

Mangrove Ecosystem sustainability Effort in Essential Ecosystem Areas (KEE) of Teluk Pangpang Banyuwangi Regency

Yanuar Yogha Pradana¹, Farida Pulansari², Rosyda Priyadarshini³

^{1,2}Master Program in Environmental Science, Faculty of Engineering, Universitas Pembangunan Nasional Veteran Jawa Timur, ³Department of Agrotechnology, Faculty of Agriculture, Universitas Pembangunan Nasional Veteran Jawa Timur, Indonesia

Email: yoga.upnvjt@gmail.com

ARTICLE INFO

ABSTRACT

Date received:

Revision date:

Date received:

Keywords:

Mangrove, AHP, KEE Teluk Pangpang, Kedunggebang, Banyuwangi, Effort

This study aims to determine priority alternative efforts in managing the mangrove ecosystem of KEE Teluk Pangpang Kab. banyuwangi. Process Hierarchy Analysis or AHP is used to determine priority alternatives in efforts to sustain mangrove ecosystems. A total of six (6) people who were expert informants were taken as respondents using purposive sampling consisting of community leaders, heads of Fishermen's groups, heads of Farmers' groups, Fisheries Service, and Academics. The results of the analysis show that for an alternative to violence, the mangrove ecosystem KEE Teluk Pangpang (Kedunggebang Village), Kab. banyuwangi, the main factor that must be considered is social (weight value = 0.689) with the most important aspect including involving community participation in the management of mangrove ecosystems (weight value = 0.701). Meanwhile it shows that alternative priority scales and efforts to sustain the mangrove ecosystem of KEE Teluk Pangpang (Kedunggebang Village) Kab. Banyuwangi with AHP, namely the order of priority is Ecotourism (weight value = 0.429), Silvofishery (weight value = 0.377) and Traditional Fisheries (weight value = 0.194). Thus, alternative ecotourism efforts are a top priority in the sustainability of the mangrove ecosystem of KEE Teluk Pangpang (Kedunggebang Village) Kab. Banyuwangi. Ecotourism In terms of ecosystem sustainability, it is defined as an alternative tourism product that has the goal of developing sustainable tourism, namely tourism development that is ecologically feasible and ethically just and provides social benefits to the community.

INTRODUCTION

Pangpang Bay is one of the coastal areas that has mangrove resources in Banyuwangi Regency. In 1989 the western part of KEE Teluk Pangpang Banyuwangi Regency had a mangrove area of \pm 207.5 Ha and increased its area to \pm 282.8 Ha in 2011, the area of the entire mangrove area of the western part of KEE Teluk Pangpang Banyuwangi Regency is currently 571.68 Ha. The increase in mangrove area is the result of rehabilitation carried out since 2000. The mangrove area of Pangpang Bay is designated as one of the essential ecosystems in Indonesia, because it is the only remaining mangrove area on the east coast of East Java Province. This mangrove area has a fairly good area and diversity of flora and fauna. In this mangrove area, there are various mangrove species and bird species that are protected and endangered (Rodiana, 2019).

The mangrove ecosystem in Pangpang Bay KEE is a conservation area outside the nature conservation area, where mangrove management is carried out by the Pangpang Bay KEE Management Forum of Banyuwangi Regency (East Java Governor's Decree on the management of Pangpang Bay KEE, 2021). The existence of the potential natural resources of the Pangpang Bay mangrove ecosystem will be a threat to mangrove sustainability if it is not balanced with a sustainable community-based mangrove conservation management system. One of the important factors in the sustainable management and protection of mangrove ecosystems is public perception which includes knowledge, attitudes and community behavior towards the mangrove ecosystem itself in ecological, social and economic dimensions (Hewindati, 2018). Personal communication with the Head of Kedunggebang Village (2022) during the survey of the research site stated that "the people of Kedunggebang Village are active in utilizing the ecology of the Pangpang Bay mangrove ecosystem, but do not make it their core livelihood, sometimes go to sea, sometimes become agricultural laborers, sometimes take care of ponds and so on according to their profit opportunities and according to the season". The relationship between the community and the existence of this mangrove ecosystem causes public perception in preserving and maintaining mangrove ecosystems, so that the mangrove ecosystem can be maintained (Satoinong, 2022). However, it can also be a potential threat to the sustainability of the KEE mangrove ecosystem in Pangpang Bay, Banyuwangi Regency due to the rapid growth of coastal community activities in the mangrove ecosystem, resulting in an increasing need for land for agriculture, aquaculture, and other uses. (Neka, 2019). Therefore, mangrove ecosystem management by combining ecological, economic and social priorities is the key to success (Haris, et al, 2021)

The Mangrove Ecosystem of KEE Teluk Pangpang Kab. Banyuwangi is very identical to Wringinputih Village, which is located in Muncar District. Because the beginning of mangrove replanting (reforestation) in Pangpang Bay was in Wringinputih Village which since 1998, this was initiated by local residents and the help of various parties. Personal communication with Arupa NGO Research Staff at the research location explained, various activities in the mangrove ecosystem that make attention by various parties in Wringinputih Village if compared with 2 (two) other villages in KEE Teluk Pangpang Kab. Banyuwangi there will be considerable differences. one example is mangrove ecosystem research activities and community service activities related to mangrove ecosystems from various institutions in KEE Teluk Pangpang, so far only found in Wringinputih Village and some Kedungasri Village activities, there have been no research activities and community service activities on mangrove ecosystems in Kedunggebang Village. The choice of location must be based on considerations of attractiveness, uniqueness, and compatibility with the chosen topic (Sidiq, 2019), therefore the selection of research sites is carried out in Kedunggebang Village, Tegaldlimo District due to considerations of novelty or uniqueness in the field of mangrove ecosystem research that has existed so far in KEE Teluk Pangpang, Banyuwangi Regency which often exists in Wringinputih Village.

