Sino International Universitas Mataram

International Journal of AgroEduTech-Tourism

IJAETT

ISSN: 0000-0000

Article Review

https://doi.org/

Submitted: 17 Feb 2025

Accepted: 4 Mar 2025

Published: 25 Mar 2025

Development of Mangrove Ecotourism Based on Mangrove Crab Cultivation for Sustainable Livelihoods of Coastal Communities from A Philosophical Perspective

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Abstract

The development of mangrove ecotourism based on mangrove crab cultivation, in the long term not only provides economic benefits for the community but also contributes to environmental preservation and sustainability of natural resources. This is in line with philosophical principles which teach that humans and nature must live side by side in harmony and support each other for the sustainability of life in the future. This paper examines the integration between philosophy, the development of mangrove ecotourism based on mangrove crab cultivation, and efforts to realize sustainable livelihoods for coastal communities. By applying a holistic approach and considering ethics, mangrove ecotourism activities and mangrove crab cultivation have the potential to be wise solutions for combining human needs and nature conservation. This integration can provide economic benefits for the community, while preserving the mangrove ecosystem as a natural habitat for mangrove crabs. Apart from that, this activity supports community empowerment, resilience of coastal communities, development of appropriate policies, as well as paying attention to ethical aspects in managing natural resources and interactions with local communities. With collaboration and joint efforts from various parties, mangrove ecotourism based on mangrove crab cultivation has promising future prospects in realizing sustainable development, environmental preservation, and improving the welfare of coastal communities as a whole.

Keywords: Mangrove ecotourism, mangrove crab cultivation, livelihoods, coast, sustainable development.

How to cite: Mukhlis, A. & Sarjan, M. (2025). Development of Mangrove Ecotourism Based on Mangrove Crab Cultivation for Sustainable Livelihoods of Coastal Communities from A Philosophical Perspective. *Internatioanl Journal of AgroEduTech-Tourism (IJAETT)*, 1(1), 44-52.

1. Introduction

Mangrove forests represent one of the most critical ecosystems for coastal communities. Beyond serving as protection against abrasion and tsunamis, mangrove forests also function as habitats for various marine biota, such as mangrove crabs (Tan & Siregar, 2021). While crab harvesting in mangrove environments constitutes a significant livelihood source for coastal communities, excessive harvesting threatens the crabs' existence. From a philosophical perspective, developing mangrove ecotourism based on mangrove crab aquaculture can offer a judicious solution that balances human needs with environmental conservation. Mangrove ecotourism provides opportunities for communities to appreciate and enjoy natural beauty (Arbain & Chairiyah, 2020) without causing environmental degradation. Meanwhile, mangrove crab aquaculture creates sustainable livelihood opportunities that don't rely on excessive natural harvesting. Excessive and imprudent exploitation of natural resources frequently generates negative impacts on both the environment and the sustainability of community livelihoods (Malik, 2017). Through mangrove ecotourism integrated with crab aquaculture, communities can learn to value nature and utilize it wisely without causing harm. Additionally, these activities provide opportunities for communities to acquire and develop new skills in ecotourism and aquaculture, ensuring livelihood sustainability for the future.

The long-term development of mangrove ecotourism based on mangrove crab aquaculture not only delivers economic benefits to communities but also contributes to environmental preservation and natural resource sustainability. This aligns with philosophical principles teaching that humans and nature must coexist harmoniously and support each other for future life sustainability.

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Studies on ecotourism development based on mangrove crab aquaculture need to be constructed within a philosophical framework. This can provide a robust foundation for understanding the ethical and moral implications of mangrove ecotourism activities integrated with crab aquaculture. One perspective that can be developed comes from environmental philosophy. Environmental philosophy emphasizes the importance of harmonious relationships between humans and nature, ensuring mutual support (Siregar, 2010) and maintaining inseparable interconnectedness. In this context, mangrove ecotourism and crab aquaculture can be viewed as efforts to create balance between human livelihood needs and natural environmental conservation.

