Analysis of factors influencing coastal community behavior in mangrove forest management in Riau Province, Indonesia

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Abstract. The management of mangroves in Teluk Pambang village is critically urgent due to the degradation of 100 hectares of land caused by abrasion and over-exploitation. Additionally, issues of abrasion and sedimentation threaten the sustainability of the coastal ecosystem. Unsustainable management practices further exacerbate this situation, negatively impacting the livelihoods of communities reliant on these resources. This research aims to analyze the factors influencing community behavior in the effective management of mangrove forests. The research utilized a survey method, involving a sample of 245 participants, including institutional managers and community members who interact directly and indirectly with mangrove forests. Sampling was conducted using purposive sampling, with analytical tools including the Likert Scale, Structural Equation Modeling (SEM) using Partial Least Squares, and bootstrapping. The research findings indicate several key factors influencing coastal community engagement in mangrove forest management. First, the perception of benefits significantly impacts positive community attitudes, with a t-value of 6.589 and a path coefficient of 0.421. Second, the ease of management contributes to active community participation, with a t-value of 6.176 and a path coefficient of 0.417. Additionally, positive community attitudes significantly influence interest in management activities, as evidenced by a t-value of 18.039 and a path coefficient of 0.724. This interest, in turn, positively affects actual system usage, with a t-value of 5.288 and a path coefficient of 0.339. The results indicate that the research model meets the criteria for evaluating both the outer and inner models. The direct impact of variable X1 on Z is 24.9%, while the impact of X2 on Z is 39.9%. Additionally, the indirect effects of variables X1 and X2 on Z, via two paths (X1 to Y1 and Y2 to Z), account for an influence of 10.3%. Meanwhile, the influence of variable X2 through Y1 and Y2 to Z is 10.2%.
Key Words: active participation, community behavior, mangrove management, perception of benefits, sustainability.

Introduction. The degradation of mangroves in Indonesia is a serious environmental issue, considering that Indonesia has one of the largest mangrove ecosystems in the world (Ilman et al 2016). Mangrove deforestation in Indonesia is responsible for emitting around 190 million metric tons of carbon dioxide equivalent annually, accounting for 42% of the country's total emissions from deforestation. Various factors influencing the condition of mangrove resources include cultural beliefs, community behavior, and economic incentives (Maulidah et al 2023). Indonesia has lost approximately 40,000 hectares of mangrove forest due to land conversion for agriculture, aquaculture, and infrastructure development over the past three decades. Mangrove plants are experiencing concerning changes globally in terms of area, habitat quality, and the provision of ecosystem services (Quinn et al 2017; Friess et al 2019). Riau Province is one of the regions experiencing degradation, particularly in terms of environmental degradation. The area of mangrove ecosystems in Riau Province has significantly declined from 180,952.1 hectares in 2000 to 145,656.9 hectares in 2019 (Oktorini et al 2022).

The decline in mangrove ecosystem area is caused by various factors, including a lack of public understanding about the importance of these ecosystems, exploitation for the expansion of plantations and infrastructure development, as well as illegal logging and shrimp pond construction (Warningsih et al 2021; Jikalahari 2022). Additionally, natural factors such as storms, rising sea levels, and saltwater intrusion also contribute to the worsening degradation (Hermanto et al 2023).

The issues in mangrove management in Teluk Pambang village include the degradation of 100 hectares of land due to abrasion, over-exploitation, and former community management areas (YKAN 2020). Data indicates that from 1997 to 2017, abrasion reached 418.88 meters, and sedimentation covered an area of 218.28 meters (Simamora et al 2018). The unsustainable management of mangrove ecosystems by the community has affected their ecological, social, and economic functions (Sari et al 2015). In this context, community involvement as development actors through empowerment strategies is essential for restoring the functions of mangroves (Lestariningsih et al 2021).

