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RESEARCH ARTICLE

Synergy Of Ecological Awareness And Blue Economy Implementation In Achieving Fisheries Sustainability In Indramayu

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Abstract
This study explores the synergy between ecological awareness and the implementation of blue economy principles in achieving fisheries sustainability in Indramayu Regency, Indonesia. The coastal area of Indramayu is known for its abundant fisheries resources but faces various threats such as overfishing, marine pollution, and coastal environmental degradation. Using a descriptive and correlational quantitative approach, this research analyzes the influence of two main variables, ecological awareness and blue economy implementation, on fisheries sustainability. Multiple linear regression was employed as it enables the simultaneous testing of more than one independent variable on a dependent variable. Data were collected from 45 active fishers in Karangsong Village, selected based on their direct involvement in fisheries activities. The regression results indicate that ecological awareness has a significant influence on fisheries sustainability (coefficient = 0.633; $p < 0.01$), followed by blue economy implementation (coefficient = 0.253; $p < 0.01$), with a simultaneous contribution of 66.1% to the variation in fisheries sustainability. The practical implications of this study highlight the need to enhance environmental education, strengthen the capacity of coastal communities, and optimize supporting infrastructure to ensure more equitable implementation of blue economy principles. These findings underscore that the success of sustainable fisheries strategies requires a combination of ecological awareness and community-based policy support.

Keywords
Ecological Awareness; Blue Economy; Fisheries Sector; Indramayu; SDGs.

1 | INTRODUCTION

Indonesia is an archipelagic country with a coastline stretching over 34,000 miles (54,716 km). Its marine territory covers 6.3 million km^2, an increase from the previously recorded 5.8 million km^2, accounting for two-thirds of the country's total area. This includes 3.1 million km^2 of territorial waters and 2.7 million km^2 of the Exclusive Economic Zone (EEZ). Indonesia comprises 17,504 islands, with 13,466 officially registered at the United Nations (Rahim et al., 2024), making it the largest archipelagic nation in the world. Fisheries play a crucial role in the economic development of many countries. The positive impacts of this sector are felt not only at the national level but also across various regions. The abundance of marine resources provides a primary source of income for coastal communities and contributes significantly to local economic growth (Angulo-Valdes et al., 2022; Rahadiansyah et al., 2022). In addition to increasing the gross domestic product (GDP), the fisheries sector provides employment opportunities for millions of people in Indonesia.

Economic activities in coastal areas are commonly referred to as the blue economy. This concept encompasses various sectors, including capture fisheries, aquaculture, seafood processing, marine biotechnology, energy and mineral resources, marine tourism, sea transportation, coastal forestry, small island resource management, the maritime industry, and related services. These sectors have the potential to contribute approximately USD 1.5 trillion annually to the global economy while creating around 45 million jobs (Rahim et al., 2024). The development of the marine economy through the blue economy aims to achieve sustainable economic growth, improve the welfare of coastal and small-scale fishers, preserve marine ecosystems and resources, and maintain national sovereignty.

Indramayu Regency is one of Indonesia's coastal regions with significant potential in the fisheries sector. Strategically located along the northern coast of Java Island, Indramayu serves as one of the largest fisheries production centers in West Java, with a total fish production of 551,632 tons in 2023 (Department of Marine and Fisheries, Indramayu, 2023). The fisheries sector serves as the economic backbone for 45% of the coastal population, particularly traditional fishers and fish farmers. However, data show that 40% of the fish stock in Indramayu's waters has been overexploited. The use of destructive fishing gear, such as trawl nets and fish bombs, has exacerbated the degradation of marine ecosystems. As a region that heavily depends on marine and fisheries resources, the sustainability of marine ecosystems is a critical factor in ensuring the welfare of coastal communities. Various challenges, including overexploitation of fishery resources, coastal degradation, marine pollution, and climate change, increasingly threaten the sustainability of this sector.

Uncontrolled exploitation of fishery resources poses a serious threat to the long-term viability of the fisheries sector in Indramayu. Overfishing leads to the depletion of certain fish populations, disrupting marine ecological balance. Additionally, marine pollution from domestic and industrial waste in coastal areas further accelerates the degradation of aquatic ecosystems. Without proper resource management, the sustainability of the fisheries sector in Indramayu will be increasingly at risk.