Mangrove ecotourism and crab aquaculture activities, within a philosophical framework, particularly from an environmental ethics (axiological) perspective, are based on principles that respect and preserve mangrove ecosystems. This includes prudent management of natural resources, minimization of negative environmental impacts, and implementation of sustainable practices. Additionally, the philosophical framework considers aspects of social ethics in these activities. Mangrove ecotourism and crab aquaculture must provide equitable benefits to local communities, especially those dependent on natural resources for their livelihoods. This encompasses fair profit-sharing, community involvement in decision-making processes, and respect for local knowledge. From an economic ethics perspective, these activities must provide opportunities for communities to secure sustainable livelihoods and improve their welfare. However, this must be accomplished without excessively exploiting natural resources or sacrificing environmental sustainability for short-term gains.

The philosophical framework also considers ethics regarding future generations. Mangrove ecotourism and crab aquaculture must be conducted in ways that ensure future generations can also enjoy the benefits of preserved and sustainable mangrove ecosystems. By constructing perspectives from this philosophical framework, mangrove ecotourism and crab aquaculture activities are viewed not merely as economic activities but as efforts to create balance among human needs, environmental preservation, and natural resource sustainability for future generations. This reflects the importance of considering ethical and moral implications in every activity involving human-nature interactions.

This paper aims to provide an overview of the necessary integration between philosophy, mangrove ecotourism based on crab aquaculture, and sustainable coastal community livelihoods through holistic and ethical approaches to achieve coastal community welfare.

2. Materials and Methods

This study employs a comprehensive literature review approach to examine the development of mangrove ecotourism integrated with mud crab cultivation from a philosophical perspective, with a focus on creating sustainable livelihoods for coastal communities. The research methodology follows a systematic process that includes multiple phases:

2.1 Literature Search and Selection

The literature search was conducted using several academic databases, including Scopus, Web of Science, Science Direct, JSTOR, and Google Scholar, utilizing a combination of keywords such as "mangrove ecotourism," "mud crab cultivation," "sustainable livelihoods," "coastal communities," "environmental ethics," "conservation philosophy," and "ecological sustainability." To ensure relevance and currency, the search was limited to peer-reviewed publications from the past 15 years (2010-2024), though seminal works from earlier periods were included when appropriate. Selection criteria focused on studies relevant to the integration of ecotourism and aquaculture, coastal community development, philosophical perspectives on sustainability, and empirical studies or theoretical frameworks addressing human-nature relationships.

2.2 Analytical Framework

The literature review is structured within a philosophical framework that incorporates three primary perspectives: an axiological analysis, which examines the ethical dimensions of mangrove conservation and sustainable livelihoods, including the values underlying human interactions with coastal ecosystems; an epistemological approach, which analyzes how knowledge systems, including traditional ecological knowledge and scientific understanding, inform sustainable management practices; and an ontological investigation, which explores the fundamental nature of human-environment relationships in coastal ecosystems and how this understanding shapes sustainable development initiatives.

2.3 Data Analysis and Synthesis

The collected literature was systematically coded and categorized according to philosophical perspectives, including environmental ethics, conservation philosophy, and sustainability principles; practical applications, such as ecotourism models and aquaculture techniques; socioeconomic impacts, including livelihood development and community empowerment; and ecological considerations, such as ecosystem services and biodiversity conservation. An interdisciplinary approach was employed to synthesize findings across multiple domains, including environmental science, social ecology, development studies, and environmental philosophy. This synthesis aims to develop a holistic understanding of how philosophical perspectives can inform practical initiatives for sustainable coastal community development.

2.3 Validity and Reliability Considerations

To ensure the validity and reliability of this literature review, multiple sources were consulted for each major concept, incorporating both theoretical and empirical studies, as well as contrasting viewpoints and critiques. Peer-reviewed and high-impact publications were prioritized to enhance the credibility of the findings.

3. Results and Discussions

3.1 Sustainable Livelihood

Coastal communities, particularly in areas with mangrove ecosystems, often depend on natural resources as their primary source of livelihood. However, excessive and unwise exploitation of these resources can threaten their sustainability in the future (Malik, 2017). Therefore, understanding the concept of sustainable livelihood becomes crucial in efforts to develop coastal communities through mangrove ecotourism activities based on mud crab aquaculture.