To effectively tackle the challenges of mangrove ecosystem preservation, a comprehensive approach is essential, integrating ecological, social, economic, institutional, and technological factors. This requires concrete actions from all stakeholders, including the government, non-governmental organizations, and local communities. A relevant model involves a synergy between government initiatives and community engagement, with clearly defined roles and responsibilities (Fikriyani & Mussadun 2014). Rehabilitating mangrove areas is a vital strategy for preserving these ecosystems, protecting the environment, and improving the livelihoods of coastal communities. By actively involving local populations in rehabilitation efforts, we can restore damaged mangrove habitats and ensure sustainable management practices that benefit both the ecosystem and the community (Firdaus et al 2021). In a more specific context, it is crucial to examine the factors influencing coastal community behavior in mangrove management, given the vital role of mangroves in maintaining ecosystem balance, protecting coastlines from erosion, and supporting local livelihoods. The increasing degradation of mangrove forests due to human activities and climate change highlights the importance of understanding community behavior as a key element in conservation efforts. Without understanding the factors that influence such behavior, management efforts may not be effective or sustainable. Therefore, this analysis aims to identify and understand the various aspects that affect community interactions with mangrove forests, ensuring that the actions taken are more targeted and sustainable.

Material and Method. This study employed a survey method, targeting the population of Teluk Pambang village who interact directly and indirectly with mangrove forests. The research was conducted in Teluk Pambang village, Bantan District, Bengkalis Regency, from August to November 2024. A total of 245 samples were collected, consisting of 76 members from mangrove groups, 20 community leaders, 19 individuals whose livelihoods are derived from mangroves, 17 general community members, 15 individuals from outside the village who utilize mangroves for their livelihoods, 12 collectors of timber and non-timber products, 43 members of organizations related to mangroves, 15 members of the Village Forest Management Institution (LPHD), and 28 partners of forest rangers. The sampling technique used was purposive sampling. Data collected for this study included both primary and secondary data. Primary data were obtained through in-depth interviews with respondents using a questionnaire, while secondary data were sourced from relevant agencies. The analysis employed descriptive qualitative methods using the Likert’s Summated Rating (SLR) scale.

This scale provides multiple items for each variable, with indicators featuring a clear scoring system ranging from 1 to 5 (Mardikanto & Soebianto 2015), organized in a rating scale. Additionally, the analysis utilized Structural Equation Modeling Partial Least Square (SEM PLS), a multivariate statistical analysis method that combines regression analysis with factor analysis to create a model explaining the simultaneous linear relationships between indicators, exogenous variables, endogenous variables, and latent variables (Santoso 2018). The steps in SEM PLS analysis included: a) building a model based on concepts and theory, b) model evaluation, and c) conducting bootstrap resampling (over 3000 times) (Rachman et al 2018). The model developed in this research is illustrated in Figure 1.