Alternative efforts to sustain mangrove ecosystems can be done by determining priorities for ecosystem planning and development and developing potential areas with the potential of natural resources owned and the availability of facilities and infrastructure in mangrove ecosystems. In designing alternative efforts for the sustainability of the mangrove ecosystem, KEE Teluk Pangpang, Banyuwangi Regency needs to involve the role of the community by prioritizing alternative efforts to sustain the mangrove ecosystem that supports the sustainability of the mangrove ecosystem. For this reason, this study aims to determine the priority of alternative efforts to sustain the mangrove ecosystem of KEE Teluk Pangpang (Kedunggebang Village) Banyuwangi Regency.

The method used to prioritize alternative efforts for the sustainability of mangrove ecosystems in KEE Teluk Pangpang, Banyuwangi Regency is to use the Analytical Hierarchy Process (AHP) for priority or strategy design because it can solve multi-objective and multi-criteria problems and is very flexible, especially in making hierarchies (Falatehan, 2007 in Mirza, 2022).

Some of the advantages of using AHP as an analytical tool are:

1. Provide a single model that is easy to understand.
2. Combining deductive design and system-based design in solving complex problems.
3. Give a scale in measuring things that do not materialize to get priority.

4. Can handle the interdependence of elements in a system and does not impose linear thinking.

The weakness of AHP is that it cannot be optimally used to solicit opinions from all components of society, because it will be too biased towards variables or criteria that have been tested (allegedly) before (Setiawati, 2019).

METHOD

This research was carried out from November 2022 to February 2023 at KEE Teluk Pangpang, Kedunggebang Village, Tegaldlimo District, Banyuwangi Regency (Figure 1). Kedunggebang Village, Tegaldlimo District which is located between LS 18°28'12"-114°21'28" and BT 114°18'12"-114°21'28". Kedunggebang Village, Tegaldlimo District, administratively, the village is divided into 3 (three) hamlets, namely Damtelu Hamlet, Krajan Hamlet and Kedungsumur Hamlet (Kedunggebang Village Profile Document, 2022).

Geographically, Kedunggebang Village has 4 (four) adjacent boundaries, namely the north bordering Wringinputih Village and Sumberberas Village (Muncar District), the south bordering Kedungwungu Village and Kedungasri Village (Tegaldlimo District), the west bordering Tegaldlimo Village and Wringinpitu Village (Tegaldlimo District) and the east bordering the waters of Pangpang Bay, Banyuwangi Regency.

