THE ROLE OF THE BLUE ECONOMY IN PROMOTING SUSTAINABLE MARINE TOURISM DEVELOPMENT IN SENDANG BIRU, MALANG REGENCY

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ABSTRACT

This study examines the role of the Blue Economy in promoting sustainable marine tourism development in Sendang Biru, Malang Regency. The Blue Economy concept emphasizes the sustainable utilization of marine and coastal resources to support economic growth while preserving environmental balance and improving community welfare. Using a quantitative approach with regression analysis, this research explores the relationship between Blue Economy implementation and regional economic resilience. The results reveal that the Blue Economy variable has a positive and significant coefficient, indicating that the development of marine tourism based on Blue Economy principles contributes substantially to strengthening local economic sustainability. This finding suggests that integrating environmental preservation, community empowerment, and marine resource management can enhance tourism competitiveness and create long-term economic benefits for local communities. The study highlights the importance of policy support and collaborative efforts among stakeholders to optimize the Blue Economy as a foundation for sustainable coastal tourism and inclusive development in Malang Regency.

Keyword : Blue Economy; Sustainable Tourism

INTRODUCTION

The concept of the Blue Economy has emerged as a transformative approach to achieving sustainable use of marine and coastal resources while balancing economic growth, social inclusion, and environmental protection. In the Indonesian context, this concept has been positioned as a key instrument for national economic transformation, particularly in maritime regions that depend heavily on ocean-based livelihoods (Pane et al., 2021). The Blue Economy framework emphasizes the integration of marine industries such as fisheries, tourism, and renewable energy with principles of sustainability and inclusivity to ensure long-term resilience (Pauli, 2018; Surya Bakti & Hakim, 2024). According to Pane et al. (2021), the successful implementation of the Blue Economy relies on innovation and ecological awareness, making marine resources a strategic driver of national prosperity.

Sendang Biru, located in Malang Regency, East Java, is one of the most prominent marine tourism destinations that illustrates the potential of the Blue Economy in a local context. The area functions as a major fishing port and gateway to the Sempu Island Nature Reserve, offering both economic opportunities and ecological significance. However, like many coastal regions in Indonesia, Sendang Biru faces persistent challenges, including environmental degradation, overexploitation of marine resources, and inadequate tourism management (Sujantoko et al., 2023; Hidayah & Rosyadi, 2019). As noted by Rudianto and Bengen (2020), the destruction of mangrove and coastal ecosystems not only disrupts biodiversity but also weakens the carbon

absorption capacity of marine environments—an essential component for climate resilience and community sustainability.

The application of Blue Economy principles in marine tourism development is expected to provide sustainable solutions by promoting harmony between economic activities and environmental preservation. This approach includes the diversification of livelihoods, the strengthening of local community capacity, and the promotion of eco-friendly tourism initiatives (Febryaningrum et al., 2024; Pratama & Firmansyah, 2022). Mira et al. (2014) highlight that integrating Blue Economy values into community-based management can enhance social resilience, create equitable economic benefits, and preserve natural resources. Similarly, Nansi et al. (2024) emphasize that post-pandemic economic recovery in Indonesia must focus on sustainable marine sectors that contribute to both economic revitalization and ecological stability.

Moreover, the Blue Economy aligns closely with global and national sustainable development frameworks, particularly the Sustainable Development Goals (SDGs), including SDG 8 on Decent Work and Economic Growth, SDG 13 on Climate Action, and SDG 14 on Life Below Water (Alifa et al., 2024; Clarke et al., 2022; Arifin et al., 2023). The Penta Helix model — which involves collaboration between government, academia, private sector, community, and media — plays a central role in implementing sustainable marine policies effectively (Alfarizi, 2024). Evidence from other Indonesian coastal regions such as the Riau Islands and Surabaya shows that Blue Economy-oriented governance and eco-tourism management can significantly increase local welfare and environmental awareness (Aprilia et al., 2022; Rachmadiarazaq et al., 2023).

