve the welfare of local communities. Effective coastal management through collaboration between governments, communities, and the private sector and implementing innovative technologies are key to the successful implementation of Blue Economy. Examples from different parts of Indonesia show that this strategy can promote efficient and sustainable use of marine resources. Therefore, Blue Economy can be a suitable model for achieving future competitive and sustainable coastal development.

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References

[1] Sari DA, Muslimah S. Blue economy policy for sustainable fisheries in Indonesia. IOP Conference Series: Earth and Environmental Science 423. IOP Publishing; 2020. pp. 1–8.

[2] The World Bank. The Potential of the Blue Economy. The Potential of the Blue Economy. 2017.

[3] Prayuda R, Sary DV. Strategi Indonesia dalam Implementasi Konsep Blue Economy Terhadap Pemberdayaan Masyarakat Pesisir di Era Masyarakat Ekonomi ASEAN/Indonesia's Strategy for Implementing the Blue Economy Concept for Coastal Community Empowerment in the ASEAN Economic Commu. Indones J Int Relations. 2019;3(2):46–64.

[4] Saefuddin A. Perguruan Tinggi, Peran Pemerintah dan Pengembangan Blue Economy/College, Government Role, and Blue Economy Development. Risal Kebijak Pertan dan Lingkungan/Agricultural Environ Policy Br. 2014;1(3):135–42.

[5] Bhattacharya P, Dash AK. Determinants of blue economy in Asia-Pacific island countries: A study of tourism and fisheries sectors. Ocean Coast Manage. 2021;211(105774):1–10.

[6] Hughes AD. Defining Nature-Based Solutions Within the Blue Economy: The Example of Aquaculture. Front Mar Sci. 2021;8(July):711443.

[7] Fahrurrozi F. Analysis Concept of The Blue Economy Islamic Perspective (Case studi Jumiang as Marine Tourism in Pamekasan). Perisai Islam Bank Financ J. 2020;4(1):17.

[8] Adiprayoga SN, Samiaji J. Opportunities and Strategies for the Blue Economy through the Empowerment of Sumatera Coastal Communities in Supporting the Realization of the National Food Security. IOP Conference Series. Earth and Environmental Science; 2021. https://doi.org/10.1088/1755-1315/934/1/012039.

[9] Choudhary P, G VS, Khade M, Savant S, Musale A, G RK, et al. Empowering blue economy: from underrated ecosystem to sustainable industry [Internet]. J Environ Manage. 2021 Aug;291(April):112697.

[10] Wuwung L, Croft F, Benzaken D, Azmi K, Goodman C, Rambourg C, et al. Global blue economy governance – A methodological approach to investigating blue economy implementation. Front Mar Sci. 2022;9(November):1–17.

[11] Kiak NT, Ratu M. Blue Economy Zone Development Strategy Using the Pentahelix Approach. Int J Multicult Multireligious Underst [Internet]. 2023;10:241–63. Available from: http://ijmmu.comhttp//dx.doi.org/https://doi.org/10.18415/ijmmu.v10i4.4461.

[12] Hakim MF. Blue Economy daerah Pesisir Berbasis Kelautan dan Perikanan. Econ Dev Anal J. 2013;2(4):446–55.

[13] Setiyowati H, Nugroho M, Halik A. Developing a Blue Economy in Depok West Java, Indonesia: Opportunities and Challenges of Neon Tetra Fish Cultivation. Sustainability (Basel). 2022;14(20):13028.

[14] Miassi YE, Dossa KF. Opportunities and risks of the blue economy for innovative companies in the sustainable aquaculture sector. J Mar Stud. 2024;1(2):1–5.

[15] Kathijotes N. Keynote: Blue Economy - Environmental and Behavioural Aspects Towards Sustainable Coastal Development [Internet]. Procedia Soc Behav Sci. 2013;101:7–13.

[16] Rachman T, Paroka D, Zubair M, Alie M, Purnama B. Sosialisasi Konsep Blue Economy dalam Pembangunan Kawasan Wisata Pesisir Kota Makassar [Teknologi Terap Untuk Pengabdi Masyarakat]. J Tepat. 2010;2024(7):9–18.

[17] Tegar D, Saut Gurning RO. Development of Marine and Coastal Tourism Based on Blue Economy. Int J Mar Eng Innov Res. 2018;2(2). https://doi.org/10.12962/j25481479.v2i2.3650.

[18] Wiratma HD, Nurgiyanti T. Pembangunan Pariwisata Kulon Progo Melalui Konsep Green Economy dan Blue Economy. Nation State J Int Stud. 2019;2(2):161–72.

[19] Pranita D, Sarjana S, Musthofa BM, Kusumastuti H, Rasul MS. Blockchain Technology to Enhance Integrated Blue Economy: A Case Study in Strengthening Sustainable Tourism on Smart Islands. Sustainability (Basel). 2023;15(6):5342.

[20] Dian A, Adnan I, Hasana S, Assidiq M. Implementasi Konsep Blue Economy di Indonesia dengan Memanfaatkan Teknologi Big Data. Sensistek. 2023;6(2):134–40.

[21] Putri VY, Janice SN, Ramdhan Azzahra T. Seeking the Opportunities and Challenges of Blue Economy Sustainable Development: A Case Study of Sidoarjo, Indonesia. Proceedings. 2022;83(16):1–6.

[22] Resta Setyawati L, Danur Cahya D, Dian Novarianti A, Djoko Said B, Keamanan Nasional F, Pertahanan UR, et al. Implementasi Konsep Ekonomi Biru Dalam Pembangunan Masyarakat Pesisir Di Kota Sabang. J Educ Dev. 2021;9(4):178–85.