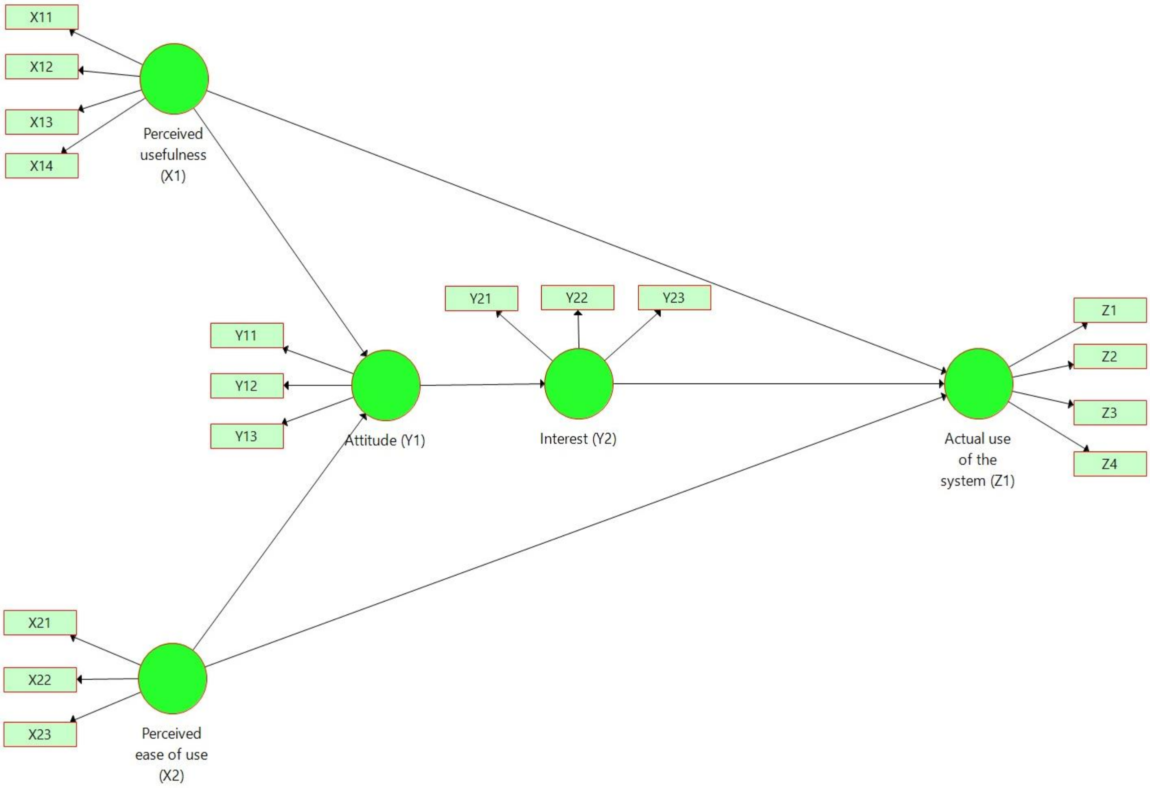

Figure 1. Factors influencing community behavior in managing mangrove forests.

The purpose of path analysis is to understand the structural relationships between various exogenous and endogenous variables, as well as the magnitude of direct and indirect effects and the total influence of the constructed model (Ghozali & Latan 2015). The SEM PLS model developed adheres to convergent validity criteria, with a loading factor greater than 0.7 and average variance extracted (AVE) exceeding 0.5. If the construct reliability is greater than 0.7 and the variance extracted is greater than 0.5, it indicates that the indicator variables are consistent (Rachbini et al 2020). Discriminant validity is assessed through cross-loading, where each indicator block should have higher loading values for the measured variables, with composite reliability greater than 0.7 (acceptable) and greater than 0.8 (very satisfactory) (Haryono & Wardoyo 2016). Cronbach's Alpha should exceed 0.6, with ranges indicating reliability levels: 0.42-0.60 (moderately reliable), 0.61-0.80 (reliable), and 0.81-1.00 (very reliable) (Dahlan 2014). For hypothesis testing, the bootstrapping resampling method was employed, running 5,000 iterations. A confidence level of 95% was used, resulting in α = 5% = 0.05 and a t-table value of 1.96. The hypotheses were defined as follows: H0 is accepted if the calculated t-value > t-table (t-table > 1.96) and the p-value < 0.05; H0 is rejected if the calculated t-value < t-table (t-table < 1.96) and the p-value > 0.05.

Results. One of the advantages of SEM PLS analysis is its ability to test models in theory. The stages in the SEM PLS data processing consist of: 1) evaluation of the outer model, 2) evaluation of the inner model, and 3) path coefficient. The following are the stages:

Evaluation of the outer model. The outer model is an assessment model for the variables that construct the research model. It consists of convergent validity (loading factor, AVE), discriminant validity (cross loading), composite reliability, and Cronbach's Alpha.

Validity testing (loading factor). The indicators of the latent variables that construct the model can be assessed formatively based on the loading factor. The results of the loading factor test are presented in Figure 2.