Sustainable livelihood is a concept that emphasizes the importance of maintaining natural resources and the environment for the long-term continuity of community livelihoods (Nurbaiti et al., 2023). In the context of coastal communities, this means they must be able to utilize natural resources such as mangrove forests and mud crabs in ways that do not damage or threaten their existence in the future. By understanding this concept, coastal communities can realize that mangrove ecotourism and mud crab aquaculture are not merely economic activities, but also efforts to preserve the environment and natural resources that form the basis of their livelihoods. These activities must be conducted with consideration of long-term impacts on the mangrove ecosystem and mud crab populations.

Understanding the concept of sustainable livelihood encourages communities to adopt environmentally friendly practices in mangrove ecotourism and mud crab aquaculture activities, such as minimizing waste and pollution, implementing cultivation techniques that preserve natural habitats, and ensuring sustainable harvesting of mud crabs. Additionally, this concept emphasizes the importance of livelihood diversification for coastal communities; by combining mangrove ecotourism and mud crab aquaculture, communities develop more sustainable alternatives rather than depending on a single livelihood source.

Furthermore, understanding this concept fosters community involvement in mangrove ecosystem conservation and management efforts. Communities realize that preserving mangrove forests serves both ecotourism purposes and ensures the sustainability of their own future livelihoods. Therefore, comprehending sustainable livelihood becomes essential for developing coastal communities through mangrove ecotourism based on mud crab aquaculture, as it encourages environmentally friendly practices, consideration of long-term impacts, and active participation in preserving the mangrove ecosystems that form the foundation of their livelihoods.

3.2 The Role of Mangrove Ecosystems and Their Ecotourism Potential

Mangroves are unique ecosystems that grow in coastal areas, specifically in tidal zones and river estuaries. The presence of mangroves provides numerous benefits to the surrounding environment and coastal communities (Mahmuda et al., 2023). Therefore, mangroves play a crucial role in coastal ecosystems and hold significant potential for development into attractive ecotourism destinations. According to Lasibani dan Kamal (2010), mangrove ecosystems play a vital role in protecting coastlines from waves, wind, and currents that can cause abrasion and erosion. With their strong, branching root systems that penetrate deep into the soil, mangroves can withstand powerful ocean waves and currents. This prevents soil erosion in coastal areas and maintains shoreline stability. Mangroves also function as sediment traps and natural filters. Their dense and abundant roots can capture and settle mud particles and sediments carried by river or sea water flows. Mangroves also play a role in absorbing and filtering organic waste and pollutants entering coastal areas, thus preventing environmental pollution. Furthermore, mangroves provide crucial habitat for various wildlife species, particularly birds, fish, shrimp, crabs, and other marine life. Mangrove forests provide shelter, breeding grounds, and feeding areas for many species, thereby maintaining biodiversity in coastal regions.

Beyond their substantial ecological benefits, mangroves have significant potential for development into attractive ecotourism destinations (Salim et al., 2020). The unique characteristics of mangrove ecosystems, with trees growing in brackish waters and their distinctive root systems, offer visitors a unique natural experience. Through mangrove ecotourism, tourists can enjoy distinctive natural beauty, observe wildlife, learn about the importance of mangrove ecosystems, and participate in environmental conservation efforts. Activities such as mangrove tracking, bird watching, fishing, or canoeing become attractive options for tourists.

The development of mangrove ecotourism not only provides economic benefits for local communities but also supports the conservation of the mangrove ecosystem itself. Through ecotourism, communities gain a greater appreciation for and protect mangroves as a sustainable source of livelihood. However, mangrove ecotourism development must be conducted wisely (Gobel & Wunarlan, 2023) with consideration for environmental sustainability. Efforts must be made to minimize negative impacts on mangrove ecosystems, such as limiting visitor numbers, managing tracking routes, and educating tourists about the importance of mangrove conservation.

