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COMMUNITY EMPOWERMENT THROUGH MANGROVE PLANTING TO SUPPORT CLIMATE CHANGE ADAPTATION IN TANJUNG PASIR VILLAGE, TELUKNAGA DISTRICT, TANGERANG REGENCY

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Abstract

Climate change has increased the vulnerability of coastal areas to abrasion, tidal flooding, and ecosystem degradation, necessitating adaptation efforts that actively involve the community. Tanjung Pasir Village, Teluknaga District, Tangerang Regency is one of the coastal areas facing these challenges and has the potential of mangrove ecosystems as a natural barrier in supporting coastal resilience. This Community Service activity aims to increase community knowledge, awareness, and participation in mangrove conservation as a climate change adaptation strategy through a community empowerment approach. The method used is the Community Empowerment Approach with the Participatory Learning and Action (PLA) principle which is implemented through four stages, namely preparation, education and socialization, participatory mangrove planting, and monitoring and evaluation. Data were obtained through participatory observation, documentation, and reflective discussions, then analyzed descriptively qualitatively. The results of the activity showed that the planting of 300 Avicennia and Rhizophora mangrove seedlings was successfully carried out with the involvement of students, lecturers, the community, the Tanjung Pasir Village Government, and the Tourism Awareness Group (Pokdarwis). This activity increased participants' understanding of the ecological function of mangroves, strengthened participation and collaboration between stakeholders, and fostered a shared commitment to maintaining the sustainability of mangrove areas. In addition to providing ecological benefits through coastal ecosystem rehabilitation, this activity also contributes to the achievement of the Sustainable Development Goals (SDGs), especially Goals 11, 13, 14, and 15. Thus, community empowerment through mangrove planting is an effective approach in supporting climate change adaptation while strengthening sustainable coastal area management.

Keywords: Climate Change Adaptation; Community Empowerment; Mangrove Planting; Community Participation; Coastal Areas.

INTRODUCTION

Climate change has become a major challenge for coastal communities around the world. Rising sea levels, changing weather patterns, and the increasing frequency of extreme hydrometeorological events have made coastal areas increasingly vulnerable to abrasion, tidal flooding, and coastal ecosystem damage (UNDP, 2025). These impacts not only threaten environmental sustainability but also affect the social and economic lives of communities that depend on coastal resources for their livelihoods. This condition is clearly felt by the people of Tanjung Pasir Village, Teluknaga District, Tangerang Regency. Tanjung Pasir Village is a coastal area in the northern part of Tangerang Regency, directly bordering the Java Sea, with an area of approximately 7.27 km². This geographical location makes this village have significant coastal resource potential, particularly in the capture fisheries sector, beach tourism, and sea transportation activities to the Seribu Islands. However, on the other hand, this geographical position also makes Tanjung Pasir Village vulnerable to various coastal environmental problems, such as abrasion, seawater intrusion, and periodic tidal flooding (Central Statistics Agency of Tangerang Regency, 2025). In recent years, the residents of Tanjung Pasir Village have increasingly faced tidal flooding, disrupting social and economic activities. In early 2026, tidal flooding reportedly inundated hundreds of homes, with floodwaters reaching 30-40 cm, hampering community mobility, fishing activities, and other economic activities (CNN Indonesia, 2026; TangerangNews, 2026). The recurring tidal flooding demonstrates that coastal communities face a real threat that requires long-term adaptation strategies to mitigate the risk of environmental damage and its resulting socio-

economic impacts. This phenomenon demonstrates that climate change is no longer an abstract global issue but has become part of the daily reality of coastal communities.