Therefore, this study seeks to analyze the role of the Blue Economy in promoting sustainable marine tourism development in Sendang Biru, Malang Regency. Through regression analysis, this research aims to identify how Blue Economy variables influence regional economic resilience and community welfare. Previous studies have shown that sustainable marine tourism can improve local economies by creating employment, encouraging innovation, and enhancing social inclusion (Poti & Hendrayady, 2020; Pranatal et al., 2023). The findings are expected to contribute valuable insights for policymakers and stakeholders to strengthen the implementation of Blue Economy principles in coastal management, ensuring that economic growth in Sendang Biru occurs in harmony with ecological preservation and community empowerment (Pane et al., 2021; Surya Bakti & Hakim, 2024).

The Blue Economy concept represents a strategic paradigm in sustainable economic development that emphasizes the responsible and efficient utilization of marine and coastal resources. This approach is not only intended to accelerate economic growth but also to enhance the overall welfare of society through inclusive and environmentally conscious practices (Surya Bakti & Hakim, 2024). The core principle of this concept lies in ensuring that the economic benefits derived from marine resources are distributed equitably across all layers of society, while simultaneously maintaining a deep concern for ecological preservation as an inseparable element of long-term prosperity. According to Pane et al. (2021), the Blue Economy framework plays a transformative role in Indonesia's economic structure, promoting marine-based industries that integrate social equity, environmental sustainability, and innovation as key pillars of development. Furthermore, as emphasized by Pauli (2018), maintaining the balance of marine ecosystems ensures the continuity of natural productivity, enabling future

generations to derive sustainable benefits from ocean resources without compromising environmental integrity.

In practice, the Blue Economy serves as a catalyst for economic diversification, particularly for developing nations that have traditionally relied on land-based industries such as agriculture and mining. Through innovations in aquaculture, marine biotechnology, and eco-tourism, coastal regions gain new opportunities to strengthen food security, reduce dependency on imports, and mitigate global market fluctuations (Nansi et al., 2024). The sustainable exploitation of marine resources also contributes to the creation of resilient livelihoods that support local communities, thereby enhancing their adaptive capacity in the face of economic and environmental uncertainty. According to Febryaningrum et al. (2024), sustainable marine tourism based on Blue Economy principles has become a key driver of local economic resilience, especially in coastal regions such as Sendang Biru, Malang Regency, where the tourism and fisheries sectors form the backbone of community welfare.

Moreover, the Blue Economy significantly contributes to employment generation in various sectors including fisheries, maritime logistics, and coastal tourism (Mira et al., 2014). These employment opportunities not only provide direct income for local populations but also stimulate regional economic growth by strengthening supply chains and encouraging innovation in marine industries. Importantly, the Blue Economy does not limit its objectives to economic expansion alone; it also prioritizes environmental stewardship. As Rudianto and Bengen (2020) argue, the preservation of mangrove ecosystems and coastal biodiversity serves as the foundation for sustaining marine life, mitigating carbon emissions, and enhancing the planet's resilience against climate change. By maintaining the ecological equilibrium of the oceans, the Blue Economy reinforces the interconnectedness of environmental health, social welfare, and long-term economic stability.

In the broader context, the Blue Economy has also emerged as a key instrument for climate change mitigation and adaptation. Through the promotion of renewable marine energy, sustainable coastal management, and carbon-sequestering ecosystems such as mangroves and seagrasses, it provides tangible solutions to reduce greenhouse gas emissions and enhance community resilience to climate-related hazards (Clarke et al., 2022). As highlighted by Alifa et al. (2024), this approach integrates economic, environmental, and social dimensions into a unified framework that supports global commitments to the Sustainable Development Goals (SDGs), particularly SDG 13 (Climate Action) and SDG 14 (Life Below Water). Thus, the Blue Economy stands not only as a driver of economic transformation but also as a comprehensive solution for addressing global sustainability challenges through integrated marine governance (Wuwung et al., 2022).

However, the implementation of the Blue Economy faces several critical challenges that must be addressed to ensure its success and inclusivity. One major issue lies in the limited human resource capacity and technical expertise within many developing regions. As noted by Alifa et al. (2024), the lack of specialized education and vocational training infrastructure significantly hampers the effective application of Blue Economy principles, particularly in sectors that demand advanced marine science, policy innovation, and sustainable business management. This capacity gap is further compounded by insufficient public awareness and limited access to knowledge transfer mechanisms that could support the development of marine-based industries.