Therefore, a balanced approach that harmonizes resource utilization and environmental conservation is urgently needed. The Indonesian government continues to promote the implementation of the Measured Fishing Policy (Penangkapan Ikan Terukur/PIT) as a strategic measure to optimize the management of fishery resources. This policy aims to ensure the sustainability of marine ecosystems while maintaining the productivity of the fisheries sector. PIT implementation requires accurate and comprehensive catch data from each fishing port. Such data are essential for setting fishing quotas, calculating non-tax state revenue (PNBP) post-production, and evaluating policy effectiveness (Raup et al., 2023). Sustainable fisheries management requires robust data accuracy as the foundation for sound decision-making. The quality of data directly influences the effectiveness of policies aimed at balancing ecosystem conservation with the economic needs of the population. If managed with scientifically based and appropriate approaches, the fisheries sector can be a renewable asset.

To address these challenges, the blue economy has emerged as a strategic framework for sustainable fisheries management. In 2023, the Ministry of Marine Affairs and Fisheries (KKP) launched the national blue economy policy aligned with the Sustainable Development Goals (SDGs), particularly Goal 14: Life Below Water, which emphasizes the importance of maintaining ocean health and building resilience to climate change. The policy comprises five main pillars: 1) expansion of marine conservation areas; 2) quota-based measured fishing (PIT); 3) development of marine aquaculture; 4) surveillance and control of coastal areas and small islands; and 5) marine debris cleanup initiatives through fisher participation campaigns.

The application of blue economy principles offers a viable solution for achieving sustainable fisheries management. It emphasizes sustainable utilization of marine resources by maintaining ecosystem balance and enhancing economic value for coastal communities. The core principles of the blue economy include resource efficiency, environmentally friendly technological innovation, and integration of economic sectors with environmental conservation. Fisheries activities are directed not only toward maximizing economic gains but also toward preserving marine ecosystems for long-term productivity. As a policy framework, the blue economy emphasizes three interconnected pillars: 1) effective protection; 2) sustainable production; and 3) equitable prosperity. The implementation of these principles is expected to

resolve issues of overexploitation while improving the well-being of fishers through more responsible fishing practices.

Ecological awareness among the community, especially fishers and fisheries business actors, plays a key role in supporting the success of blue economy implementation. Communities with a solid understanding of the impacts of overexploitation on marine ecosystems are more likely to support sustainable fishing practices. Ecological awareness enhances compliance with regulations, encourages the use of environmentally friendly technology, and reduces destructive practices. To foster this awareness, intensive education and outreach programs are required, emphasizing the importance of sustaining fishery resources. Environmental campaigns, fisher training programs, and incentive-based policies for environmentally friendly fishing practices can serve as effective strategies for changing community behavior.

Studies on the potential of the blue economy have been widely discussed in the literature; however, attention to the dimension of community ecological awareness as a determinant of its successful implementation at the local level remains relatively limited, particularly in Indramayu Regency, which possesses both significant fisheries potential and pressing ecological challenges. This condition creates a research gap, namely the lack of empirical studies that simultaneously examine the interrelationship between ecological awareness and blue economy implementation in relation to fisheries sustainability. Therefore, this study aims to analyze the influence of ecological awareness and blue economy implementation, both partially and simultaneously, on fisheries sustainability. The findings of this research are expected to provide empirical contributions to the development of sustainable fisheries management strategies and support the achievement of the Sustainable Development Goals (SDGs).

2 | BACKGROUND THEORY

This study integrates two key pillars of sustainable development in the marine sector: ecological awareness and the implementation of the blue economy. In coastal regions such as Indramayu, which rely heavily on the fisheries sector, the integration of these concepts is essential to maintaining a balance between coastal community welfare, marine resource conservation, and economic efficiency. This research draws upon literature that addresses the principles, challenges, and strategic pathways for building a sustainable fisheries sector.

Theoretical Framework

Ecological awareness refers to the level of public understanding regarding the reciprocal relationship between human activities and environmental preservation, particularly within marine ecosystems. This concept aligns closely with ocean literacy, which is defined as the understanding of the ocean's influence on human life and vice versa. The level of ecological awareness significantly influences both individual behavior and public policy concerning marine resource conservation and sustainable use (Santoro et al., 2021). In the Indonesian context, climate change and habitat degradation, such as the loss of mangroves and coral reefs, have been shown to reduce potential fish catches by up to 20% with a sea temperature rise of 1.5 °C. This underscores the need to enhance ecological awareness to motivate both adaptation and conservation actions.