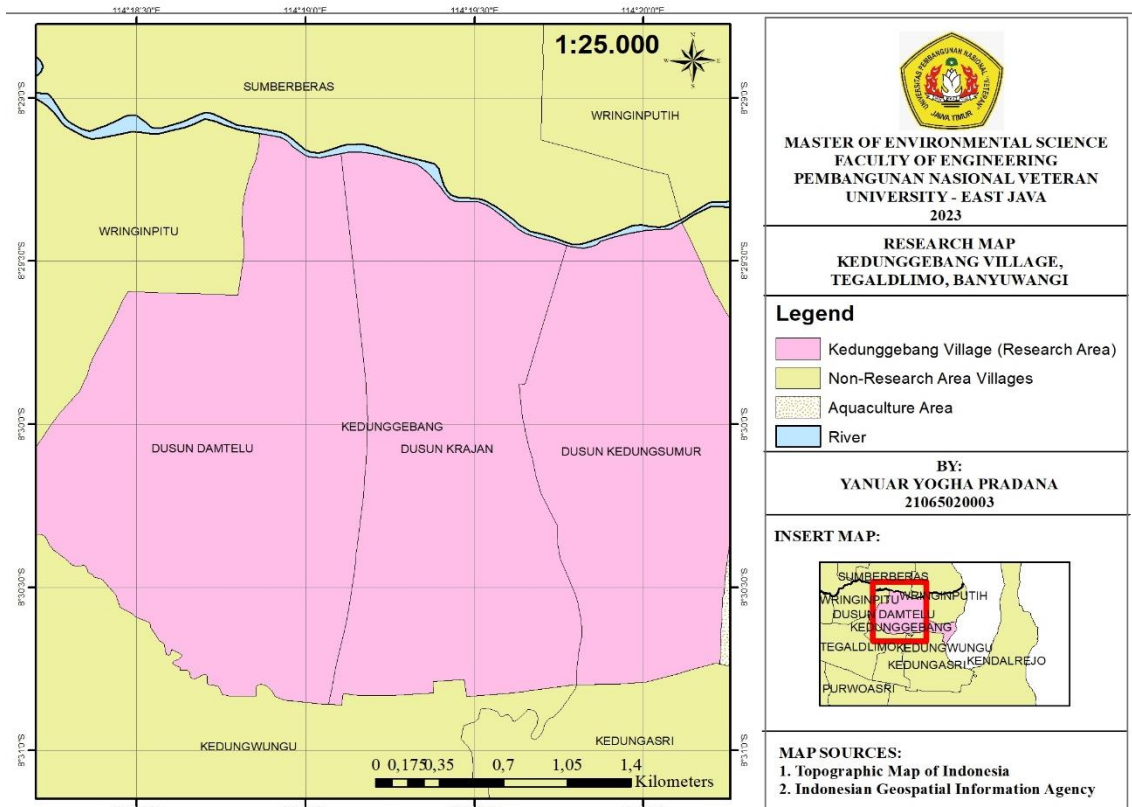


Figure 1. Map of Research Location

Process Hierarchy Analysis expanded by Thomas L. Saaty (1990) in Setiawati (2019) is intended to create a problem model that has no structure, usually set to solve measurable problems, problems that require judgment *or* in complex situations, *in* situations where data, statistical information is very minimal or not at all and only qualitative based on perception, experience or intuition. AHP is also widely used in decision making for many criteria, planning, resource allocation and prioritization of strategies that players have in conflict situations. The principles in solving problems with AHP are:

- a) The principle of arranging hierarchy (*Decomposition*), which is solving the problem as a whole into the smallest parts. If you want a more precise result, problem solving can be done on the smallest parts, from which problems will be obtained based on certain groups.
- b) The principle of determining the most important (*Comparative Judgment*), Giving a value about the relative importance of two parts at a certain level related to the level above.
- c). The principle of logical *consistency*, several similar objects can be classified according to uniformity and relevance.

With the hierarchy process, it can be easier to design priorities or strategies because it can solve *multi-objective and multi-criteria* problems and is very flexible, especially in making hierarchies (Falatehan, 2007 in Mirza, 2022). The AHP method is based on estimating the relative priorities of paired (weights, importance, preferences) criteria against goals and alternatives for each (sub)criterion. A paired comparison matrix for criteria with respect to purpose, and a paired comparison matrix for alternatives (one matrix for each criterion) are generated using the pair-pair comparison scale shown in Table 1. The AHP method can also be used to assess directly from criteria regarding objectives and alternatives regarding each criterion, which is implemented in the study only on the criteria of interest in the research.

Table 1. Scale of appeal in pairs

Importance	Definition	Information
1	Equally important	Both elements have the same influence.
3	A little more important	Experience and judgment strongly favor one element compared to one's partner.
5	More importantly	One element is very likable and practically its dominance is very real, compared to its counterpart element.
7	Very important	One element proved to be very likable and practical very likable, compared to its counterpart elements.
9	Absolutely more important	One element is absolutely preferable to its counterpart, at the highest level of confidence.
2,4,6,8	Middle values between two adjoining opinions	These values are necessary for a compromise
Opposite	If element <i>i</i> has one of the numbers above when compared to element <i>j</i> , then <i>j</i> has its opposite when compared to <i>i</i> .	

The hierarchical analysis compiled in this study consists of 4 (four) levels, where the first level is the goal, then the second level is in the form of criteria, which is followed by the third level in the form of sub-criteria, and the last or fourth level in the form of alternatives. The sample of this study is an expert or expert informant consisting of elements: head of fishermen group, head of farmer group, fisheries extension worker, academician or lecturer of fisheries and coastal communities. The instrument used for the AHP study is a questionnaire designed based on the AHP method. In this analysis, the inconsistency ratio value should be <0.1; if >0.1, then the questionnaire should be repeated (Saaty, 1990 in Wibowo, 2022). The AHP approach uses the Saaty scale (Saaty, 1990 In Singgalen, 2022) with weighted values of 1-9. The weight value 1 represents "equal importance", this indicates that the value of the attribute has the same scale, the weight value is 1; the weight value 9 represents the case of the attribute being "absolute importance" compared to other scales (Table 1).

The questionnaire used in the AHP study was a matrix with a pairwise comparison (Figure 2). Each criterion, sub-criterion and alternative (Table 2) is compared with each other. Then a scale of 1-9 is used in the evaluation and is the opposite of table 1.