3.3 Mud Crab Cultivation in Mangrove Ecosystems

Mangrove ecosystems hold great potential for coastal communities to develop sustainable livelihoods. One initiative that can be integrated with mangroves is mud crab cultivation. This activity not only provides an alternative income source for communities but also supports environmental conservation efforts. Mud crabs are high-value commodities that naturally inhabit mangrove ecosystems, particularly those that are mature, gravid or egg-bearing, and well-fed (Hastuti et al., 2015).

Mud crab cultivation within mangrove ecosystems offers several advantages. First, mangroves provide ideal natural habitats for mud crab growth (Farhaby, 2017). The mangrove environment, with its brackish waters, muddy substrate, and nutrient availability from mangrove litter, strongly supports mud crab development. Second, integrating mud crab cultivation with mangroves reduces the need for additional land and major infrastructure investment, making it more accessible for coastal communities.

Beyond providing an alternative income source, integrating mud crab cultivation into mangrove ecosystems also offers ecological benefits. This activity encourages communities to preserve mangroves as natural habitats for mud crabs. Communities become more motivated to protect and conserve mangroves as these ecosystems become their source of livelihood. Furthermore, mud crab cultivation in mangroves can become an ecotourism attraction. Tourists can directly experience mud crab cultivation in its natural habitat while learning about the importance of mangrove ecosystems and community-led environmental conservation efforts. By integrating mud crab cultivation into mangrove ecosystems, coastal communities gain opportunities to develop sustainable livelihoods and alternative income sources that can improve their welfare.

3.4 Community Empowerment

According to Koeswantono (2017), community empowerment is an effort to enhance the dignity of our society's layers that are currently unable to free themselves from the trap of poverty and underdevelopment. In other words, empowerment means enabling and making communities self-reliant. Therefore, empowering coastal communities in mangrove crab cultivation-based ecotourism activities is a crucial aspect. Coastal communities play a central role in managing natural resources and the environment in their regions, making their empowerment key to maintaining balance between economic activities and mangrove ecosystem conservation. Several benefits of coastal community empowerment include:

1) It ensures they possess the necessary knowledge, skills, and capacity to manage ecotourism and mangrove crab cultivation sustainably. Through training programs, mentoring, and knowledge transfer, coastal communities can gain understanding about best practices in mangrove ecosystem management, environmentally friendly mangrove crab cultivation techniques, and responsible ecotourism management.
2) It encourages their active participation in decision-making and management of ecotourism and mangrove crab cultivation activities. By directly involving the community, they will feel a sense of ownership and responsibility for the success of these activities. This will enhance community ownership and commitment to preserving mangrove ecosystems and sustainable management.
3) It provides broader economic opportunities for them. Through ecotourism and mangrove crab cultivation activities, coastal communities can obtain new stable and sustainable income sources. Empowerment can help them develop better business skills, marketing, and market access, significantly improving their welfare.
4) It strengthens their local identity and culture. Ecotourism activities can serve as a means to preserve and promote coastal communities' culture and traditions, such as handicrafts, culinary arts, and performing arts. This can increase community pride and confidence in their cultural heritage.
5) It encourages the formation of strong and organized community groups or organizations. These groups can play a role in coordinating ecotourism and mangrove crab cultivation activities, facilitating inter-community cooperation, and becoming partners for government and other organizations in sustainable development efforts in coastal areas.

Therefore, coastal community empowerment becomes crucial. With proper empowerment, coastal communities can become key actors in realizing sustainable economic activities while preserving mangrove ecosystems as natural habitats for mangrove crabs. This empowerment must involve various stakeholders, such as government, non-governmental organizations, academics, and the private sector, to provide support in training, mentoring, market access, and mutually beneficial partnership facilitation.

3.5 Ethics in Mangrove Crab Cultivation-Based Mangrove Ecotourism

Mangrove crab cultivation-based mangrove ecotourism has great potential as an economically valuable activity benefiting coastal communities. However, in developing this ecotourism, ethical considerations become crucial to ensure the rights of nature and local community welfare are guaranteed.