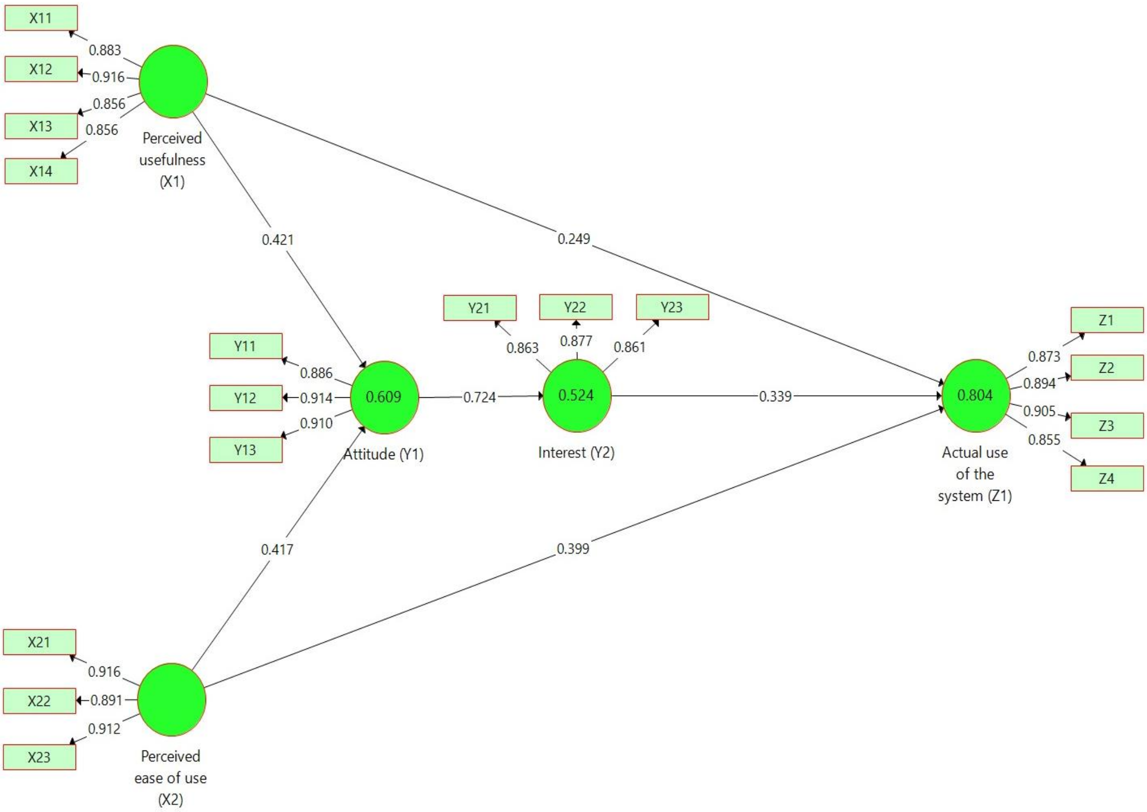

Figure 2. Outer loading factors influencing community behavior in managing mangrove forests.

Figure 2 shows that the indicators for each latent variable have values greater than 0.7. This means that the indicators can accurately measure the latent variables.

Average variance extracted (AVE). AVE is used to assess the average percentage of variance explained by each indicator of the latent variable. Table 1 shows the AVE values for the constructed model.

Table 1

Average variance extracted

Variable	*Average variance extracted*	*Information*
X1	0.771	Valid
X2	0.821	Valid
Y1	0.816	Valid
Y2	0.751	Valid
Z1	0.778	Valid

The results of AVE test show that all variables in the model have AVE values above 0.5, ranging from 0.751 to 0.821. These values indicate that each latent construct in the model is able to explain more than 50% of the variance in its indicators, thereby meeting the criteria for good convergent validity.

Discriminant validity (cross loadings). The cross-loading test aims to assess the correlation between each indicator and the latent variables used. The results of the cross-loading test are presented in Table 2.

Table 2

Cross loadings test

Variable	*Y2*	*Z1*	*X1*	*X2*	*Y1*
X11	0.62	0.748	0.883	0.655	0.612
X12	0.625	0.729	0.916	0.661	0.689
X13	0.561	0.608	0.856	0.654	0.619
X14	0,62	0.63	0.856	0.609	0.633
X21	0.705	0.783	0.7	0.916	0.697
X22	0.669	0.725	0.63	0.891	0.643
X23	0.698	0.774	0.664	0.912	0.632
Y11	0.668	0.591	0.635	0.627	0.886
Y12	0.606	0.57	0.617	0.632	0.914
Y13	0.683	0.684	0.713	0.704	0.910
Y21	0.863	0.721	0.651	0.672	0.643
Y22	0.877	0.703	0.596	0.664	0.61
Y23	0.861	0.694	0.549	0.646	0.628
Z1	0.704	0.873	0.71	0.754	0.62
Z2	0.743	0.894	0.671	0.757	0.636
Z3	0.729	0.905	0.705	0.748	0.592
Z4	0.7	0.855	0.65	0.702	0.562