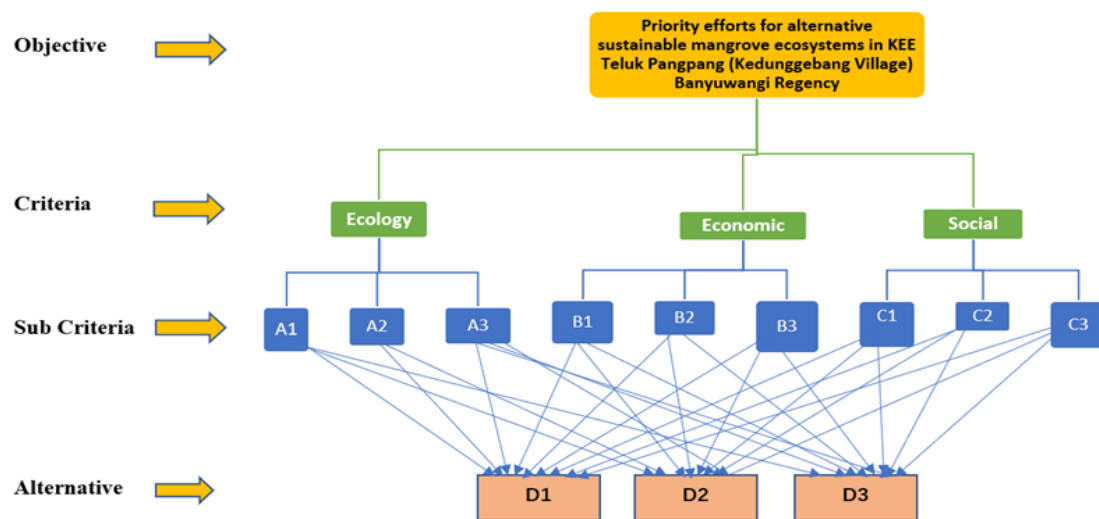


Figure 2. Hierarchy Structure of Mangrove Ecosystem Sustainability

Table 2. Description of AHP Hierarchy

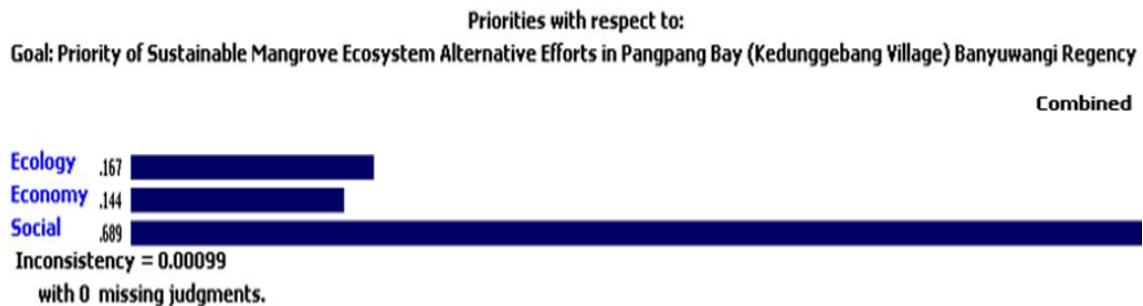
Purpose	Description
Purpose	Reviewing Alternative Efforts for Priority Sustainability of Mangrove Ecosystems KEE Teluk Pangpang (Kedunggebang Village) Banyuwangi Regency
Criterion	
1	Ecology
2	Economics
3	Social
Sub criteria	
A1	Increase the diversity of vegetation structure of mangrove ecosystems
A2	Rehabilitating the vegetation structure of mangrove ecosystems
A3	Maintaining shoreline abrasion by conserving mangrove ecosystems
B1	Increase the use of mangrove ecosystems for local communities
B2	Increase community income for local UMR
B3	Increase other incomes of the community
C1	Increase public knowledge of mangrove ecosystems
C2	Involving community participation for mangrove ecosystem management
C3	Uphold local wisdom & available policies / rules on mangrove ecosystem management
Alternative	
D1	Ecotourism
D2	Silvofishery
D3	Traditional fisheries

RESULTS AND DISCUSSION

The study of priority efforts for the sustainability of mangrove ecosystems in KEE Teluk Pangpang, Banyuwangi District, Kedunggebang Village is determined based on the dimensions of mangrove ecosystem sustainability which refers to modifications from Pitcher & Preikshot (2001)

in Kuvaini (2019) and based on considerations after field observations (Wibowo, et al, 2022), The accuracy of choosing issues to be raised from the field is the key to successful analysis

Based on the *Analytic Hierarchy Process* (AHP) on the study of priority efforts for the sustainability of mangrove ecosystems in KEE Teluk Pangpang, Banyuwangi Village, Kedunggebang Village, there are three (3) aspects, namely: (1) ecological aspects (weight value = 0.167), (2) economic aspects (weight value = 0.144) and (3) social aspects (weight value = 0.689). Based on the results of AHP analysis with *Expert Choice* 11, it was obtained that the Social Aspect (with a weight value = 0.689) is the main aspect to be considered in the study of priority efforts for the sustainability of mangrove ecosystems in KEE Teluk Pangpang, Banyuwangi District, Kedunggebang Village. This weighting value is obtained from *expert* informants who assess actual conditions in the field, namely the need to increase public knowledge of mangrove ecosystems, involve community participation for mangrove ecosystem management, uphold local wisdom & policies / rules available on mangrove ecosystem management. This shows that the sustainability of mangrove ecosystems is determined by community-based and institutional mangrove management patterns. Thus, the essential value of the area can be utilized positively and sustainably for the surrounding community. Similar results are in line with research on mangrove ecosystem sustainability strategies on Seram Island by Pattimahu (2010) in Muhsimin (2018), namely aspects that get top priority, namely social aspects, because the social dimension is considered less than optimal in supporting the sustainability of mangrove ecosystems.



Source: output expert choice 11;

Figure 3. Priority for mangrove ecosystem sustainability efforts in KEE Teluk Pangpang, Banyuwangi District, Kedunggebang Village

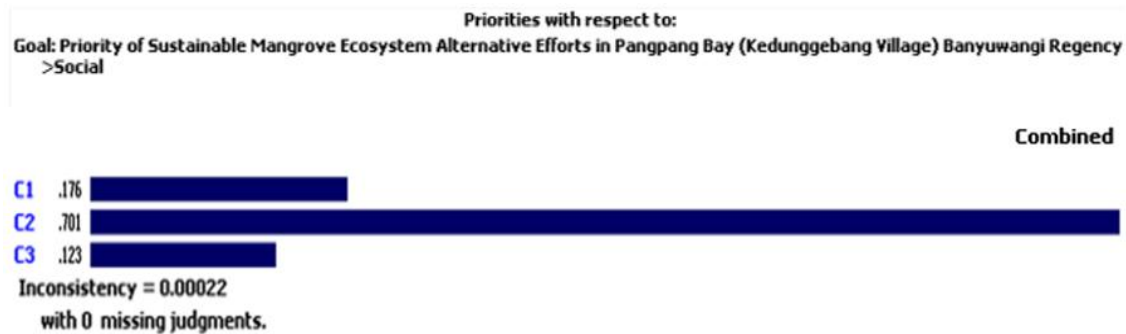
The value of the inconsistency ratio is $0.00099 < 0.1$ (maximum limit) which means that the results of the analysis can be accepted. Every aspect that needs to be considered in an alternative effort to prioritize the sustainability of mangrove ecosystems in KEE Teluk Pangpang, Banyuwangi District, Kedunggebang Village and its weight value is presented in Figure 3.