Another prominent obstacle is the low level of investment in Blue Economy sectors. Compared to other economic fields, marine-related industries still receive minimal capital support due to high investment risks, political uncertainty, and inadequate understanding of long-term benefits (Febryaningrum et al., 2024). As a result, innovation and technological advancement in marine resource utilization often progress slowly, limiting the potential for large-scale transformation. Furthermore, Mira et al. (2014) emphasize that the absence of a clear and consistent regulatory framework also poses significant barriers. Without transparent and supportive policies, industry players are reluctant to engage in sustainable practices, as regulatory ambiguity increases operational uncertainty and business risk.

Addressing these challenges requires a collaborative governance model involving the government, private sector, academia, and local communities — an approach commonly referred to as the Penta Helix framework (Alfarizi, 2024). By fostering synergy among these stakeholders, it becomes possible to strengthen institutional capacity, attract responsible investment, and enhance innovation ecosystems. Additionally, as highlighted by Pane et al. (2021) and Surya Bakti & Hakim (2024), developing a sustainable Blue Economy must be accompanied by education reform, targeted investment in marine research, and community empowerment programs that enable inclusive participation in resource management. In this way, the Blue Economy can evolve into a cornerstone of sustainable national development, ensuring that marine-based prosperity is achieved in harmony with ecological preservation and intergenerational equity.

Reseach Methodology

This study adopts a quantitative explanatory approach designed to analyze the influence of the Blue Economy on the sustainable development of marine tourism in Sendang Biru, Malang Regency. The quantitative method was chosen to allow a systematic, objective, and measurable examination of the relationship between variables using statistical tools. The analysis process employed the Statistical Package for the Social Sciences (SPSS) software to test data validity, reliability, and regression relationships between variables.

The research was conducted in Sendang Biru, one of the main marine tourism areas in Malang Regency that has considerable potential for developing a Blue Economy model. The area is known for its fishing activities, ecotourism, and marine biodiversity, making it an appropriate location to study how sustainable economic principles can be applied to marine-based industries. The population of this study consists of local fishermen, tourism business owners, residents engaged in marine-related livelihoods, and local government officials who play a role in managing marine tourism. To ensure data representativeness, the research used a purposive sampling technique, selecting 100 respondents who are directly involved in the development of marine tourism and the implementation of Blue Economy principles in the region.

Data collection was conducted through questionnaires and documentation. Primary data were obtained using structured questionnaires containing statements measured on a Likert scale (1–5) to assess respondents' perceptions of the Blue Economy's role and its impact on sustainable tourism. Secondary data were sourced from government publications, regional development reports, Badan Pusat Statistik (BPS) data, and relevant academic journals discussing marine tourism and environmental economics.

The combination of primary and secondary data provided a comprehensive understanding of both local practices and broader economic trends.

The variables used in this study include the Blue Economy as the independent variable and Sustainable Marine Tourism Development as the dependent variable. The Blue Economy variable was measured through indicators such as resource efficiency, sustainable fisheries management, marine ecosystem preservation, waste reduction, and inclusive economic growth. Meanwhile, the sustainable tourism variable covered indicators such as environmental protection, community participation, income distribution, and infrastructure improvement. Each indicator was operationalized into measurable items, allowing for a detailed analysis of the relationship between both variables.

The data analysis technique utilized SPSS version 25, involving several stages to ensure the robustness of the findings. Descriptive statistical analysis was first conducted to describe respondent characteristics and variable tendencies. Next, validity and reliability tests using Pearson's correlation and Cronbach's Alpha were carried out to confirm the accuracy and consistency of the research instrument. Before conducting regression analysis, classical assumption tests—including normality, multicollinearity, and heteroscedasticity tests—were performed to ensure that the regression model met statistical requirements. The core of the analysis involved multiple linear regression to examine the effect of the Blue Economy on sustainable marine tourism development. Furthermore, the coefficient of determination (R^2) was used to determine the proportion of variation in sustainable tourism that can be explained by the Blue Economy, while t-tests and F-tests were used to assess the significance of the relationship between the variables.

All research activities were conducted following ethical standards. Respondents participated voluntarily and were informed about the research objectives. The confidentiality of personal data was strictly maintained. Ethical approval for conducting the study was obtained from the academic institution overseeing this research project. Through this methodological approach, the study aims to provide empirical evidence regarding how the application of Blue Economy principles can strengthen the sustainability of marine tourism in Sendang Biru and contribute to the local community's economic resilience.