The blue economy is a development paradigm that seeks to balance marine-based economic growth with the conservation of ocean resources. It emphasizes the sustainable use of marine resources while generating economic value for coastal communities. This approach encompasses a range of sectors, including fisheries, marine tourism, ocean-based renewable energy, and coastal ecosystem services (Schoettli, 2018). A study by Hamaguchi et al. (2024) highlights the importance of integrating environmentally based fisheries and marine tourism policies to avoid spatial use conflicts in marine areas.

The sustainability of the fisheries sector is determined by how well fisheries management can maintain fish stocks, protect marine biodiversity, and ensure the well-being of coastal communities. The ecosystem-based management (EBM) approach is widely applied to account for holistic ecological impacts in fisheries governance. Research by Sari et al. (2024) on flying fish roe fisheries in Papua demonstrates that sustainable practices must also consider the social and cultural dimensions of local communities. Equitable access to marine resources and the protection of small-scale fishers' rights are essential components of sustainable fisheries governance (Bennett et al., 2021). Furthermore, technological innovations such as Global Fishing Watch play a strategic role in enhancing transparency and monitoring to combat illegal fishing practices (Merten et al., 2016).

Literture Review

Efforts to achieve sustainable fisheries in coastal regions such as Indramayu require a synergy between community ecological awareness and the implementation of blue economy principles. The blue economy concept emphasizes the sustainable utilization of marine resources while maintaining ecological and social values. In this context, blue economy-driven development not only focuses on economic growth but also reinforces social resilience and environmental conservation (Han et al., 2025).

Han et al. (2025) argue that the blue economy can enhance social inclusion and reduce ecological footprints when

accompanied by the adoption of clean technologies, knowledge transfer, and green financing mechanisms. Their study provides evidence that active engagement of local communities and institutions in marine resource management is a critical factor in achieving sustainable development.

Moreover, coastal areas with high human activity, such as Indramayu Regency, must pay special attention to nearshore marine spaces (NMS), which possess significant ecological and social value. Diederichsen et al. (2025) highlight that NMS are often overlooked in blue economy policies, despite being primary sites for traditional fishing communities and local economic activities such as fisheries, tourism, and maritime transportation. The success of blue economy-based development heavily depends on the inclusive and ecological governance of these spaces.

A local case study conducted by Mollet et al. (2024) in Jayapura demonstrates that a blue economy approach can enhance the potential of marine fisheries when combined with community involvement, product diversification, and improved market access. These findings reinforce the argument that the blue economy is not merely a macro-level policy but also a set of field practices that must be aligned with local socio-cultural characteristics.

On the other hand, Syahputra et al. (2025) emphasize the importance of educational literacy as the foundation of ecological awareness. An educational program based on sustainable blue tourism in Pesisir Selatan successfully improved community understanding of the interlinkages between environmental sustainability and long-term economic well-being. This indicates that ecological awareness can be cultivated through participatory and educational approaches, thereby fostering a policy ecosystem supportive of the blue economy.

Finally, Dubey (2025), in his review of the bioeconomy, asserts that the utilization of biological resources must consider distributive justice and environmental carrying capacity to prevent exacerbating social inequalities or biodiversity loss. This perspective is especially relevant for regions like Indramayu, where economic pressures often conflict with ecological imperatives.

In conclusion, the literature demonstrates that the synergy between ecological awareness and the implementation of blue economy principles offers a strategic approach to addressing the challenges of fisheries sustainability. A combination of community education, local capacity building, technological innovation, and community-based marine spatial governance constitutes key elements for advancing sustainable fisheries in coastal regions such as Indramayu.

3 | METHOD

This study explores the relationship between ecological awareness and the implementation of the blue economy in relation to the sustainability of the fisheries sector in Indramayu Regency. A quantitative method with a descriptive and correlational approach is employed to obtain a comprehensive understanding of the interrelationships among the research variables. This approach allows for empirical data analysis while also enabling in-depth exploration of social, economic, and environmental factors influencing the implementation of the blue economy.