In addition to facing tidal flooding, Tanjung Pasir Village also boasts a mangrove ecosystem spread along the northern coast of the village and forms a vital part of the coastal landscape of Teluknaga District. This mangrove area, located directly adjacent to the Java Sea, has been the site of various mangrove rehabilitation programs involving the government, universities, environmental communities, and the local community. Tanjung Pasir Village is a priority location for mangrove rehabilitation in Tangerang Regency because its coastal areas frequently experience abrasion and tidal inundation. In 2024, educational activities and the planting of 1,000 mangrove seedlings were carried out in the mangrove forest area of Tanjung Pasir Village as part of efforts to restore the coastal ecosystem and increase public awareness of environmental conservation (Lantang et al., 2024). Previously, the central government and local governments also carried out mangrove rehabilitation activities in this area as part of the national coastal ecosystem restoration program (Tanjung Pasir Village Government, 2022). The existence of this mangrove area demonstrates that Tanjung Pasir Village possesses important ecological capital that can be developed as a natural barrier against the impacts of climate change and as a means of empowering coastal communities. One widely recommended approach to climate change adaptation in coastal areas is the rehabilitation of mangrove ecosystems. Mangroves serve a crucial ecological function as natural coastal protection from abrasion and waves, absorb blue carbon, provide habitat for various biota, and maintain the balance of coastal ecosystems (Arifanti et al., 2022). Mangroves can dampen the energy of ocean waves, reduce the risk of coastal erosion, and help mitigate the impacts of tidal flooding and seawater intrusion, which frequently occur in coastal areas. In addition to their ecological benefits, mangroves also have economic and social value that can support the sustainability of coastal community livelihoods through fisheries, nature-based tourism, and the sustainable use of mangrove forest products.

The implementation of community empowerment programs through mangrove planting is also closely linked to the achievement of the Sustainable Development Goals (SDGs). This activity supports Goal 13 (Climate Action) by increasing community capacity to adapt to the impacts of climate change and reducing the risk of coastal disasters. From an environmental conservation perspective, mangrove rehabilitation contributes to Goal 14 (Life Below Water) by maintaining coastal ecosystems as habitats for various marine biota, while also supporting Goal 15 (Life on Land) through biodiversity conservation and coastal land ecosystem rehabilitation. Furthermore, active community involvement in the planning, implementation, and maintenance of mangrove areas aligns with Goal 11 (Sustainable Cities and Communities), which emphasizes the importance of building resilient, inclusive, and sustainable settlements and communities. Thus, mangrove planting activities not only produce ecological benefits but also strengthen the social and economic dimensions of the community, thus becoming a form of implementation of sustainable development that integrates environmental aspects, community empowerment, and resilience to climate change (UN, 2015; UNDP, 2025). However, the success of mangrove rehabilitation is determined not only by the number of seedlings planted, but also by the active involvement of the community in each stage of the activity. From a community empowerment perspective, the sustainability of a conservation program depends heavily on the community's ability to understand, manage, and protect the environmental resources around them. Community empowerment is the process of increasing the capacity of individuals and groups to actively participate in decision-making and actions related to their lives (Ife & Tesoriero, 2019). Through empowerment, communities become not only beneficiaries of the program but also key actors in maintaining the sustainability of the coastal environment and increasing their capacity to adapt to climate change. Various studies in the past five years have shown that a community-based approach can increase the success of mangrove rehabilitation while strengthening the community's capacity to adapt to climate change (Utami et al., 2024; Gunawan et al., 2025). Conservation activities that directly involve the community can increase environmental awareness, strengthen social capital, and foster a sense of ownership in the rehabilitated coastal area. However, most research still focuses on the ecological aspects of mangrove rehabilitation, such as planting success rates, land cover area, or carbon storage potential. Studies that highlight the process of community empowerment through mangrove planting activities as a means of building capacity for climate change adaptation are still relatively limited.particularly in the coastal areas of Tangerang Regency. This situation demonstrates the need to document and evaluate community empowerment practices through mangrove conservation activities in specific local contexts.

Based on these conditions, this community service activity was implemented through a mangrove planting program that actively involved the Tanjung Pasir Village community. This activity aims to increase community knowledge, awareness, and participation in preserving the mangrove ecosystem as an effort to support climate change adaptation. The focus of the activity is directed at the process of community empowerment through environmental education and mangrove planting practices as a form of collective action in maintaining the

sustainability of coastal areas. Theoretically, this activity is expected to enrich the study of environment-based community empowerment in the context of climate change adaptation. Practically, this activity is expected to become a model of community-based coastal management that can be replicated in other coastal areas facing similar problems.