RESULT AND DISCUSSION

1. The results of interviews conducted in Sendang Biru, Malang Regency, revealed that local communities generally understand the ecological and economic importance of marine resources, especially within the framework of the **Blue Economy**. Respondents, including fishermen, tourism business owners, and local leaders, stated that marine ecosystems—such as coral reefs, seaweed, and mangroves—play a crucial role in maintaining coastal stability, supporting biodiversity, and providing livelihoods. Many respondents highlighted the direct benefits of sustainable marine resource management, such as increasing fish catch, supporting marine tourism, and promoting the production of marine-based products. However, some still have limited understanding of the long-term sustainability aspect of the Blue Economy, indicating the need for continued education and awareness programs. The community also recognizes that preserving the marine environment is key to ensuring a balance between ecological sustainability and economic welfare.

2. In terms of implementation, the local government of Malang Regency, together with the Sendang Biru community, has developed several strategies aligned with the principles of the Blue Economy. These include **marine conservation efforts, the promotion of eco-friendly tourism, and community-based economic empowerment programs**. The government has initiated rehabilitation and replanting of coastal vegetation, supported sustainable fishing practices, and encouraged the development of marine ecotourism to diversify income sources. Community participation is actively fostered through training and the establishment of small enterprises related to marine tourism and local products. Moreover, policies that promote responsible resource management and environmental protection have been integrated into regional planning. These initiatives reflect a growing awareness of the importance of integrating environmental preservation with economic development, ensuring that the marine potential of Sendang Biru continues to contribute to sustainable livelihoods while maintaining ecological balance.

Regression Analysis

Tabel 1. Simple Linear Regression Analysis

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig
	B	Std. Error	Beta		
(Constant)	15,110	1,386		4,930	0,001
Blue Economy	0,195	0,140	0,277	0,987	0,000

Source: Processed Primary Data

From the results of table 1, a simple linear regression equation is obtained, including: Y = 15.110 + 0.195.X1+e

1. The coefficient of the regression equation is positive. This shows that the blue economy variable remains or is equal to zero. Meanwhile, the beta value = 15.110 indicates that there is no blur economy variable, so economic sustainability is worth 15.110.
2. The blue economy coefficient is 0.095, this shows that there is a positive relationship between the blue economy and economic sustainability. The positive sign shows that if the blue economy variable increases by one unit, the level of food security will increase by 0.195 or 19.5% assuming the other variables are constant.

This shows the significant contribution of the blue economy sector in strengthening economic sustainability

Tabel 2. Hasil Uji Koefisien Determinasi

Model	R	R Square	Adjusted R Square	Std. Error of the estimate
1	0,535	0,350	0,317	1,782467

Source: Processed Primary Data,

From table 7, the R2 value or coefficient of determination is 0.350. This means that the percentage value of the influence of the blue economy on economic sustainability is 0.735 or 63.50%, the remaining 36.50% shows that other factors also have an important

impact. These factors may include fiscal and monetary policies, political and social conditions, technological developments, as well as external conditions such as climate change and economic dynamics. This underscores the complexity of factors influencing economic sustainability.

Tabel 3. T Test

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig
	B	Std. Error	Beta		
(Constant)	15,110	1,386		4,930	0,001
Blue Economy	0,195	0,140	0,277	0,987	0,000

Source: Processed Primary Data

In table 3, it can be seen that from the simple linear regression analysis test, the regression coefficient value for the blue economy variable is 0.195, the direction given by the green economy variable is positive, so it can be interpreted that the influence given by the green economy variable on economic sustainability is positive. Then the significant value of the blue economy variable is 0.000, which means it is smaller than 0.05. This shows that the results of this test are significant. The results obtained from this test are that there is a partial influence of the blue economy variable on economic sustainability.

Discussion

The results of the regression analysis indicate that the Blue Economy variable exerts a positive and significant influence on economic sustainability in Sendang Biru, Malang Regency. The regression coefficient of 0.195 signifies that every one-unit increase in Blue Economy practices contributes to an increase of 0.195 units in economic sustainability. This positive direction indicates that the implementation of Blue Economy principles—such as sustainable marine resource management, environmentally friendly tourism, and inclusive coastal community development—plays a vital role in strengthening the local economy. Moreover, the significance value (Sig = 0.000), which is far below the 0.05 threshold, confirms that the relationship is statistically significant and that the Blue Economy has a measurable and real impact on the economic conditions of the Sendang Biru coastal community.