The first aspect that needs to be considered in efforts to sustain mangrove ecosystems in KEE Teluk Pangpang, Banyuwangi District, Kedunggebang Village is the Social Aspect. Based on Figure 3, the highest priority scale in social aspects is involving community participation for mangrove ecosystem management (weight value 0.701). The weight value is obtained from *expert* informants who view the conditions in the field that community participation is needed for mangrove ecosystem management. Inconsistency ratio = $0.00022 < 0.1$ (maximum limit) which means that the results of the analysis are acceptable.

Every aspect considered in efforts to sustain mangrove ecosystems in KEE Teluk Pangpang, Banyuwangi District, Kedunggebang Village and its weight value can be seen in Figure 4. Based on Figure 4. It can be explained that for the sustainability of mangrove ecosystems, community participation is needed for mangrove ecosystem management. Where the participation of local communities is in accordance with the perception of high-category communities (Figure 4) on the existence of mangrove ecosystems so that the role of these communities can be involved in formulating regulations, regulations or policies for sustainable mangrove ecosystem management, especially in Kedunggebang Village.

Direct community participation in every development activity is a form of social interaction that is very important in determining a success in development in each sector. According to Suryani

research (2020) that in the management of mangrove ecosystem areas, cooperation between the community and stakeholders is needed in order to create ecosystem balance in mangrove ecosystem areas for sustainable development. The KEE Management Forum of Teluk Pangpang Kab. Banyuwangi and stakeholders must manage the role of the community as an internal strength as an opportunity to ensure the sustainability of the mangrove ecosystem.



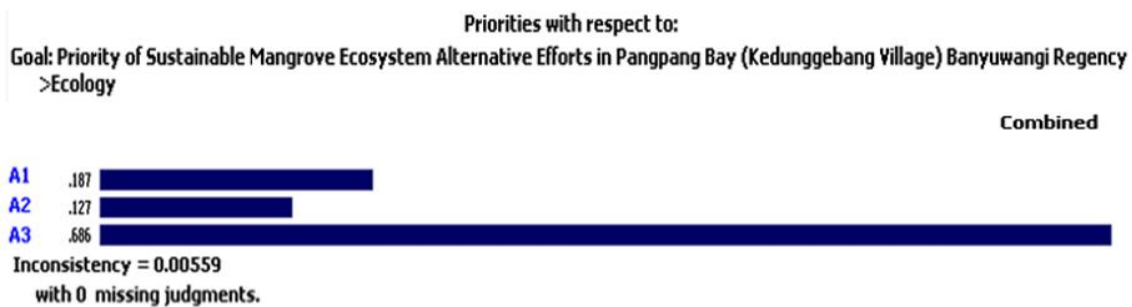
Source: output expert choice 11;

Information:

- C1 = Increase public knowledge of mangrove ecosystems
- C2 = Involving community participation for mangrove ecosystem management
- C3 = Upholding local wisdom & available policies on mangrove ecosystem management

Figure 4. Alternative efforts to prioritize social aspects

Community involvement in the management of mangrove ecosystems that are classified as high can be increased in capacity to prevent activities that damage mangrove ecosystems, such as increasing the efficiency of implementing sanctions for mangrove ecosystem destruction and formulating mangrove ecosystem sustainability policies or regulations. In addition, the involvement of existing communities can be increased their knowledge about the sustainability of mangrove ecosystems so that people feel they own, maintain, care for and supervise activities in mangrove ecosystems so that the sustainability of mangrove ecosystems in KEE Teluk Pangpang, Banyuwangi District, Kedunggebang Village can be maintained.



Source: output expert choice 11;

Information:

- A1 = Increase the diversity of mangrove ecosystem vegetation structure
- A2 = Rehabilitating the vegetation structure of mangrove ecosystems
- A3 = Maintaining shoreline abrasion by conservation of mangrove ecosystems

Figure 5. Alternative efforts to prioritize ecological aspects

The Pangpang Bay KEE Management Forum can communicate to all stakeholders including the community in sustainable mangrove ecosystem management at the stage of socialization, planning, implementation, and supervision in accordance with the management action plan and action plan for the protection of the Pangpang Bay EEC for 2021 – 2025.

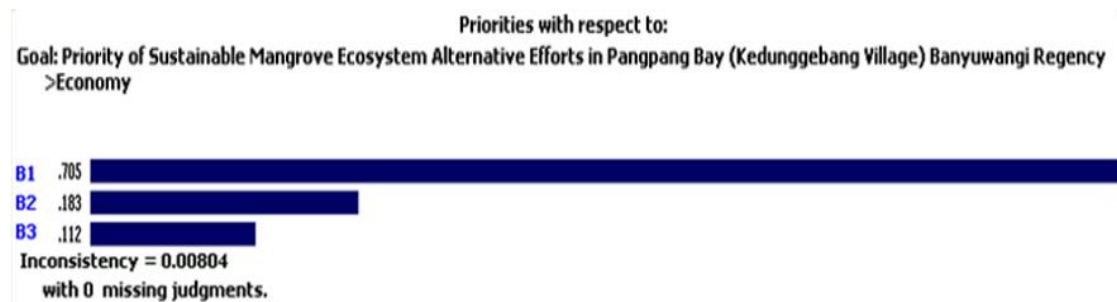
The second aspect that needs to be considered in an alternative effort to prioritize the sustainability of the mangrove ecosystem KEE Teluk Pangpang, Banyuwangi District, Kedunggebang Village is the Ecological Aspect. Based on Figure 5, the highest priority scale in ecological aspects is Maintaining shoreline abrasion with mangrove ecosystem conservation (weight value 0.686). The