METHOD

This Community Service (PKM) activity was held on Sunday, May 31, 2026, at 08.00-15.00 WIB, in the coastal area of Tanjung Pasir Village, Teluknaga District, Tangerang Regency, Banten Province (Tanjung Pasir Mangrove Ecotourism and Conservation Area). This location was chosen because it is one of the coastal areas that is vulnerable to abrasion, tidal flooding, and degradation of the mangrove ecosystem as a result of climate change. The activity was carried out by all students of the Master of Management Program Batch I of Matana University as an implementation of the Tri Dharma of Higher Education in the field of community service. The implementation of the activity involved 30 participants consisting of students, lecturers, the community, and activity partners, namely the Tanjung Pasir Village Government and the Tourism Awareness Group (Pokdarwis).

The method used in this activity is a community empowerment approach by applying the principles of Participatory Learning and Action (PLA). This approach positions the community as both the subject and partner in every stage of the activity through a process of collaborative learning, problem identification, solution development, and implementation of concrete actions in environmental conservation. Through this approach, the community is not only the beneficiary of the program but is also encouraged to actively participate in maintaining the sustainability of the mangrove ecosystem. The PLA approach was chosen because it can increase community knowledge, skills, sense of ownership, and commitment to sustainable coastal environmental management (Chambers, 2008; Ife & Tesoriero, 2019).

The activity was implemented in four stages. The first stage was preparation, which included coordination with the Tanjung Pasir Village Government and the Tourism Awareness Group (Pokdarwis), a planting site survey, identification of community needs, and the development of a technical implementation plan. This stage also involved determining planting locations based on substrate conditions, tidal levels, and coastal area characteristics to ensure optimal growth opportunities for mangrove seedlings.

The second phase involved education and outreach regarding climate change, the ecological function of mangroves, and the importance of community participation in preserving coastal ecosystems. The activities included material delivery, interactive discussions, and question-and-answer sessions aimed at increasing public understanding of the benefits of mangroves in reducing abrasion, tidal flooding, seawater intrusion, and supporting adaptation to climate change (Arifanti et al., 2022). The third phase involved collaborative mangrove planting in the coastal area of Tanjung Pasir Village. All participants planted 300 mangrove seedlings, consisting of Avicennia and Rhizophora species. Prior to planting, participants received a demonstration on proper mangrove planting techniques, including selecting planting sites, adjusting spacing, installing stakes to support seedlings, and adapting planting techniques to the characteristics of coastal areas. This activity not only aimed to increase mangrove vegetation cover but also served as a means of experiential learning, which is expected to foster public awareness of coastal environmental conservation and strengthen the community's capacity to adapt to climate change (Utami et al., 2024).

The final stage is monitoring and evaluation to assess the activity implementation process and the level of community participation. Monitoring is carried out through initial observations of the condition of the planted mangrove seedlings to ensure they are in good condition and have an optimal growth opportunity. Meanwhile, evaluation is conducted through participatory observation, field documentation, and reflective discussions with participants regarding the benefits of the activity, challenges encountered, and follow-up plans for mangrove maintenance.

Table 1. Schedule for Implementation of Community Service Activities

Time	Activity	Expected output
08.00–08.30 WIB	Participant registration, opening, and welcome	Participants are registered and receive information about the objectives of the activity.
08.30–09.30 WIB	Education and outreach regarding climate change, mangrove functions, and community empowerment	Increased participant understanding of the importance of mangroves as a climate change adaptation strategy

09.30–12.00 WIB	Participatory planting of 300 mangrove seedlings (Avicennia and Rhizophora)	Implementation of mangrove planting and increased community involvement in coastal conservation
12.00–13.00 WIB	Rest, prayer, and lunch	Participants rest before continuing the activity
1:00–2:30 PM WIB	Initial monitoring of planting results, discussion and reflection with participants	The initial condition of mangrove seedlings was identified and input and commitment from participants were obtained to maintain the sustainability of the mangrove area.
2:30–3:00 PM WIB	Evaluation of activities, submission of follow-up plans, and closing	Establishing a joint commitment to mangrove maintenance and program sustainability

Activity data was collected using three techniques: participant observation, documentation, and reflective discussions. Participant observation was conducted throughout the entire activity to assess participant engagement, planting techniques, interactions between participants, and collaboration between universities, village governments, and the community. Documentation, including activity photos, field notes, and administrative data, served as evidence of activity implementation. A reflective discussion was conducted at the end of the activity to gather information on participant understanding, perceptions of the activity's benefits, and commitment to supporting sustainable mangrove management.