The research site was purposively selected in Karangsong Village, Indramayu Regency, West Java, based on the consideration that Karangsong represents an area with intensive fisheries activities and serves as a focal point for various conservation initiatives and community-based marine economic development programs, including the initial implementation of blue economy principles. In addition, this area is experiencing pressures on the sustainability of marine resources, both from ecological and economic perspectives.

The data analysis techniques employed in this study include.

1) Quantitative analysis (inferential statistics) using correlation and regression tests to examine the relationships between ecological awareness, blue economy implementation, and fisheries sustainability.
2) Qualitative analysis (thematic analysis) to analyze interview and observational data to gain a deeper understanding of the phenomena under study.

The sample in this study consisted of 45 active fishers, determined using purposive sampling with the following criteria: (1) having worked as fishers for at least the past three years, (2) being permanent residents of Karangsong Village, and (3) possessing direct experience in fishing activities as well as involvement in local-level marine resource management.

The research instrument employed was a structured questionnaire based on a 5-point Likert scale, consisting of three main sections corresponding to the study variables: (1) ecological awareness, measured through indicators of understanding of marine environmental issues, attitudes toward conservation, and environmentally friendly behavior; (2) blue economy implementation, encompassing indicators of circular economy practices, resource efficiency, and participation in sustainable marine economic programs; and (3) fisheries sustainability, covering ecological, economic, and social dimensions.

All questionnaire items employed a five-point Likert scale ranging from strongly disagree (1) to strongly agree (5). The collected data were analyzed using descriptive statistical analysis to illustrate the distribution of each variable. Multiple linear regression was applied as it is suitable for testing the simultaneous effects of independent

variables on the dependent variable. Classical assumption tests (normality, multicollinearity, and heteroscedasticity) were also conducted to ensure the validity of the model.

Data collection was conducted in June 2025 through direct visits to Karangsong Village, with strict adherence to research ethics, including obtaining informed consent from all respondents. The overall research process was aimed at contributing to the formulation of fisheries development policies that are more equitable, sustainable, and grounded in the empowerment of coastal communities.

4 | RESULTS AND DISCUSSION

4.1 Results

4.1.1 Descriptive Statistics

Based on the respondent data analyzed, the study involved 45 participants with a balanced gender distribution: 22 women and 23 men. The average age of respondents was 43.2 years, with an age range of 20 to 65 years, indicating that the majority were within the productive and mature adult age group. This demographic suggests a high likelihood of having direct experience and involvement in the fisheries sector or local economic activities. In terms of educational background, most respondents (33 individuals) had completed only primary education, while the remaining respondents were evenly distributed across junior secondary school, senior high school, and vocational high school levels, with four individuals in each category. This indicates a generally low level of formal education among respondents, which may have implications for their perceptions and understanding of issues such as ecological awareness, the implementation of the blue economy, and the sustainability of the fisheries sector. These findings highlight the importance of aligning educational strategies and policy interventions in the context of sustainable development with the specific socio-demographic characteristics of the local population targeted.

4.1.2 Empirical Results and Discussion

The regression results indicate that the ecological awareness variable (X1) has a significant effect on fisheries sustainability (Y), with a coefficient of 0.633 and a p-value of 0.000. The blue economy implementation variable (X2) also shows a significant effect, with a coefficient of 0.253 and a p-value of 0.006. The model intercept is 9.778, and the R-squared value is 0.6612, indicating that 66.1% of the variation in fisheries sustainability can be explained by the two independent variables.

Table 1. Multiple Linear Regression Results

Variable	Coefficient	Std. Error	t-Statistic	Prob. (p-value)
C (Constant)	9.777889	5.994550	1.631130	0.1103
Ecological Awareness (X1)	0.632667	0.088011	7.188502	0.0000***
Blue Economy Implementation (X2)	0.252989	0.087652	2.886300	0.0061***

Model Summary.

1) R-squared: 0.6612
2) Adjusted R-squared: 0.6451
3) F-statistic: 40.98496
4) Prob(F-statistic): 0.0000
5) S.E. of regression: 4.0644
6) Durbin-Watson stat: 1.6252

***p < 0.01 (significant at 1% level)

More specifically, the F-test results reveal that the regression model is statistically significant overall (Prob F-statistic = 0.000), suggesting that ecological awareness and blue economy implementation jointly exert a significant influence on fisheries sustainability. The adjusted R-squared value of 0.645 reflects a stable model, even after accounting for the number of variables and sample size used.