These findings are consistent with research conducted by Voyer et al. (2018) and Smith-Godfrey (2016), who found that the Blue Economy approach provides an integrated framework that links economic development with environmental protection and social welfare. In the context of Sendang Biru, the application of Blue Economy principles is reflected through the development of marine tourism, the expansion of sustainable fisheries, and the empowerment of small-scale coastal businesses. This integrated model helps the local community diversify their sources of income beyond traditional fishing activities, reducing vulnerability to seasonal and ecological fluctuations. For instance, fishermen have started engaging in eco-tourism activities, such as guided snorkeling tours, boat rentals, and seafood-based culinary tourism, which not only increase income but also foster environmental awareness among visitors and residents alike.

The significant and positive effect of the Blue Economy variable also underlines the importance of good governance and local policy intervention in achieving sustainable outcomes. The Malang Regency Government, through its marine and fisheries programs, has implemented initiatives aimed at promoting responsible resource management, such as mangrove reforestation, coral reef protection, and the establishment of marine conservation zones. These initiatives are supported by training programs designed to build community capacity and encourage environmentally friendly business practices. The collaboration between the government, local communities, and private sectors has become a key factor in transforming Sendang Biru into a model of sustainable coastal development that balances economic growth with ecological integrity.

Furthermore, the findings also emphasize that the Blue Economy contributes to achieving several Sustainable Development Goals (SDGs), particularly SDG 8 (Decent Work and Economic Growth), SDG 13 (Climate Action), and SDG 14 (Life Below Water). By promoting inclusive economic activities that depend on healthy marine ecosystems, the Blue Economy ensures that economic benefits are distributed equitably among community members while maintaining environmental sustainability. In this context, Sendang Biru demonstrates how coastal tourism development—when managed under Blue Economy principles—can stimulate local entrepreneurship, increase employment opportunities, and support long-term ecological resilience.

In conclusion, the results of the regression analysis affirm that the Blue Economy is a strategic driver of sustainable economic transformation in coastal regions such as Sendang Biru. The strong and positive relationship between Blue Economy practices and economic sustainability reflects the effectiveness of integrating ecological preservation with economic policy. Therefore, continued investment in environmental conservation, marine-based innovation, and human resource development is essential to ensure that the Blue Economy remains a sustainable pathway for improving livelihoods, enhancing economic resilience, and preserving marine ecosystems for future generations.

Conclusion

Based on the results of the regression analysis, it can be concluded that the Blue Economy has a positive and significant effect on economic sustainability in Sendang Biru, Malang Regency. The regression coefficient value of 0.195 with a significance level of 0.000 ($p < 0.05$) indicates that the application of Blue Economy principles contributes meaningfully to strengthening local economic resilience. This means that the better the implementation of sustainable marine resource management, the higher the level of economic sustainability achieved by the coastal community.

The findings of this study reinforce the understanding that the Blue Economy is not only an economic development concept but also a strategic approach that integrates environmental, social, and economic dimensions. In Sendang Biru, the implementation of Blue Economy practices—such as sustainable fisheries, mangrove ecosystem rehabilitation, and eco-tourism development—has proven to support community welfare while preserving marine resources. The empowerment of local communities through training, innovation, and policy support has further strengthened the capacity of coastal residents to adapt to changing environmental and economic conditions.

Furthermore, this study highlights that the success of the Blue Economy in promoting sustainable development depends on collaborative governance involving

local governments, the private sector, and community participation. Sustainable management of marine resources supported by effective policy frameworks can create new economic opportunities while ensuring long-term environmental protection.

In conclusion, the Blue Economy plays a crucial role in promoting sustainable marine tourism development and ensuring the balance between economic growth and ecological preservation. The case of Sendang Biru demonstrates that a well-implemented Blue Economy strategy can enhance local livelihoods, stimulate inclusive growth, and safeguard marine ecosystems. Therefore, strengthening the Blue Economy framework through education, innovation, and integrated policy support is essential to achieve a sustainable and resilient coastal economy in Malang Regency and beyond.

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