The data obtained were analyzed using a qualitative descriptive approach through the stages of data reduction, data presentation, and conclusion drawing as outlined by Miles, Huberman, and Saldaña (2020). The analysis focused on describing the implementation process of the community empowerment approach, the level of participant participation, increased understanding of mangrove functions, forms of collaboration between stakeholders, and the activity's contribution to climate change adaptation efforts in coastal areas.

The success of the activity was evaluated based on four main indicators, namely: (1) the level of active participation of participants during the entire series of activities, (2) the involvement of the community and local partners in the mangrove planting process, (3) increased understanding of participants regarding the function of mangroves as a climate change adaptation strategy demonstrated through discussions and reflections during the activity, and (4) the formation of a joint commitment between the community, the Tanjung Pasir Village Government, Pokdarwis, and universities to support the maintenance of the mangrove area after the activity ends. These indicators are used as a basis for analyzing the results of the activity presented in the discussion section.

DISCUSSION

Community service activities through mangrove planting in Tanjung Pasir Village are a concrete form of action in supporting climate change adaptation in coastal areas. This activity is not only oriented towards adding mangrove vegetation, but also aimed at building community awareness, participation, and concern for the importance of maintaining sustainable coastal ecosystems. This approach aligns with the concept of community empowerment, which positions the community as active subjects in the development process, not merely beneficiaries of programs (Ife & Tesoriero, 2019). Based on observations and implementation of activities in the field, the discussion of this activity can be explained through several aspects as follows.

1. Implementation of Mangrove Planting Activities in Tanjung Pasir Village

Mangrove planting activities were carried out in the coastal area of Tanjung Pasir Village, Teluknaga District, Tangerang Regency. This location was chosen because it is a coastal area prone to abrasion, tidal flooding, seawater intrusion, and mangrove ecosystem degradation. Coastal areas are highly vulnerable to the impacts of climate change, particularly due to rising sea levels and the increasing intensity of extreme hydrometeorological events (UNDP, 2025).

The activity was carried out on Sunday, May 31, 2026, involving approximately 30 participants consisting of students of the Master of Management Program Batch I of Matana University, lecturers, community members, the Tanjung Pasir Village Government, and Pokdarwis. The activity began with an opening and briefing regarding the objectives of the mangrove planting activity, followed by environmental education, demonstrations of planting techniques, implementation of the mangrove planting, initial monitoring, reflective discussions, and closing.

Figure 1. Community Service Objective Guidance Activities

A total of 300 Avicennia and Rhizophora mangrove seedlings were planted in a participatory manner by participants. These two mangrove species were chosen because of their excellent adaptability to coastal characteristics and their crucial role in resisting abrasion, dampening waves, and supporting coastal ecosystem recovery. Mangroves serve important ecological functions as shoreline protectors, biota habitats, carbon sinks, and coastal ecosystem buffers (Arifanti et al., 2022).

During the planting process, participants receive guidance on proper planting techniques, from selecting planting sites, installing stakes or supports, adjusting plant spacing, and how to plant seedlings for optimal growth. This activity serves as a form of experiential learning, as participants not only gain theoretical knowledge but also engage directly in environmental conservation practices.

Figure 2. Mangrove Planting Activities

2. Increasing Participants' Awareness of Mangroves Function

One important outcome of this activity was an increased understanding of the ecological, social, and economic functions of mangroves. Prior to the planting activity, participants received education on the role of mangroves in addressing the impacts of climate change. The material covered the functions of mangroves as coastal protectors, abrasion buffers, wave absorbers, carbon sinks, marine biota habitats, and life support for coastal communities.