weight value is obtained from *expert* informants who view conditions in the field that it is very necessary to maintain shoreline abrasion with mangrove ecosystem conservation. Inconsistency ratio = $0.00559 < 0.1$ (maximum limit) which means that the results of the analysis can be accepted. Every aspect considered in the management of coastal areas in Banggi Market, Rembang Regency along with their weight values can be seen in Figure 5.

The results of the analysis show that maintaining shoreline abrasion in the mangrove ecosystem of KEE Teluk Pangpang, Banyuwangi District, Kedunggebang Village must be done to maintain the survival of the people in the area by conserving mangrove ecosystems. Important implications of this point are maintaining the integrity of the coastline from potential abrasion useful for mangrove ecosystem conservation, increasing the diversity of mangrove vegetation structure and improving measurable mangrove vegetation rehabilitation programs. The results of the analysis are in line with the research of Marasabessy, et al (2018) in Wibowo (2022) that environmental (ecological) factors have priority in mangrove ecosystem management.

The third aspect that needs to be considered in an alternative priority effort for the sustainability of the mangrove ecosystem KEE Teluk Pangpang, Banyuwangi District, Kedunggebang Village is the Economic Aspect. Each criterion on the Economic Aspect considered in the sustainability of mangrove ecosystems and their weight values can be seen in Figure 6.

Based on Figure 6, the highest priority scale in the economic aspect is to increase the use of mangrove ecosystems for local communities (weighted value 0.705). This weight value is obtained from *expert* informants who view conditions in the field that it is very necessary to maintain coastline abrasion with mangrove ecosystem conservation. It can be concluded that the economic aspect by increasing the use of mangrove ecosystems for local communities needs to be improved to increase income and welfare of environmentally friendly people in mangrove ecosystems.



Source: *output expert choice 11*;

Information:

- B1: Increase the use of mangrove ecosystems for local communities
- B2: Increase community income for local UMR
- B3: Increase people's other income

Figure 6. Alternative efforts to prioritize economic aspects

Human activities in utilizing mangrove ecosystems have both positive and negative impacts on resources and the environment around mangroves. Mangrove forest destruction is caused by uncontrolled use, because the dependence of people who occupy coastal areas is very high and the conversion of mangrove forests for various purposes (plantations, ponds, settlements, industrial areas, tourism) without considering their sustainability and function to the surrounding environment (Siahaan, 2021). Therefore, informal education such as counseling and training needs to be organized by the KEE Management Forum Teluk Pangpang Kab. Banyuwangi and stakeholders to increase community insight by equipping knowledge and skills to create added value from mangrove utilization, increase the role in management and reduce adverse interventions in mangrove ecosystems. Inconsistency ratio = $0.00804 < 0.1$ (maximum limit) which means the results of the analysis are acceptable.

The results of the overall analysis of the priority scale, criteria and alternatives for the sustainability of the mangrove ecosystem of KEE Teluk Pangpang, Banyuwangi Regency with the *Analysis Hierarchy Process (AHP)* can be seen in Figure 7. From the picture, it can be seen that the three priorities in management by looking at all aspects and alternatives are Ecotourism (weight

0.429), The value gain is obtained from *expert* informants who assess that the output of increasing community participation for mangrove ecosystem management is the most priority in the form of ecotourism. Thus, it can improve social aspects in the sustainable management of mangrove ecosystems.

Combined instance -- Synthesis with respect to:
 Goal: Priority of Sustainable Mangrove Ecosystem Alternative Efforts in Pangpang Bay (Kedunggebang Village) Banyuwangi Regency
 Overall Inconsistency = .00



Source: *output expert choice 11*;

Information:

- D1: Mangrove ecotourism management
- D2: *Silvofishery* management in mangrove ecosystems
- D3: Traditional fisheries management (*Artisinal Fisheris*)

Figure 7. Alternative Priorities for Mangrove Ecosystem Sustainability Efforts KEE Teluk Pangpang Kab. Banyuwangi Kednggebang Village

The next alternative priorities are silvofhisery (0.377 weight) and Artisanal Fisheries (0.194 weight). The overall inconsistency ratio value (overall analysis) is $0.00 < 0.1$ (maximum limit) which means that the results of the analysis can be accepted. More details can be seen in Figure 7. Based on Figure 7, it can be seen that the top priority in coastal area management is Ecotourism. These results are in accordance with Rodiana (2019) The suitability of mangrove ecosystems in their carrying capacity for mangrove ecotourism based on mangrove density, mangrove types, tides and biota objects in appropriate categories. Ecotourism In terms of ecosystem sustainability dimension, it is defined as one of the alternative tourism products that has the aim of building sustainable tourism, namely tourism development that ecologically provides economically feasible and ethically fair benefits, and provides social benefits to the community (Azizih, 2020). Meanwhile, according to Dewi (2021), ecotourism is a community activity in the form of responsible visits to natural areas that keep the environment in its original state and promote the welfare of the local community.