Table 2 presents the results of the discriminant validity test using cross loadings, which show that each indicator has the highest loading value on its corresponding latent construct compared to other constructs. For instance, indicators X11 to X14 have the highest correlations with construct X1, indicators X21 to X23 with X2, Y11 to Y13 with Y1, Y21 to Y23 with Y2, and Z1 to Z4 with Z1. This pattern indicates that all indicators are more strongly associated with the constructs they are intended to measure, rather than with unrelated constructs.

Reliability test (composite reliability). The composite reliability test in SEM PLS aims to evaluate how well the indicators within the variable constructs perform. The results of the composite reliability test are presented in Table 3.

Table 3

Composite reliability

Variable	*Composite reliability (rho_a)*	*Composite reliability (rho_c)*	*Criteria*	*Information*
X1	0.931	0.931	> 0.7	Reliable
X2	0.893	0.932	> 0.7	Reliable
Y1	0.890	0.930	> 0.7	Reliable
Y2	0.835	0.901	> 0.7	Reliable
Z1	0.906	0.933	> 0.7	Reliable

All variables in the study have composite reliability values greater than 0.7, indicating that all variables are acceptable and meet the criteria for composite reliability.

Cronbach's Alpha test. Cronbach's Alpha is used to measure the consistency of the indicators that build the variables. A high Cronbach's Alpha value indicates better reliability. Table 4 shows the Cronbach's Alpha values for each variable.

Table 4

Cronbach's Alpha for behavior

Variable	*Cronbach's Alpha*	*Criteria*	*Information*
X1	0.901	> 0.6	Very reliable
X2	0.891	> 0.6	Very reliable
Y1	0.888	> 0.6	Very reliable
Y2	0.835	> 0.6	Very reliable
Z1	0.905	> 0.6	Very reliable

The results presented in Table 4 show the Cronbach's Alpha values for each variable in the model, namely X1, X2, Y1, Y2, and Z1. All variables have Cronbach's Alpha values above 0.8, exceeding the minimum reliability threshold of 0.6. These values, which range from 0.835 to 0.905, fall into the "very reliable" category. This indicates that each construct demonstrates strong internal consistency, meaning that the indicators forming each variable consistently measure the same underlying concept.

Evaluation of the inner model*.* The testing of the inner model consists of: R square (strong ≥ 0.67, moderate 0.33 ≤ 0.67, weak ≤ 0.33), Q square, and path coefficients. These three tests are useful for examining the relationships between variables.

R square. The feasibility of the constructed model is assessed using R square (to examine the impact of exogenous variables on latent and endogenous variables). Below are the results of the R square calculations (Table 5).

Table 5

Evaluation of the inner model (R square)

Variable	*R square*
Attitude (Y1)	0.609
Behavioral intention (Y2)	0.524
Actual system usage (Z1)	0.804

The endogenous variable attitude (Y1) and the endogenous variable actual system usage (Z1) are influenced by exogenous variables categorized as strong, while the endogenous variable behavioral intention (Y2) is influenced at a moderate level by the endogenous variables.

Q square. The Q square test aims to assess the model's ability to predict the values of the dependent variable based on independent variables. Table 6 shows the Q square values from the constructed model.

Table 6

Q square for community behavior

Variable	*Q square predict*
Attitude (Y1)	0.489
Behavioral intention (Y2)	0.389
Actual system usage (Z1)	0.620

As shown in Table 6, the Q-square values for the community behavior model are as follows: Attitude (Y1) has a Q-square value of 0.489, indicating moderate predictive power; Behavioral intention (Y2) has a Q-square value of 0.389, suggesting weaker predictive ability; and Actual system usage (Z1) has a Q-square value of 0.620, demonstrating stronger predictive capability. These results indicate that the model is able to predict the dependent variables to varying degrees, with actual system usage showing the highest level of predictive accuracy.