Table 2. Variance Inflation Factor (VIF)

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	35.93463	97.88833	NA
X1	0.007746	77.81137	1.116562
X2	0.007683	67.37509	1.116562

Multicollinearity diagnostics indicate that the Variance Inflation Factor (VIF) values for X1 and X2 are both 1.116, well below the commonly accepted threshold of 10, confirming the absence of multicollinearity and thereby strengthening

the validity of the parameter estimates.

Table 3. Breusch-Godfrey Serial Correlation LM Test (Up to 2 Lags)

Test	Value
F-statistic	0.762206
Prob. F(2,40)	0.4733
Obs*R-squared	1.652004
Prob. Chi-Square(2)	0.4378

Furthermore, the Breusch-Godfrey LM test for autocorrelation yields a p-value of 0.4733 ($p > 0.05$), indicating no evidence of autocorrelation in the model. However, the Breusch-Pagan-Godfrey test for heteroskedasticity reveals a p-value of 0.0467, suggesting the presence of heteroskedasticity in the residuals. This indicates that the variance of the residuals is not constant, and thus the use of robust standard errors should be considered in subsequent analyses to ensure more accurate estimations.

The regression coefficient indicates that each one-unit increase in the ecological awareness scale enhances fisheries sustainability by 0.633 units, assuming other variables remain constant. The interpretation of the results shows that ecological awareness exerts a more dominant influence compared to blue economy implementation. This finding suggests that strengthening public awareness of the importance of preserving marine ecosystems, through education, training, and environmental campaigns, serves as a key determinant and can have a tangible impact on the conservation of fisheries resources. Meanwhile, the implementation of the blue economy, represented in practices such as measured fishing, marine area conservation, and marine waste management, also contributes positively to fisheries sustainability, yet remains limited due to constraints in infrastructure, technological access, and community literacy.

These results are consistent with previous studies, such as Rahim et al. (2024) and Han et al. (2025), which emphasize that community ecological awareness is a crucial factor in sustaining the fisheries sector. The higher coefficient of ecological awareness compared to the blue economy reaffirms that behavioral change within communities serves as the primary driver of fisheries sustainability. Nevertheless, the implementation of the blue economy faces several challenges: (1) limited infrastructure, such as modern fish auction facilities and cold storage, which hinders the efficiency of the fish supply chain; (2) low adoption of environmentally friendly technologies due to the limited capital of small-scale fishers; and (3) socio-cultural factors, such as the persistent use of traditional fishing gear, which often obstructs community transformation (Syahputra et al., 2025).

Compared to the study by Mollet et al. (2024) in Jayapura, which successfully integrated local communities into fisheries product diversification, the implementation in Indramayu, particularly in Karangsong Village, reveals a gap in both literacy and market access. This underscores the need for a participatory approach that not only emphasizes macro-level policies but also considers the social dynamics within local communities.

Based on field observations and brief interviews conducted during the data collection process, it was found that most fishers in Indramayu have begun to recognize the importance of preserving marine ecosystems, particularly following outreach efforts by the fisheries department and environmental NGOs. However, the implementation of environmentally friendly practices still faces significant challenges, such as the use of non-standard fishing gear and limited capital to transition toward more sustainable technologies (Rahmayanti et al., 2025).

On the other hand, the blue economy programs implemented by the local government have not been fully understood or reached the fishing communities, particularly small-scale fishers. Information gaps, limited technical training, and the lack of supporting infrastructure, such as hygienic and integrated fish auction facilities, are still evident. Accordingly, the empirical data demonstrating the significance of both variables for sustainability are consistent with the actual conditions observed in the community. Thus, this study provides empirical evidence that the sustainability of fisheries requires a combination of structural interventions (infrastructure, regulation, technology) and the enhancement of community capacity.

4.2 Discussion

The findings from this study underline the importance of both ecological awareness and the adoption of blue economy practices in maintaining fisheries sustainability in Indramayu. These factors are interdependent, and their combined influence offers a more robust framework for sustainable fisheries management. The analysis shows that ecological awareness plays a more significant role than blue economy implementation in ensuring sustainable fisheries. The positive influence of ecological awareness suggests that when local communities, especially fishers, are well-informed about the environmental consequences of overfishing and ecosystem degradation, they are more likely to engage in sustainable practices. This aligns with earlier studies, such as those by Santoro et al. (2021), which argue that increasing ecological literacy within communities can drive responsible behaviors, particularly in fisheries management. While knowledge of environmental issues is crucial, the challenge lies in translating this awareness into consistent action. Traditional fishing practices, such as using non-standard fishing gear, remain prevalent despite growing awareness. This highlights the need

for ongoing efforts to reinforce ecological education and support communities in adopting new, environmentally friendly technologies. Behavioral shifts take time and require continuous engagement through education, training programs, and incentives to encourage sustainable fishing practices.

Blue economy initiatives, while beneficial, face implementation barriers that reduce their full potential. Although blue economy practices like marine conservation and resource efficiency can contribute to sustainability, their impact in Indramayu is constrained by a lack of infrastructure and technological limitations. For instance, the absence of modern fish auction facilities, inadequate cold storage, and limited capital for adopting new technologies are key obstacles that hinder the effectiveness of blue economy policies in the region. Hamaguchi et al. (2024) emphasize the importance of integrating environmentally sustainable practices with economic activities, but without the necessary infrastructure and capital, these efforts struggle to gain traction. The findings from this study reflect these constraints and underscore the need for targeted investments in infrastructure, technology, and financial mechanisms to support the transition toward a blue economy. The combined effect of both ecological awareness and blue economy practices provides a more effective approach to achieving fisheries sustainability. As observed by Han et al. (2025), the integration of blue economy strategies with community engagement and awareness-building efforts can accelerate the transition to sustainable fisheries. In Indramayu, where fisheries form the backbone of the local economy, strengthening the synergy between these two elements is key. Ecological awareness drives the adoption of responsible practices, while blue economy policies, when implemented effectively, offer the structural support needed to ensure long-term sustainability. For example, policies like measured fishing, marine area conservation, and resource efficiency can promote sustainability, but their success hinges on community participation and support. Without informed and engaged communities, the effectiveness of these policies diminishes. This supports the findings of Mollet et al. (2024), which advocate for a participatory approach that not only focuses on national policies but also considers local socio-cultural dynamics in ensuring the success of blue economy strategies.

Despite the progress made in raising ecological awareness and implementing blue economy policies, significant challenges remain. These challenges include the limited infrastructure, low adoption of sustainable technologies, and insufficient support for small-scale fishers. To overcome these barriers, additional efforts are needed in the form of capacity-building programs, technological innovation, and greater access to financial resources. Future studies should focus on the role of green financing mechanisms and policy interventions that can help small-scale fishers overcome financial barriers. Additionally, research exploring how socio-cultural factors influence the success of blue economy policies at the local level will provide deeper insights into effective strategies for sustainable fisheries management. Comparative studies across other coastal regions in Indonesia, as suggested by Buana et al. (2024), can also help to identify best practices and tailored solutions for the successful implementation of blue economy principles.

5 | CONCLUSIONS AND FUTURE WORK

This study concludes that the sustainability of the fisheries sector in Indramayu Regency is significantly influenced by two main factors: ecological awareness and the implementation of the blue economy. The analysis reveals that ecological awareness exerts a greater influence compared to blue economy implementation, indicating that public understanding and concern for marine ecosystem preservation play a critical role in fostering sustainable fishing practices. Meanwhile, the implementation of blue economy principles, such as measured fishing and marine area conservation, also contributes positively, although practical challenges in the field remain. Therefore, the synergy between enhancing ecological awareness and optimizing the implementation of the blue economy constitutes a key strategy for achieving long-term and equitable sustainability in the fisheries sector of Indramayu's coastal areas.

Based on the research findings, several practical recommendations can be implemented to strengthen the sustainability of the fisheries sector in Indramayu. The local government needs to expand community-based education programs and continuous environmental campaigns to further enhance public awareness of the importance of preserving marine ecosystems. Furthermore, the provision of supporting infrastructure, such as hygienic fish auction facilities, adequate cold storage, and access to environmentally friendly technologies, should be prioritized to ensure the more effective implementation of blue economy practices. Green financing schemes and incentive mechanisms for small-scale fishers also need to be reinforced to accelerate the adoption of blue economy principles at the community level. To deepen the analysis, further research is recommended in the form of comparative studies across coastal regions, to better understand the social and cultural dynamics influencing the successful implementation of the blue economy in Indonesia.

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