Mangroves have the ability to store large amounts of carbon, both in aboveground biomass and in the sediments beneath. Therefore, mangrove ecosystems are often associated with the concept of blue carbon, which plays a crucial role in climate change mitigation (Alongi, 2020). Furthermore, mangrove rehabilitation can also increase the resilience of coastal communities to the risks of abrasion and tidal flooding because mangrove roots help retain sediment and reduce the pressure of ocean waves (Arifanti et al., 2022).

Through interactive discussions, participants learned that mangroves are not just coastal plants, but a vital part of the natural defense system of coastal areas. Mangroves can reduce the risk of damage from ocean waves and tidal flooding. Furthermore, mangroves contribute to the sustainability of the fisheries sector by providing a breeding ground for various marine life.

Figure 3. Interactive Discussion with Village Officials and Pokdarwis of Tanjung Pasir Village

This activity provided participants with firsthand experience demonstrating that climate change issues can be addressed not only through broad policies but also through simple, collective actions. This aligns with the community-based adaptation approach, which emphasizes the importance of local community involvement in responding to the impacts of climate change in accordance with the local social and ecological context (Reid et al., 2021).

3. Community Participation in Coastal Environmental Conservation

The approach used in this activity is a community empowerment approach based on the principles of Participatory Learning and Action (PLA). The PLA approach emphasizes a collaborative learning process between facilitators and the community, enabling the community to participate in problem identification, solution development, activity implementation, and program evaluation (Chambers, 2008).

Community participation is evident in the involvement of the Tanjung Pasir Village Government and the Tourism Awareness Group (Pokdarwis) in supporting the implementation of the program. The involvement of local partners is crucial because they have direct knowledge of environmental conditions, area characteristics, and the challenges faced by coastal communities. From an empowerment perspective, local community involvement is a key requirement for a program's sustainability, as the community has direct access to the resources being managed (Ife & Tesoriero, 2019).

Figure 4. Community Participation in Coastal Environmental Conservation

Furthermore, the involvement of Matana University students and lecturers demonstrates the role of higher education institutions in supporting community development through the implementation of the Tri Dharma Perguruan Tinggi (Three Pillars of Higher Education). This activity brings together academics, the community, and the village government in a collaborative effort. This synergy provides crucial social capital for building a sustainable environmental conservation movement.

The participation in this activity also demonstrated a sense of togetherness and concern for the environment. Participants actively participated in the planting process, engaged in discussions, and shared their views on the importance of preserving mangrove areas. This demonstrates that community service activities can serve as a means of strengthening social ties and building ecological awareness.

4. Mangrove Planting as a Climate Change Adaptation Strategy

Coastal areas are among the most vulnerable to the impacts of climate change. Sea level rise, tidal flooding, abrasion, and changing weather patterns pose real threats to coastal communities, including those in Tanjung Pasir Village. Therefore, mangrove planting is highly relevant as an ecosystem-based adaptation strategy.

Figure 5. General Condition of the Tanjung Pasir Village Mangrove Conservation Area

Ecosystem-based adaptation is an approach that utilizes natural functions to help communities cope with the impacts of climate change. In the context of coastal areas, mangroves can act as natural barriers, reducing the pressure of ocean waves, slowing abrasion, and helping maintain shoreline stability (Arifanti et al., 2022). Thus, mangrove planting not only serves a conservation function but also forms part of a coastal community protection strategy.

In addition to being a form of adaptation, mangroves also contribute to climate change mitigation through their ability to absorb and store carbon. Mangrove ecosystems are known as important reservoirs of blue carbon. Alongi (2020) explains that mangrove forests play a significant role in the carbon cycle because they can store carbon in biomass and soil over long periods.

However, the success of mangrove planting cannot be measured solely by the number of seedlings planted. The program's sustainability depends heavily on seedling survival, regular maintenance, and community commitment to maintaining the planted area. Utami et al. (2024) emphasize that mangrove management strategies must consider ecological, social, institutional, and community involvement aspects for mangrove rehabilitation to have a sustainable impact.