According to Noor (2020), ecotourism is one option to promote an environmental ecosystem that is maintained naturally, as well as an area for tourist visits and environmental development based on nature maintenance and conservation.

According to Vathurohman (2022), Ecotourism according to TIES (*The International Ecotourism Society*), has 8 (eight) pillars in the development of ecotourism-based destinations. The eight pillars include the following:

- 1.Minimize physical, social, behavioral, and psychological impacts
- 2.Build awareness and respect for culture and the environment
- 3.Provide direct economic benefits for conservation
- 4.Provide a positive experience for tourists and local communities
- 5.Provide economic benefits for local communities
- 6.Provide travellers with memorable interpretive experiences that help increase sensitivity to political, environmental and social climates
- 7.Design, build, and operate low-impact facilities
- 8.Recognize the spiritual rights and beliefs of indigenous people in the destination

The second priority is *Silvofhisery*. In line with the results of Wijaya's research (2019), namely "the use of mangrove ecosystems for mangrove crab *silvofishery* cultivation can be an alternative solution to the problem of land use owned by residents or organizations around mangrove conservation areas. By being used for silvofishery, the community or *silvofishery* land owner will continue to maintain the existence of mangrove trees on their land, so that the community or organization's land area can function as a buffer zone for mangroves in the ecotourism area, which is the core zone". *Silvofhisery* consists of two words, namely "silvo" which means forest or trees and

"fisheries" means fishery (mina). Similarly, in Indonesian which is often referred to as wanamina which means intercropping between fisheries and mangrove ecosystem forests.

Silvofishery is an approach pattern consisting of integrated activities between shrimp, fish, crab and other farming activities with planting, maintenance, management and efforts to preserve mangrove forests (Pratama, 2022). Mangroves are one of the distinctive coastal ecosystems because they have an integrated role between physical aspects and biological aspects, or also known as ecological functions, while their use will be meaningful in economic aspects for ecosystem users, namely humans. *Silvofishery* can be said to be integrated cultivation between mangroves and crabs is one of the strategies carried out by the government to integrate the economic needs of coastal communities and conserve mangrove resources.

Silvofishery, locally known as wanamina, is a form of integrated coastal aquaculture system that combines brackish water aquaculture with mangrove conservation. *Silvofishery* is an alternative to sustainable crab pond development without sacrificing the economic welfare of farmers and at the same time supporting efforts to preserve mangrove ecosystems. One environmentally friendly cultivation system is *silvofishery*, which is an integrated system between mangrove trees and brackish water cultivation. *Silvofishery* has economic and ecological advantages, because it can increase the income of farmers and local communities, *silvofishery* can be applied for ecotourism and fishing activities. In addition, mangrove trees can protect coastal land from abrasion, reduce waste from aquaculture ponds, and aquatic organism habitat life (Fitriawati, 2018).

The next priority is *Artisanal Fisheries*. FAO (*Food and Agriculture Organization*) defines small-scale fisheries or artisanal fisheries as "traditional fisheries involve fishing households (as opposed to commercial enterprises), using relatively little capital and labor, relatively small fishing vessels (if any), short fishing trips, close to shore, primarily for local consumption (Halim, et al, 2020). Management of coastal areas, especially mangrove ecosystems that have high essential value, must also pay attention to small fishermen who depend on fish resources for their lives. Fish fishing or farming activities that are not environmentally friendly or even damaging in order to meet the needs of fishermen's families will threaten the sustainability of mangrove ecosystems. People's ignorance of what is done or because of the pressure of economic needs is the trigger. Traditional fisheries include all activities from the pre-harvest, harvest and post-harvest chains carried out by men and women, playing an important role in food security and nutrition, poverty alleviation, equitable development and sustainable resource utilization (Vatria, 2020).

Community involvement and participation is very important and key to the success of sustainable mangrove ecosystem management. Therefore, the most important strategy that must be considered in mangrove ecosystem management is the supervision of area development by the government, community perception and participation. Community perception and participation in mangrove ecosystem management provide opportunities for the community to obtain transparent, balanced and objective information that can contribute to problem solving and reduce potential conflicts in the development of sustainable mangrove ecosystems.

CONCLUSION

Based on the analysis study, it can be concluded that the most important priority in mangrove ecosystem sustainability through the AHP approach is the social aspect by prioritizing increasing community involvement and capacity for sustainable mangrove ecosystem management. The overall priority scale on the sustainability of mangrove ecosystems is the development of ecotourism as a top priority in managing the sustainability of mangrove ecosystems. Ecotourism from the perspective of the ecosystem sustainability dimension is defined as one of the alternative tourism products that has the aim of building sustainable tourism, namely tourism development that ecologically provides economically feasible and ethically fair benefits, and provides social benefits to the community.

The limitation of this study is that the research was carried out in one village only, it is recommended that similar research in the future be carried out in 3 (three) villages (wringinputih, kedunggebang, kedungasri) on the coast of KEE Teluk Pangpang Kab. Banyuwangi. Research on mangrove ecosystem sustainability efforts is limited to mangrove ecosystem sustainability priorities through the AHP approach, has not been completed with a mangrove ecosystem sustainability status

study, it is recommended in subsequent similar studies accompanied by additional mangrove ecosystem sustainability status studies with a Multidimensional Scalling (MDS) approach.