Coefficient. The path coefficient is used to assess the magnitude of the influence between variables (direct and indirect effects). A positive value indicates that the influence of the exogenous variable has a positive effect, and vice versa. The factors analyzed to determine the influence of coastal community behavior in the management of mangrove forests include the perception of benefits, the perception of ease, attitude, behavioral intention, and actual system usage. Therefore, a hypothesis test was conducted using bootstrapping with 5,000 iterations. The hypothesis test was performed by first resampling bootstrapping based on the established hypotheses, with a resampling level of 5,000 times.

Direct effects. The direct effects value represents the direct influence of exogenous variables on endogenous variables. The results of the direct effects analysis are presented in Table 7.

Table 7

Specific direct effects

No	*Variable*	*Original sample (O)*	*T statistics (O/STDEV)*	*P-values*	*Explanation*
1	X1 -> Y1	0.421	6.589	0.000	Significant
2	X1 -> Z1	0.249	5.325	0.000	Significant
3	X2 -> Y1	0.417	6.176	0.000	Significant
4	X2 -> Z1	0.399	6.346	0.000	Significant
5	Y1 -> Y2	0.724	18.039	0.000	Significant
6	Y2 -> Z1	0.339	5.288	0.000	Significant

The results in the Table 7 show that all direct relationships between the variables in the model are statistically significant, as indicated by p-values of 0.000 and T-statistics (O/STDEV) well above the common threshold of 1.96. Specifically, variable X1 has a significant direct effect on Y1 (O = 0.421, T = 6.589) and Z1 (O = 0.249, T = 5.325), while X2 also shows a significant influence on Y1 (O = 0.417, T = 6.176) and Z1 (O = 0.399, T = 6.346). Furthermore, Y1 significantly affects Y2 (O = 0.724, T = 18.039), and Y2 in turn has a significant direct effect on Z1 (O = 0.339, T = 5.288). These findings demonstrate strong and meaningful direct effects among the variables in the model, with the relationship between Y1 and Y2 showing the highest magnitude of influence. O/STDEV is the ratio between the original sample value (O) and the standard deviation (STDEV) obtained from the bootstrapping results in Partial Least Squares Structural Equation Modeling (PLS-SEM) analysis.

Indirect effects. The SEM PLS data processing results can show the indirect effects between exogenous variables, endogenous variables, and latent variables. The results of the indirect effects analysis are presented in Table 8.

Table 8

Specific indirect effects among latent variables in community behavior for mangrove management

No	*Variable*	*Original sample (O)*	*T statistics (O/STDEV)*	*P-values*	*Explanation*
1	X2 -> Y1 -> Y2 -> Z1	0.102	3.584	0.000	Significant
2	X2 -> Y1 -> Y2 -> Z1	0.103	4.342	0.000	Significant
3	X1 -> Y1 -> Y2	0.305	6.094	0.000	Significant
4	X2 -> Y1 -> Y2	0.302	5.545	0.000	Significant
5	Y1 -> Y2 -> Z1	0.245	5.316	0.000	Significant

The Table 8 presents the results of the indirect effects analysis in the SEM-PLS model, indicating that all mediation pathways between exogenous and endogenous latent variables in the context of community behavior toward mangrove management are statistically significant. This is evidenced by the p-values of 0.000 and T-statistics (O/STDEV) that far exceed the minimum threshold of 1.96. The indirect path from X2 to Z1 through Y1 and Y2 shows two highly consistent estimates (O = 0.102 and 0.103; T = 3.584 and 4.342), demonstrating the robustness of the results. In addition, the paths from X1 to Y2 through Y1 (O = 0.305; T = 6.094) and from X2 to Y2 through Y1 (O = 0.302; T = 5.545) are also found to be significant. Likewise, the mediating role of Y2 in the relationship between Y1 and Z1 (O = 0.245; T = 5.316) is confirmed as significant. These findings highlight the crucial role of the mediating variables Y1 and Y2 in facilitating the indirect influence among the latent variables in the model of community behavior toward mangrove ecosystem management.