5. Educational and Learning Value for Participants

This mangrove planting activity had strong educational value for all participants, especially students in the Matana University Master of Management Program. Through this activity, students not only understood the theory of community empowerment and sustainable development but also experienced firsthand the process of implementing an environmentally-based social program.

This activity provides an understanding that community empowerment requires communication, coordination, collaboration, and multi-stakeholder involvement. In a management context, this activity also reflects the importance of program planning, role allocation, resource management, activity implementation, and evaluation of results. This process aligns with the qualitative descriptive approach used in this activity, which describes phenomena based on participant observation, documentation, and reflection in the field (Miles et al., 2020).

For the community, this activity provides education on the importance of preserving mangrove ecosystems as an integral part of coastal life. It is hoped that the community will increasingly understand that the presence of mangroves is directly related to the protection of their homes, the sustainability of their livelihoods, and the quality of the environment. This education is crucial for fostering a sense of ownership in mangrove areas and encouraging them to maintain their sustainability.

Figure 6. Mangrove Type Introduction Activity

6. Contribution of Activities to Sustainable Development Goals

The community service activity of planting mangroves in Tanjung Pasir Village is linked to several Sustainable Development Goals (SDGs). First, this activity supports SDG Goal 13, Climate Action, by contributing to increased development capacity to address the impacts of climate change through ecosystem-based adaptation actions (United Nations, 2015).

Second, this activity supports SDG Goal 14, Life Below Water, as mangroves are a vital habitat for various marine life and play a role in maintaining the balance of coastal ecosystems. Third, this activity also supports SDG Goal 15, Life on Land, through coastal vegetation rehabilitation and biodiversity conservation.

Furthermore, this activity also aligns with SDG Goal 11, Sustainable Cities and Communities, as it encourages the development of more thriving, environmentally conscious, and disaster-adaptable coastal communities. Thus, mangrove planting not only provides ecological benefits but also strengthens the educational dimension of sustainable development.

Figure 7. Campaign Activities on the Importance of Planting Mangroves

7. Challenges and Follow-up Plans

Although the program is running smoothly, several challenges need to be addressed to ensure the program has a long-term impact. The first challenge is the continued maintenance of the mangrove seedlings after the program

concludes. Newly planted mangrove seedlings require regular monitoring to ensure optimal growth. Risks such as seedling death, being swept away by currents, litter disturbance, or damage to stakes need to be anticipated through monitoring.

The second challenge is the need to strengthen the role of local communities as guardians of the sustainability of mangrove areas. Planting programs will be more effective if local communities are involved in maintenance, replanting, and monitoring of the areas. The principle of community empowerment emphasizes that program sustainability will be strengthened if communities have the capacity, awareness, and control over the resources within their environment (Ife & Tesoriero, 2019).

The third challenge is the importance of ongoing education. Environmental awareness cannot be built through a single activity; it needs to be strengthened through campaigns, outreach, and periodic conservation activities. Universities can act as partners through ongoing community service activities, research, and collaborative programs with village communities.

By considering these challenges, it is hoped that the mangrove planting activity in Tanjung Pasir Village will not stop as a temporary activity, but can develop into a sustainable community-based coastal conservation movement.

CONCLUSION AND SUGGESTION

Conclusion

A community service activity through mangrove planting in Tanjung Pasir Village, Teluknaga District, Tangerang Regency, was successfully implemented through a participatory community empowerment approach. This activity involved Matana University's first batch of Master of Management students, lecturers, the community, the Tanjung Pasir Village Government, and the Tourism Awareness Group (Pokdarwis) as activity partners. The activity was implemented through preparation, education and outreach, mangrove planting, initial monitoring, and evaluation and reflection with participants.

The planting of 300 Avicennia and Rhizophora mangrove seedlings represents a concrete action to support coastal ecosystem rehabilitation and climate change adaptation. This activity provides ecological benefits by increasing mangrove vegetation cover, protecting coastal areas from abrasion and tidal flooding, and supporting coastal ecosystem balance. This aligns with the view that mangroves play a crucial role in coastal protection, carbon storage, and strengthening coastal resilience to the impacts of climate change (Alongi, 2020; Arifanti et al., 2022).