REFERENCES

- Azizih, Azmi A. 2020. Public perception of mangrove ecotourism in Lubuk Kertang Village, West Brandan District, Langkat Regency. Faculty of Agriculture – Muhamadyah University North Sumatra: Medan
- Goddess, Dian Novita. 2021. Analysis of the Ecotourism Carrying Capacity of Mangrove Forests, Sriminosari Village, Labuhan Maringgai District, East Lampung Regency. Raden Intan State Islamic University: Lampung
- Governor of East Java. 2020. Decree on the Determination of KEE Teluk Pangpang, Banyuwangi Regency. East Java Provincial Government: Surabaya
- Governor of East Java. 2021. Decree of KEE Management of Pangpang Bay, Banyuwangi Regency. East Java Provincial Government: Surabaya
- Haris, Abiyyu Muhammad., Hardjomidjojo, Hartrisari., Kusmana, Cecep. 2021. Sustainability Status of Mangrove Ecosystem Management in Kecamatanantarumajaya, Bekasi Regency. IPB Graduate School: Bogor
- Hewindati, Tri Y. 2018. Sustainable Management of Community-Based Mangrove Ecosystems: A Case Study of Blanakan Village, Subang, West Java. FMIPA UT: Tangerang
- Kuvaini, Aang., Hidayat, Aceng., Cecep, Kusmana., Basuni, Sambas., 2019. Multidimensional Assessment Techniques to Evaluate the Sustainability of Mangrove Forest Management on Kangean Island, East Java Province. Regional & Environmental Journal: Semarang
- Mirza, Mohamad. 2022. Mangrove Tourism Management Strategy Based on Carrying Capacity on the Coastal Site of Tugurejo District, Semarang. Journal of Environmental Science: Semarang
- Muhsimin, Santoso, Nyoto., Hariadi. 2018. Sustainability Status of Mangrove Ecosystem Management in the Coastal Area of Akuni Village, Tinanggea District, South Konawe Regency. Journal of Silviculture IPB: Bogor
- Noor, Adetya. 2020. The impact of the existence of Sicanang mangrove ecotourism on the socio-economic conditions of the community in Belawan Sicanang Village, Medan Belawan District. State Islamic University of North Sumatra: Medan
- Rodiana lilik. 2019. Suitability and Supporting Capacity of Ecotourism Based on Mangrove Ecology in Pangpang Bay, Banyuwangi. IPB: Bogor
- Rohman, Abdul. 2022. Village and Village Development Level - Kedunggebang Village Profile. Kedunggebang Village Government: Banyuwangi
- Rosyid, Al Harun Muhammad. 2022. Sustainability Analysis of Mangrove Ecosystem Management at Permata Pilang Beach, Probolinggo City, East Java. UIN Sunan Ampel: Surabaya
- Satoinong, risman F. 2022. Community perception of the existence of mangrove forest in Tuapeijat Village, North Sipora District, Mentawai Islands Regency. FPIK – Hatta University: Padang
- Siahaan, Natalia Irene. 2021. Mangrove Management Strategy as a Sustainable Conservation Effort on the Coast of Semarang City. Undip Journal of Environmental Sciences: Semarang
- Sidiq, Umar., Choiri Miftahul M., 2019. Qualitative Research Methods in Education. CV. Nata Karya: Ponorogo
- Setiawati, Tri Ragil. 2019. Mangrove Management Strategy in Wonorejo Mangrove Ecotourism Surabaya. Master of Environmental Engineering - ITS: Surabaya
- Syriac, N. (2020). Typology-based coastal area development and management strategy in the coastal area of Gunungkidul Regency, Yogyakarta. Azimut Journal: Padang
- Wibowo, Bambang Argo., Bambang, Azis Nur., Pribadi, Rudhi., Setiyanto, Indradi., Prihantoko, Kukuh Eko., Sutanto, Himawan Arif. 2022. Coastal Area Management Strategy in Banggi Market, Rembang Regency with an Analytical Hierarchy Process (AHP) Approach. Journal of Tropical Oceans: Semarang
- Vathurohman. 2022. Mangrove Forest Ecotourism Development Strategy in South Sawang Village, Karimun Regency. Riau Islamic University: Pekanbaru

- Vijaya, Nirmalasari Idha., Trisyani, Ninis., Sulestiani, Aniek. 2019. Development Potential of Silvofishery Aquaculture in Wonorejo Mangrove Area Surabaya. Journal of forest research and nature conservation: Jakarta
- Primary, Is Arianto. 2022. Feasibility Study of Silvofishery Development of Mangrove Area in Lantebung. UNHAS: Makassar
- Fitriawati, Ajeng Nurul., Triwanto, Joko., Syarifuddin, Amir. 2018. Study of Silvofishery Development in Mangrove Land of Budeng Village, Jembrana Regency, Bali. UMM: Malang
- Halim, Abdul., Wiryawana, Budy., Loneraganb, Neil R., Hordyke, Adrian., M. Fedi A., Sonditaa., Whitef, Alan T., Koeshendranag, Sonny., Ruchimatg, Toni., Pomeroyh, Robert S., Yuni, Christiana. 2020. Formulate a definition of small-scale fisheries to support capture fisheries management in Indonesia. Journal of Fisheries and Marine Research: Malang
- Vatria, Belvi. 2020. FAO SSF Guidelines: Voluntary Guidelines to Ensure the Sustainability of Small-Scale Fisheries in Indonesia. Pontianak State Polytechnic Vocational Journal: Pontianak

Copyright holder:
(2023)

First publication right:
Journal of Social Science

This article is licensed under:

