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Economic Impact of Mangrove Ecotourism on Coastal Livelihoods in East Lombok

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Abstract

The concept of community-based ecotourism places local communities as the main actors in sustainable coastal resource management. This study aims to evaluate the economic impact of community-based mangrove ecotourism development on the welfare of coastal communities in Poton Bako Hamlet, East Lombok Regency, Indonesia. This study was motivated by implementing a community empowerment program integrated with mangrove conservation activities and educational ecotourism development in 2024-2025. The research method used was a mixed-methods approach, with data collection through structured interviews with local stakeholders, analysis of Bale Mangrove Pokdarwis' financial reports, and participatory observation of community-based tourism activities. The results of the study showed a significant increase in village income, with an accumulation of IDR 647.38 million until April 2025. Most of the income was allocated for social activities, environmental conservation, and the construction of public facilities. In addition, this program encourages the growth of new economic activities, creates job opportunities for young people, and encourages diversification of community livelihoods that previously depended on the traditional fisheries and agriculture sectors. The practical implications of this research indicate that community-based ecotourism, when supported by strong local institutions and participatory governance, has the potential to be a sustainable economic driver in remote coastal areas.

Keywords: Coastal Economy; Community Empowerment; Ecotourism; Mangrove Conservation; Sustainable Development.

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I. Introduction

Mangrove ecosystems are an important part of the coastal landscape that have a strategic ecological role as a natural protector against abrasion, carbon absorber, and habitat for various marine species and water birds [1, 2]. In addition to its ecological role, mangrove areas also have great potential to be developed as community-based ecotourism destinations that can provide economic value while encouraging active community participation in conservation activities [3–6]. The concept of community-based ecotourism places local communities as the main actors in the sustainable management of coastal resources [5]. A study conducted in the mangrove area of Budo Village, North Sulawesi, showed that community participation combined with strengthening local institutions can increase conservation awareness while encouraging increased tourist visits [7]. Similar findings were also obtained from research in Mangunharjo, Semarang, which emphasized the importance of community empowerment through environmental training and education in supporting sustainable ecotourism.

Previous studies in the mangrove ecotourism area of Budo Village, North Sulawesi, showed that local institutional strengthening strategies through training and mentoring contributed to increasing the volume of tourist visits and changing community behavior towards conservation [7]. Demikian pula, penelitian di Semarang mengungkap bahwa pemahaman masyarakat terhadap Similarly, research in Semarang revealed that community understanding of the importance of mangrove conservation was directly positively correlated with the success of ecotourism programs. However, most existing studies focus on the ecological or social aspects of mangrove ecotourism development, and few systematically evaluate the economic contribution of ecotourism to the welfare of coastal communities, especially in eastern Indonesia, such as West Nusa Tenggara. There are not many studies that examine how ecotourism activities managed collectively by local institutions, such as Pokmaswas and Pokdarwis, can become a significant source of income for villages, while opening up new economic opportunities for the community [8]. In addition, to date, no scientific study has systematically measured the economic impact of implementing ecotourism on the livelihoods of local communities. Therefore, this study aims to evaluate the economic impact of community-based mangrove ecotourism development in Poton Bako Hamlet, focusing on increasing income, creating new jobs, and diversifying community economic sources.

In addition, the younger generation's involvement in managing and promoting ecotourism, especially through digital media and English-language content, has not been a major focus in previous research. In fact, this dimension is very important in presenting a new approach to empowering coastal communities based on technology and global environmental literacy. This initiative provides a new color in the development of ecotourism, which is not only oriented towards conservation, but also on improving the competence of the younger generation and the competitiveness of tourist destinations digitally. Based on the research gap, this study aims to evaluate the economic impact of community-based mangrove ecotourism development in Poton Bako Hamlet, East Lombok Regency. This study focuses on the analysis of ecotourism's contribution to increasing village income, diversifying community livelihoods, and youth involvement in the local economic ecosystem. With this approach, the study is expected to enrich literature on community-based ecotourism governance and provide policy input for sustainable coastal area development.

II. Method

The approach used in this study is association [9, 10], to determine the relationship between strengthening local institutions, diversifying livelihoods, and English-based digital promotion on the economic impact of coastal communities. This study was conducted in Poton Bako Hamlet, Jerowaru Village, Jerowaru District, East Lombok Regency, which is the location for implementing a community-based ecotourism program by Pokdarwis Bale Mangrove and Pokmaswas Kompas. The data collection technique was carried out using the census method, namely the entire population that met the criteria were made respondents [8, 11]. The respondents in this study numbered 50 people, consisting of members of Pokdarwis, Pokmaswas, micro-business actors around the tourist area, and residents who received economic benefits from ecotourism activities. The selection of respondents was carried out purposively based on direct involvement in management activities or the economic impact of the program.