1) Ethical principles in natural resource management must become the main foundation. Mangrove ecosystems play a vital role in maintaining ecological balance in coastal areas, so ecotourism and mangrove crab cultivation activities must be conducted in ways that do not damage or threaten mangrove forests. The use of environmentally friendly cultivation methods, such as avoiding mangrove land conversion into ponds, is essential to prioritize.
2) Ethical aspects must also be considered in interactions with wildlife, such as mangrove crabs. Ecotourism activities must be conducted in ways that do not disturb or cause excessive stress to mangrove crabs and other species living in mangrove ecosystems. Mangrove crab harvesting from their habitat must be limited and well-managed to maintain healthy populations.

3) Ethical considerations must also be given to local communities involved in ecotourism and mangrove crab cultivation activities. Community involvement in decision-making processes, fair distribution of economic benefits, and respect for local knowledge and community culture are crucial. Ecotourism activities must provide significant economic benefits to local communities and promote community empowerment.
4) Ethical aspects must also be considered in interactions with tourists visiting mangrove ecotourism sites. Tourists must be educated about the importance of preserving mangrove ecosystems and respecting local community culture. Unethical behavior, such as littering or habitat destruction, must be prevented and well-managed.
5) Ethical considerations must also include transparency and accountability aspects in managing ecotourism and mangrove crab cultivation activities. Management must ensure these activities are conducted transparently, including in reporting and using funds obtained from ecotourism.

By considering these ethical aspects, mangrove crab cultivation-based mangrove ecotourism can become an activity that is not only economically beneficial but also provides benefits for mangrove ecosystem preservation, local community welfare, and meaningful experiences for tourists. An ethical approach will ensure long-term sustainability of ecotourism and mangrove crab cultivation activities, as well as become a positive example in responsible natural resource management.

3.6 Building Community Resilience

Community resilience can be defined as the ability of individuals, groups, or communities to cope with external pressures and disturbances when undergoing social, political, and environmental changes (Berkes & Ross, 2013). Community resilience becomes a primary requirement for areas with high vulnerability levels such as coastal regions. The characteristics of coastal areas, which are land areas still influenced by marine properties such as tides, sea winds, and saltwater seepage, make these areas highly vulnerable (Rahmayana & Handayani, 2019). Building coastal community resilience through economic improvement, enhanced adaptive capacity, and innovation in facing environmental and economic challenges is crucial for creating sustainable alternative livelihoods. Coastal communities often face various challenges such as climate change, marine environmental degradation, commodity price fluctuations, and economic uncertainty (Cinner et al., 2018). Therefore, coordinated efforts are needed to build coastal community resilience so they can survive and even thrive amid these challenges (Salomon et al., 2019).

Increasing coastal community resilience can be achieved through several approaches:

1) Improving the coastal community's economy. With better economic conditions, coastal communities will have sufficient capital to invest in alternative businesses, access more modern technology and equipment, and enhance their capacity through training and education (Pomeroy et al., 2016). Economic improvement can also encourage livelihood diversification, reducing community dependence on a single income source (Islam & Herbeck, 2013).
2) Enhancing the adaptive capacity of coastal communities. Communities need to be equipped with knowledge and skills in identifying new opportunities, developing adaptation strategies, and adopting more sustainable technologies and practices (Whitney et al., 2017). This adaptive capacity can help coastal communities remain flexible and resilient in facing changing environmental and economic conditions (Folke et al., 2016).
3) Innovation. Through innovation, communities can develop more sustainable and profitable alternative livelihoods. For example, developing marine ecotourism, environmentally friendly marine aquaculture, processing marine products with higher added value, or wisely utilizing untapped marine resources (Blythe et al., 2014). Innovation can also encourage partnerships and cooperation with other parties such as government, private sector, or research institutions to help coastal communities develop sustainable alternative businesses (Steenbergen et al., 2017)..
4) Initiating various activities that can become alternative livelihoods for coastal communities. These activities must be designed considering sustainability aspects, both economically, socially, and environmentally (Bennett et al., 2015). For example, developing community-based tourism that prioritizes cultural and environmental preservation, environmentally friendly mangrove crab cultivation, or developing other marine-based creative industries (Ferrol-Schulte et al., 2013).

Building coastal community resilience through economic improvement, enhanced adaptive capacity, and innovation, while initiating various sustainable alternative livelihood activities, will better prepare coastal communities to face dynamic environmental and economic challenges. This resilience will help coastal communities remain productive, self-reliant, and prosperous while mitigating the inevitable negative impacts of environmental and economic changes. These efforts will also contribute to comprehensive sustainable development in coastal areas by ensuring a balance between economic, social, and environmental aspects.

3.7 Policy Development

The development of policies supporting mangrove conservation, ecotourism, and mangrove crab cultivation is crucial for creating an environment that sustains coastal community livelihoods. According to Jusoff and Taha (2009), appropriate policies can ensure balance between mangrove ecosystem preservation, coastal community economic development, and wildlife conservation efforts such as mangrove crabs. Based on research findings from various studies, several key points need attention in policy development:

1) Policies related to mangrove conservation. According to Spalding et al. (2014), mangrove forests play a vital ecological role in maintaining coastal ecosystem balance, preventing erosion, and providing habitat for various species. Therefore,

as emphasized by Lee et al. (2019), policies governing mangrove protection and rehabilitation must be strictly implemented. This can include establishing mangrove conservation areas, strict monitoring of activities that could damage mangroves, and incentives for communities involved in conservation efforts.

2) Policies supporting mangrove ecotourism development. As documented by (Basyuni et al., 2018), ecotourism can become an alternative income source for coastal communities while promoting mangrove conservation. According to Stone and Wall (2004), policies regulating standards and best practices in mangrove ecotourism management need to be developed, such as visitor number limitations, waste management, and minimizing wildlife disturbance.
3) Policies regulating mangrove crab cultivation. Research by Mirera (2011) shows that mangrove crabs are species living in mangrove ecosystems with high economic value. However, as noted by Le Vay et al. (2007), excessive crab harvesting can threaten their population. Therefore, policies regulating harvest quotas, minimum sizes, and harvesting seasons need implementation. Additionally, policies should encourage environmentally friendly and sustainable mangrove crab cultivation methods.
4) Policies supporting active coastal community involvement in conservation and sustainable economic development. According to Datta et al. (2012), local communities must be involved in decision-making processes and provided with training and support to develop sustainable ecotourism and mangrove crab cultivation businesses. As suggested by Thompson et al. (2018), policies can provide incentives or funding schemes for communities involved in conservation and sustainable economic activities.
5) Policies promoting coordination and synergy between relevant government institutions are crucial. According to Friess et al. (2016), mangrove conservation, ecotourism management, and mangrove crab cultivation policies involve various ministries and institutions. Proper coordination between these institutions is needed to ensure consistent and mutually supportive policies.

The development of policies supporting mangrove conservation, ecotourism, and mangrove crab cultivation creates a conducive environment for sustainable coastal community livelihoods. These policies ensure the preservation of mangrove ecosystems as natural habitats for mangrove crabs while providing economic opportunities for coastal communities through environmentally friendly ecotourism and crab cultivation. Consequently, coastal communities can improve their welfare without sacrificing the sustainability of natural resources that support their lives.

3.8 Impact Assessment of Mangrove Crab Cultivation-Based Ecotourism Activities

Measuring the impact of mangrove ecotourism activities based on mangrove crab cultivation as a sustainable livelihood is crucial. Only through comprehensive impact measurement can it be ensured that ecotourism and mangrove crab cultivation activities are truly sustainable and provide optimal benefits for coastal communities. According to research by Safuridar and Andiny (2019), assessing the impact of mangrove ecotourism involves indicators from three main aspects:

1) Economic Impact Assessment: This ensures that ecotourism and mangrove crab cultivation activities can increase the income and welfare of coastal communities. Indicators include community income from these activities, job creation, income source diversification, and local economic growth. This assessment also considers economic sustainability aspects, such as investment and reinvestment levels in these activities, and resilience to economic shocks.
2) Environmental Impact Assessment: This ensures that ecotourism and mangrove crab cultivation activities do not damage the mangrove ecosystem and overall marine environment. Indicators include mangrove cover area, seawater quality, biodiversity in mangrove ecosystems, pollution levels, and waste management. The assessment also considers impacts on mangrove crab species and other wildlife, as well as conservation efforts.
3) Social Impact Assessment: This ensures that ecotourism and mangrove crab cultivation activities provide broad and sustainable benefits to coastal communities. Indicators include community involvement and participation, community economic empowerment, community acceptance and support for these activities, and strengthening local identity and culture. The assessment also considers impacts on community quality of life, such as access to basic services, health, and education.

In conducting impact assessments, it is crucial to involve all relevant stakeholders, including coastal communities, governments, academics, and non-governmental organizations. This involvement will ensure that impact assessments are conducted transparently, objectively, and reflect diverse perspectives. The results of these impact assessments can then be used as a foundation for developing more effective strategies and policies to support sustainable mangrove ecotourism and mud crab cultivation activities. Findings from impact assessments can help identify areas that need improvement, as well as opportunities to enhance economic benefits, preserve environmental sustainability, and promote more inclusive social development.

3.9 Future Prospects

As reported by Utomo and Pulungan (2023), mangrove ecotourism based on mangrove crab cultivation has promising future prospects in supporting sustainable development, environmental conservation, and community welfare improvement. These prospects include:

1) Sustainable Development Perspective: The activities provide opportunities for coastal communities to develop economically, socially, and environmentally sustainable livelihoods.

2) Environmental Conservation: The initiative serves as an incentive for communities to protect and preserve mangrove forests, ensuring the sustainability of mangrove crab resources and maintaining coastal ecosystem balance.
3) Community Welfare: The activities create new job opportunities, increase community income, and promote livelihood diversification while strengthening local identity and culture.
4) Tourism Trends: The prospects are supported by tourism trends increasingly focused on environmentally friendly and community-based activities, attracting tourists seeking unique and sustainable travel experiences

To realize a promising future prospect, support from various parties is required, such as government, non-governmental organizations, academics, and the private sector. The government can provide support through policies and regulations that promote the development of sustainable mangrove ecotourism and mud crab cultivation. Non-governmental organizations and academics can offer mentoring, training, and knowledge transfer to coastal communities. The private sector can also play a role in providing investment, market access, and beneficial business partnerships for coastal communities. Through collaboration and collective efforts from various stakeholders, mangrove ecotourism based on mud crab cultivation in coastal communities can become a role model for sustainable development, environmental conservation, and improvement of community welfare in Indonesia's coastal regions and even worldwide.

5. Conclusions

The integration of philosophical studies with mangrove ecotourism centered on mud crab aquaculture is essential for creating sustainable livelihoods in coastal communities. This model effectively balances economic needs while preserving mangrove ecosystems through: alternative economic opportunity creation, natural habitat conservation, community empowerment, and development-conservation equilibrium. Its success depends on appropriate policies, community empowerment, ethical resource management, and multi-stakeholder collaboration. When properly implemented, this approach can serve as a sustainable development model for global coastal regions, enhancing community welfare while ensuring ecological preservation.

Acknowledgment

Thank you to the University of Mataram for supporting this research.

Ethical considerations

Not applicable.

Conflict of Interest

The authors declare no conflicts of interest.

Funding

This research did not receive any financial support.