Factors influencing coastal community behavior in mangrove forest management

Influence of perception of benefits on attitude in mangrove forest management. The perception of benefits variable has a significant influence on mangrove forest management (t-value of 6.589). The perception of benefits has a path coefficient of 0.421 (indicating a positive relationship with attitude); the higher the perception of benefits, the more it enhances community attitudes towards mangrove forest management. The community in Teluk Pambang village believes that efforts in mangrove forest management will have positive impacts (both direct and indirect) on the community, with several positive effects being felt by the people. The community in Teluk Pambang village assesses the condition of the mangrove trees in their area as quite good, with a high density compared to neighboring villages. This positively impacts the productivity of the mangrove plants, including variations in species, trunk circumference, leaves, and fruit. Furthermore, the presence of mangroves provides significant economic benefits; fishermen who rely on this ecosystem directly experience increased income, as it offers habitats for various marine species such as fish, shrimp, and crabs. Indirectly, the increased income for fishermen also stimulates the growth of microenterprises in the village, as they have greater purchasing power for their daily needs. Additionally, mangroves play a crucial role in carbon trading, with one hectare of mangrove forest capable of absorbing 110 kg of carbon, thus contributing to national revenue. The community also recognizes the positive environmental impacts of mangroves, such as reducing wind velocity, preventing erosion, maintaining freshwater quality, and absorbing carbon dioxide. From a social perspective, the management of mangrove forests has established strong institutional frameworks, including community groups involved in management, the implementation of village regulations, enforcement against illegal logging, collaboration in restoration efforts, and agreements to prohibit the illegal use of mangrove wood.

Influence of perceived ease on attitude in mangrove forest management. The perception of benefits significantly influences mangrove forest management, with a t-value of 6.176. The perception of benefits variable has a path coefficient of 0.417, indicating a positive relationship with attitudes; as the perception of benefits increases, so does the attitude toward mangrove forest management. Below are the specific indicators that build the perceived ease variable. The ease of obtaining information about mangrove plants greatly assists the community of Teluk Pambang village in managing their mangrove forests, with primary sources of information coming from partners such as the Riau Provincial Environmental Agency, the Bengkalis District Forest Management Office, the Nature Conservation Foundation (YKAN), and local mangrove management organizations (LPHD, MMP, and KPM). The information received includes management techniques, ecological knowledge, regulations, and the creation of village regulations. The presence of these partners also supports community understanding through direct assistance in management practices, which enhances work effectiveness (Barlian et al 2018; Fadhillah et al 2019). Additionally, the partners play a crucial role in promoting community independence, evident from the application of information in establishing mangrove management institutions, creating protective regulations, and developing ecological databases.

The influence of perceived benefits on actual system usage in mangrove forest management. Perceived benefits significantly influence mangrove forest management, with a t-value of 5.325. The perceived benefits variable shows a path coefficient of 0.249, indicating a positive relationship with actual system usage; as the perception of benefits increases, so does the actual usage of the system in managing mangrove forests. The community's positive perception of the benefits of mangrove forests includes increased productivity (dense growth), increased income (both direct and indirect), improved environmental quality (positive impacts of mangrove forests), and enhanced community relationships (institutional development and mangrove protection). This demonstrates that the mangrove ecosystem in Teluk Pambang village provides significant ecological and economic benefits to the environment and enhances community welfare. The primary products from the mangrove forests, such as fish, shellfish, shrimp, crabs, and fruits, are mainly used for family consumption to meet dietary protein needs, and any surplus is sold to the local community. The proceeds from these sales are used to fulfill additional needs (Alnursa 2023).

The influence of perceived ease on actual system usage in mangrove forest management. Perceived ease significantly influences mangrove forest management, with a t-value of 6.346. The perceived ease variable shows a path coefficient of 0.399, indicating a positive relationship with actual system usage; as the perception of ease increases, so does actual system usage in managing mangrove forests. Perceived ease in understanding information is reflected in the ease of obtaining information (from sustainable partners), the ease of comprehending information (through in-depth explanations), and the ease of applying information (via assistance), all of which positively impact the management organizations (LPHD, MPP, KPM) in the direct management of mangrove forests. The mangrove ecosystem in Teluk Pambang village is managed under LPHD. The management organization for the mangrove ecosystem in Teluk Pambang takes the form of a mangrove management group (KPM). Currently, LPHD has established good cooperation with both government and non-governmental organizations (NGOs) in managing the mangrove ecosystem. This collaboration reflects that the mangrove management organization maintains a positive image in executing partnerships (Alifiah & Roesminingsih 2018).