This study uses three independent variables, namely: 1) Strengthening local institutions, which is measured through indicators: organizational structure, role in supervision, and involvement in decision making, 2) Diversification of livelihood sources, with indicators: number of new business types, income

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from non-traditional businesses, and family involvement in tourism businesses, 3) English-based digital promotion, with indicators: intensity of publication on social media, youth participation in digital content, and reachability of audiences outside the region. Meanwhile, the dependent variable is the economic impact, which is measured through three main indicators: 1) Increased household income, 2) Creation of new jobs, and 3) Growth of local micro businesses around the ecotourism area.

To measure these variables, data were collected through a closed questionnaire with a Likert scale of 1-5, which was distributed to all respondents [12]. In addition, semi-structured interviews were also conducted with key figures and leaders of local institutions, as well as documentation from Pokdarwis' financial reports and data on the number of tourist visitors. Next, the collected data will be processed using the SPSS application, by conducting multiple linear regression analysis to see the partial and simultaneous effects of the three independent variables on the dependent variable [13]. Before testing is carried out, the data is first tested through validity, reliability, and classical assumption tests (normality, multicollinearity, and heteroscedasticity) [8]. This analysis draws empirical conclusions and provides data-based recommendations for developing sustainable ecotourism. A complete presentation of the research flow is shown in Figure 1.

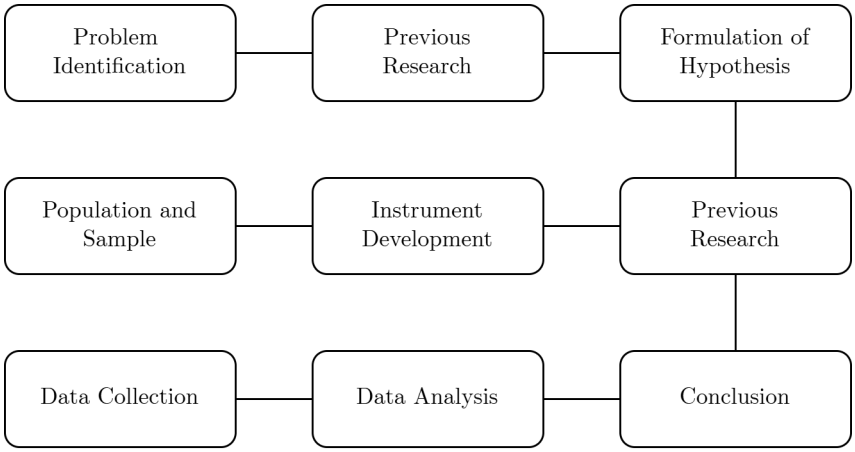

Figure 1. Research Flow

III. Results and Discussion

1. Description Analysis

Descriptive analysis aims to provide an overview of respondents' perceptions of the research variables [12], namely: strengthening local institutions, income diversification, digital promotion, and economic impact. Each variable is measured through the average score of the indicators that have been designed in the questionnaire with a Likert scale of 1 - 5. Table 1 shows the Descriptive Statistics of the Research Variables.

Table 1. Descriptive Statistics of Research Variables

Variables	Minimum	Maximum	Mean	Standard Deviation
Local Institutions	3.00	4.00	3.54	0.50
Diversification of Income	2.00	4.00	3.06	0.74
Digital Promotion	2.00	4.00	2.94	0.91
Economic Impact	3.00	4.00	3.46	0.50

Table 1 shows that Local Institutions (X) show the highest average value (3.54), indicating that the community considers the existence and function of local institutions such as Pokmaswas and Pokdarwis to be quite effective in supporting ecotourism activities; Economic Impact has a mean value of

3.46 with a low standard deviation (0.50), indicating a positive and fairly uniform perception of the economic benefits obtained; Income Diversification and Digital Promotion have lower mean values (3.06 and 2.94), as well as a relatively higher standard deviation, reflecting greater variation in community perceptions, possibly due to the uneven distribution of benefits or the suboptimal implementation of the two aspects. Furthermore, Economic Impact has the second highest average, namely 3.46, indicating a positive perception of increased income, job creation, and micro-business growth as a result of mangrove ecotourism development. With a relatively small standard deviation (around 0.5 - 0.9), the distribution of respondents' answers shows consistency and is not too spread out, strengthening the reliability of the descriptive results.