This activity also provides educational and social benefits by enhancing participants' understanding of the function of mangroves and the importance of community participation in environmental protection. Through the PLA approach, participants and the community are not merely the objects of the activity but are also involved as part of the learning process and collective action. This approach aligns with the principles of community empowerment, which emphasize the importance of community participation, awareness, and independence in managing environmental resources (Chambers, 2008; Ife & Tesoriero, 2019).

Overall, this activity demonstrates that community empowerment through mangrove planting can serve as a collaborative model for coastal environmental management. The involvement of universities, village governments, community groups, and participants is crucial in building collective awareness of environmental conservation. Thus, this activity not only contributes to mangrove conservation but also supports the achievement of Sustainable Development Goals, particularly Goals 11, 13, 14, and 15 (United Nations, 2015).

The success of this activity needs to be continued with regular monitoring and maintenance so that the mangrove seedlings that have been planted can grow well and provide long-term benefits for the coastal community of Tanjung Pasir Village.

Suggestion

In order for this mangrove planting activity to provide a more optimal and sustainable impact, there are several suggestions that can be implemented in the future.

1. **Regular monitoring and maintenance**

Regular monitoring of planted mangrove seedlings is necessary to determine their growth rate and survival rate. This monitoring is crucial for identifying dead, damaged, or washed-away seedlings so that they can be promptly replanted or replanted. Regular monitoring is also necessary because the success of mangrove rehabilitation is determined not only by the number of seedlings planted but also by the continuity of care after the activity (Utami et al., 2024).

2. Strengthening the role of local communities

The Tanjung Pasir Village community needs to be continuously involved in mangrove maintenance and monitoring activities. The village government and the Tourism Awareness Group (Pokdarwis) can form small groups or environmental volunteer teams responsible for sustainably maintaining the mangrove planting area. Local community involvement is crucial because they are the closest to the coastal area and play a strategic role in ensuring the program's sustainability (Ife & Tesoriero, 2019).

3. Sustainable environmental education

Educational activities regarding the function of mangroves and climate change adaptation should not be limited to planting activities, but should be continued through regular outreach, environmental campaigns, and learning activities for the public, students, and local communities. Continuous education is necessary to strengthen environmental awareness and foster long-term conservation behavior.

4. Cross-stakeholder collaboration

The sustainability of mangrove conservation programs requires collaboration between universities, local governments, village governments, communities, environmental groups, and the private sector. This collaboration can strengthen support for resources, funding, education, and more focused coastal area management. A collaborative approach is crucial because coastal environmental issues cannot be solved by one party alone but require synergy from various stakeholders.

5. Development of mangrove areas as educational ecotourism

The mangrove area in Tanjung Pasir Village has the potential to be developed as an ecotourism destination based on environmental education. This development must be carried out while adhering to conservation principles to avoid damaging the existing ecosystem. If properly managed, the mangrove area can provide economic benefits to the community while raising visitor awareness of the importance of environmental conservation.

6. Replication of activities in other coastal areas

This community-based mangrove planting model can be replicated in other coastal areas facing issues of abrasion, tidal flooding, and environmental degradation. However, each replication must be tailored to the ecological, social, and economic characteristics of the local community for effective results.

7. Integration with university community service and research programs

Matana University can make this activity a sustainable community service program integrated with student and faculty research. Further studies can be conducted to assess the success rate of mangrove growth, the social impact of the activity on the community, and the program's contribution to increasing climate change adaptation capacity. Further analysis can use a qualitative descriptive approach or program evaluation to gain a more in-depth understanding of the program's benefits to the community and the environment (Miles et al., 2020).

With this follow-up, it is hoped that the mangrove planting activity in Tanjung Pasir Village will not only be a ceremonial activity, but will develop into a sustainable coastal conservation movement, have an ecological impact, and provide socio-economic benefits for the local community.

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