The influence of attitude perception on interest in mangrove forest management. Attitude has a significant influence on mangrove forest management, with a t-value of 18.039. The attitude variable shows a path coefficient of 0.724, indicating a positive relationship with interest; as attitudes improve, interest in mangrove forest management also increases. The assistance activities carried out by partners have a positive impact on the community's interest, concern, and confidence in participating in the implementation of Village Regulation No. 07 regarding the protection and management of mangroves, as well as in preventing illegal logging. Community interest in mangrove forest management is also driven by carbon trading issues. Mangrove forests are among the highest carbon-storing ecosystems in tropical regions compared to other forest types (Donato et al 2011), presenting an opportunity for carbon trading if reducing emissions from deforestation and forest degradation (REDD+) schemes can be implemented (Asmani 2012). The economic value of carbon approach, through carbon incentives, encourages community involvement in mangrove forest management.

The influence of interest on actual system usage in mangrove forest management. Interest has a significant influence on mangrove forest management, with a t-value of 5.288. The interest variable shows a path coefficient of 0.339, indicating a positive relationship with actual system usage; as interest increases, so does the actual usage of the system in managing mangrove forests. Community interest is influenced by concern, confidence, and satisfaction regarding mangrove forest management. The community perceives that mangroves can protect Teluk Pambang village from abrasion and strong winds from the sea. Additionally, mangrove vegetation plays a role in reducing the threat of tsunamis (Alongi 2008). Past experiences and teachings have led the community to pay more attention to mangrove forests (Barbier et al 2011; Donato et al 2011; Alongi 2014). In the past, some residents lived by the coast, but due to erosion, they moved to higher ground. Collaborative management of mangrove forests with partners has greatly helped the community understand the importance of the mangrove ecosystem, thereby increasing participation in planting, maintenance, monitoring, and adherence to regulations. Community involvement in managing, preserving, and protecting mangrove resources aims to maintain the health of mangrove forests and coastal ecosystems. Direct engagement and involvement of the community can restore the functions of mangroves (Damastuti et al 2022; Sathiyamoorthy & Sakurai 2024).

Conclusions. Based on an in-depth analysis of the factors influencing the behavior of coastal communities in the management of mangrove forests, it can be concluded that several key interrelated elements contribute to community engagement. First, the perception of benefits has a significant impact on community attitudes, with a t-value of 6.589 and a path coefficient of 0.421. This indicates that the higher the community's perception of the benefits of mangrove forests - such as increased productivity and economic welfare - the more positive their attitudes toward the management of these forests. Furthermore, the perception of ease also significantly contributes to attitudes, with a t-value of 6.176 and a path coefficient of 0.417. When communities feel that mangrove management can be carried out easily, it encourages them to participate more actively. In addition, positive attitudes toward mangrove forest management significantly influence interest, with a t-value of 18.039 and a path coefficient of 0.724. This shows that communities with favorable attitudes are more likely to have a higher interest in engaging in management activities. This interest, in turn, has been shown to positively affect actual system usage, with a t-value of 5.288 and a path coefficient of 0.339. Community interest is influenced by factors such as concern, confidence, and satisfaction with the outcomes of the management efforts undertaken.

Factors such as perceived benefits, ease of access, attitudes, and interest interact with each other and shape community behavior in the management of mangrove forests. Therefore, it is essential to enhance public understanding of the benefits of mangrove forests and to provide easy access to information and training. Steps that can be taken include developing educational programs focused on the ecological and economic benefits of mangrove forests, ensuring easy access to information related to best practices, and providing training and support to empower the community. Additionally, adequate support from the government and relevant institutions is crucial to create policies that promote sustainable mangrove forest management.

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Conflict of interest. The authors declare that there is no conflict of interest.

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