2. Validity and Reliability Test

2.1. Validity Test

Validity testing is conducted to determine the extent to which the instrument used can measure the constructs intended in this study [14]. Testing is conducted using Principal Component Analysis (PCA) on independent and dependent variables [15]. The results of PCA processing present the percentage of variance explained by each main component, as shown in Table 2 below.

Table 2. Descriptive Statistics of Research Variables

Main Components	Percentage Variance (%)
Component 1	33.04
Component 2	27.96
Component 3	23.14
Component 4	15.86
Total	100.00

Based on Table 2, the four main components can explain 100 of the total variance in the data. The first component explains 33.04%, followed by the second component at 27.96%, the third at 23.14%, and the fourth at 15.86%. No single component dominates extremely, indicating that each indicator has a proportional contribution to the formation of the construct. These results indicate that each indicator has a fairly proportional contribution to the formation of the construct, with no dominance of only one dimension. The even distribution between components indicates that the construct built through the research instrument has good structural validity, and this is shown in Figure 2.

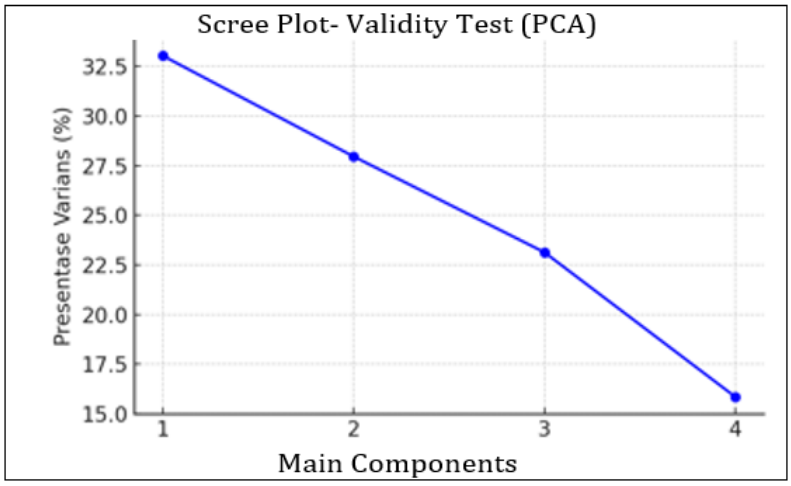

Figure 2. Validity Test Graph

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2.2. Reliability Test

The instrument's reliability was tested using Cronbach's Alpha, which measures internal consistency between items in a single construct. The calculation results show a value of $\alpha = 0.075$, below the minimum threshold of 0.6. This value indicates that the instrument still has weaknesses in terms of consistency between items [16]. The low alpha value is most likely due to the limited number of indicators and the similarity of respondent answer patterns (low item variance). Therefore, it is recommended that improvements be made to the instrument by increasing the number of indicators and clarifying the assessment range to improve discrimination between respondents.

3. Normality Test

A normality test ensures that the data used in the regression analysis meets the assumption of normal distribution, an important requirement in parametric statistical analysis. This test uses the Shapiro-Wilk Test, suitable for small to medium samples ($n < 100$). The results of the Shapiro-Wilk Test are shown in Table 3.

Table 3. Descriptive Statistics of Research Variables

Variables	Shapiro-Wilk Statistics	p-value	Interpretation
Local Institutions	0.634	6.56×10^{-10}	Abnormal
Diversification of Income	0.809	1.42×10^{-6}	Abnormal
Digital Promotion	0.736	3.94×10^{-8}	Abnormal
Economic Impact	0.634	6.56×10^{-10}	Abnormal

With all p-values <0.05, it can be concluded that the four variables are not significantly normally distributed. This is likely due to the limitations of the 1–5 Likert scale, which results in a data distribution that tends to be "clustered" (*bimodal or skewed*).

3.1. Multicollinearity Test

The multicollinearity test aims to determine whether there is a high correlation between independent variables in the regression model. High multicollinearity can cause instability in the regression coefficient estimates and reduce the validity of the model [11]. This test is performed by calculating the Variance Inflation Factor (VIF) for each independent variable shown in Table 4. Generally, a VIF value > 10 indicates symptoms of high multicollinearity.

Table 4. Descriptive Statistics of Research Variables

Variables	VIF Value	Interpretation
Local Institutions	1.08	There is no multicollinearity
Diversification of Income	1.05	There is no multicollinearity
Digital Promotion	1.11	There is no multicollinearity

Table 4 shows that all independent variables have VIF values < 2, indicating no multicollinearity among the independent variables in the model. Thus, the regression model can be continued to the next test without correcting the relationship between the independent variables.

3.2. Autocorrelation Test

An autocorrelation test is conducted to determine whether there is a correlation between residuals (errors) in the linear regression model. Significant autocorrelation, especially in the positive direction, can cause bias in calculating standard errors and reduce the accuracy of model parameter estimates.

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Therefore, the assumption of being free from autocorrelation is important to fulfill so that the results of the regression analysis can be interpreted validly [8, 11].

Testing was carried out using the Durbin-Watson (DW) Test, which produces statistical values between 0 and 4. DW values approaching 2 indicate no autocorrelation, while values <1.5 indicate positive autocorrelation, and values >2.5 indicate negative autocorrelation. The following are the results of the Durbin-Watson test on the regression model of this study (see Table 5).

Table 5. Durbin-Watson (DW) Autocorrelation Test Results

Test Type	DW Statistic Value	Interpretation Range	Conclusion
DW Test	1,543	1.5 – 2.5	There is no significant auto-correlation

Based on the results shown in Table 5, the Durbin-Watson value of 1.543 is in the range of 1.5 to 2.5, which means that the regression model does not show symptoms of autocorrelation. Thus, the assumption of residual independence is met, and the model can be used for further testing without the risk of bias caused by residual correlation. This indicates that the error values of one observation with another are unrelated, which strengthens the validity of the multiple linear regression model used in this study.

3.3. Heteroscedasticity Test

The heteroscedasticity test is used to determine whether the variance of the regression residual is constant (homoscedastic) or not (heteroscedastic). Failure to meet this assumption can cause inefficiency of the regression estimate, although the estimate remains unbiased. This test is performed using the Breusch-Pagan Test, with the hypothesis. H_0: there is no heteroscedasticity (homoscedasticity) and H_1: heteroscedasticity occurs. The results of the Breusch Pagan Test are shown in Table 6 below.

Table 6. Breusch Pagan Test Results

Statistics	Mark	Interpretation
LM Statistics	3.136	-
LM-Test p-value	0.371	>0.05 → not significant
F-Statistic	1,026	-
F-Test p-value	0.390	>0.05 → not significant

Table 6 shows that the LM test and F-Test show p-value > 0.05, so it can be concluded that there are no symptoms of heteroscedasticity in the model. Thus, the regression model meets the assumption of constant residual variance. The heteroscedasticity test aims to identify whether residual variation is not constant or uneven (heteroscedastic) in the regression model, which can interfere with the validity of parameter estimates. Failure to fulfill this assumption can cause the coefficient estimate to remain unbiased but become inefficient, making the conclusions drawn from the model biased. A graphical approach is used to detect heteroscedasticity through a scatter plot between the studentized residual and the standardized predicted value, shown in Figure 3. The pattern of points that spread irregularly around the zero line (without forming a certain pattern such as a fan, cone, or curve) indicates that the model does not contain symptoms of heteroscedasticity.

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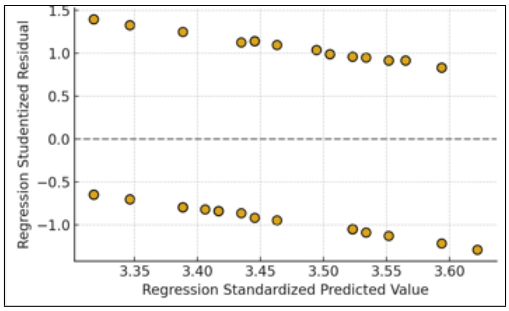

Figure 3. Test Results Heteroscedasticity

Based on Figure 3, it can be seen that the distribution of residual points is randomly distributed around the zero horizontal line, and does not form a certain systematic pattern. There is no widening or narrowing fan-shaped pattern that usually indicates symptoms of heteroscedasticity. Thus, it can be concluded that the linear regression model meets the assumption of homoscedasticity, or in other words, there is no heteroscedasticity. This strengthens the model's validity and shows that the error variance is constant across all prediction levels.

3.4. Hypothesis Testing

Partial Significance Test (t-Test)

A partial significance test is conducted to test the influence of each independent variable on the dependent variable individually in a multiple linear regression model. In the context of this study, the t-test is used to measure the extent of influence of the three independent variables, namely: Strengthening Local Institutions, Income Diversification, and Digital Promotion, on the dependent variable Economic Impact. The test uses the t-statistic value and a significance level of 5% ($\alpha = 0.05$). The decision-making criteria are as follows. If the p-value < 0.05, then H_0 is rejected, meaning that the independent variable significantly influences the dependent variable. If the p-value ≥ 0.05, then H_0 is accepted, meaning no significant effect exists. Table 7 below shows the results of the partial significance test based on the regression output.

Table 7. Results of Partial Significance Test (t-Test)

Variables	Coefficient (β)	t-count	p-value	Information
Local Institutions	-0.071	-0.467	0.642	Not significant
Diversification of Income	-0.029	-0.283	0.779	Not significant
Digital Promotion	+0.088	+1,047	0.301	Not significant

Table 7 shows that the three independent variables have a p-value > 0.05, indicating that none of the variables significantly affect the Economic Impact variable. Strengthening Local Institutions shows a negative relationship to economic impacts, although not statistically significant. This is likely due to the role of institutions that are still administrative and not optimal in distributing economic benefits directly to the community. Diversification of Revenue has also not made a statistically significant contribution. This may be influenced by the inability to achieve economies of scale or because most emerging businesses are still in their early stages and are not yet stable. Although Digital Promotion has a positive coefficient (+0.088), it has not shown a significant partial influence. However, the positive direction of the relationship indicates a potential contribution if the digital promotion strategy is strengthened and developed consistently. With these results, it can be concluded that partially, none of the variables have a significant effect on increasing economic impact independently. Therefore, simultaneous significance testing (F Test) is needed to determine whether the overall model still has explanatory power for the dependent variable.

Simultaneous Significance Test (F Test)

Simultaneous significance test is conducted to determine whether the independent variables together have a significant influence on the dependent variable [17]. This test is important to determine whether the overall regression model is suitable for explaining the variations in the dependent variable. The hypotheses tested are as follows. $H_0 : \beta_1 = \beta_2 = \beta_3 = 0$ (No simultaneous effect) and H_1: At least one $\beta \neq 0$ (There is a simultaneous effect). The test was conducted using F statistics and a significance level of 5% ($\alpha = 0.05$). The following are the results of the F test and Adjusted R-Squared shown in Table 8.

Table 8. Test Results and Adjusted R-Squared

Statistical Test	Mark	Interpretation
F-Statistic	0.4684	The model is not significant simultaneously
F-Test p-value	0.7058	>0.05 → Reject H_1
Adjusted R-Squared	-0.0336	The model is unable to explain the variance of the dependent variable

The F-test results show that the F-statistic value is 0.4684 with a p-value of 0.7058, far above the significance level of 0.05. This means that simultaneously, the three independent variables (Local Institutional Strengthening, Income Diversification, and Digital Promotion) do not significantly affect the Economic Impact variable. The Adjusted R-Squared value of -0.0336 also indicates that the model cannot explain the variation in the data. A negative Adjusted R^2 indicates that the model used is less accurate in explaining the relationship between variables, even worse than a model without predictors (empty model).

This finding shows that although there is a strong theoretical relationship between these variables, in the empirical context of the population studied, the simultaneous contribution of the three variables has not been able to explain changes in economic impact significantly. Several possibilities could cause this: 1) The implementation period of the program is too short to produce real economic effects, 2) The scale of ecotourism activities is still limited, 3) The existence of other variables that are more dominant but not included in the model (e.g. policy support, market conditions, accessibility, and technology).

IV. Conclusion

This study analyzes the influence of strengthening local institutions, diversifying livelihood sources, and English-based digital promotion on the economic impact of community-based mangrove ecotourism development in Poton Bako Hamlet, East Lombok Regency. Based on the results of the descriptive analysis, it was found that respondents' perceptions of the variables of local institutional strengthening and economic impact were in the good category, while income diversification and digital promotion were still in the moderate category. This shows that the community is generally starting to feel the benefits of ecotourism activities, but the implementation of supporting aspects is not yet evenly distributed and optimal.

The results of multiple linear regression analysis show that the three independent variables, either partially or simultaneously, do not significantly affect the economic impact. In addition, the negative Adjusted R-Squared value indicates that the regression model used has not adequately explained the variation in the economic impact variables. However, the positive direction of the digital promotion variable coefficient indicates a potential contribution if developed more systematically and strategically. Overall, these findings suggest that the economic impacts of community-based mangrove ecotourism have not been fully realized in the short term, and the success of the program is highly dependent on institutional effectiveness, the carrying capacity of alternative economic activities, and digital-based promotional capacity. The practical implications of this research are that ecotourism development needs to be focused on improving the quality and effectiveness of local institutions and strengthening economic diversification and more systematic digital promotion strategies, especially those oriented towards the international market.

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Declaration

The author originally wrote this article and has never been published in any journal or scientific publication.

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