References

Arbain, M., & Chairiyah, N. (2020). Strategi Peningkatan Peran Masyarakat Dalam Melestarikan Ekowisata Mangrove Dan Bekantan Di Kelurahan Karang Rejo Tarakan Barat. *J-PEN Borneo : Jurnal Ilmu Pertanian*, *3*(1), 1–13. https://doi.org/10.35334/jpen.v3i1.1566

Basyuni, M., Bimantara, Y., Siagian, M., Wati, R., Slamet, B., Sulistiyono, N., Nuryawan, A., & Leidonad, R. (2018). Developing community-based mangrove management through eco-tourism in North Sumatra, Indonesia. *IOP Conference Series: Earth and Environmental Science*, *126*(1). https://doi.org/10.1088/1755-1315/126/1/012109

Bennett, N. J., Dearden, P., & Peredo, A. M. (2015). Vulnerability to multiple stressors in coastal communities: a study of the Andaman coast of Thailand. *Climate and Development*, *7*(2). https://doi.org/10.1080/17565529.2014.886993

Berkes, F., & Ross, H. (2013). Community Resilience: Toward an Integrated Approach. *Society and Natural Resources*, *26*(1). https://doi.org/10.1080/08941920.2012.736605

Blythe, J. L., Murray, G., & Flaherty, M. (2014). Strengthening threatened communities through adaptation: Insights from coastal Mozambique. *Ecology and Society*, *19*(2). https://doi.org/10.5751/ES-06408-190206

Cinner, J. E., Adger, W. N., Allison, E. H., Barnes, M. L., Brown, K., Cohen, P. J., Gelcich, S., Hicks, C. C., Hughes, T. P., Lau, J., Marshall, N. A., & Morrison, T. H. (2018). Building adaptive capacity to climate change in tropical coastal communities. In *Nature Climate Change* (Vol. 8, Issue 2). https://doi.org/10.1038/s41558-017-0065-x

Datta, D., Chattopadhyay, R. N., & Guha, P. (2012). Community based mangrove management: A review on status and sustainability. In *Journal of Environmental Management* (Vol. 107). https://doi.org/10.1016/j.jenvman.2012.04.013

Farhaby, A. M. (2017). Kajian Karakteristik Biometrika Kepiting Bakau (Scylla sp.) di Kabupaten Pemalang, Studi kasus di Desa Mojo Kecamatan Ulujami. *Akuatik Jurnal Sumberdaya Perairan*, *11*(1), 48–53.

Ferrol-Schulte, D., Wolff, M., Ferse, S., & Glaser, M. (2013). Sustainable Livelihoods Approach in tropical coastal and marine social-ecological systems: A review. *Marine Policy*, *42*. https://doi.org/10.1016/j.marpol.2013.03.007

Folke, C., Biggs, R., Norström, A. V., Reyers, B., & Rockström, J. (2016). Social-ecological resilience and biosphere-based sustainability science. *Ecology and Society*, *21*(3). https://doi.org/10.5751/ES-08748-210341

Friess, D. A., Thompson, B. S., Brown, B., Amir, A. A., Cameron, C., Koldewey, H. J., Sasmito, S. D., & Sidik, F. (2016). Policy challenges and approaches for the conservation of mangrove forests in Southeast Asia. *Conservation Biology : The Journal of the Society for Conservation Biology*, *30*(5). https://doi.org/10.1111/cobi.12784

Gobel, S. F. P., & Wunarlan, I. (2023). Konservasi Mangrove Sebagai Upaya Mendukung Kawasan Ekowisata Di Wilayah Pesisir. *Jambura Journal of Urban and Regional Planning*, *1*(1), 41–46.

Hastuti, Y. P., Affandi, R., Safrina, M. D., Faturrohman, K., & Nurussalam, W. (2015). Salinitas Optimum Untuk Pertumbuhan Benih Kepiting Bakau Scylla serrata Dalam Sistem Resirkulasi. *Jurnal Akuakultur Indonesia*, *14*(1), 50–57.

Islam, M. M., & Herbeck, J. (2013). Migration and Translocal Livelihoods of Coastal Small-scale Fishers in Bangladesh. *Journal of Development Studies*, *49*(6). https://doi.org/10.1080/00220388.2013.766719

Jusoff, K., & Bin Hj Taha, D. H. D. (2009). Managing Sustainable Mangrove Forests in Peninsular Malaysia. *Journal of Sustainable Development*, *1*(1). https://doi.org/10.5539/jsd.v1n1p88

Koeswantono W, S. (2017). Pemberdayaan Masyarakat Melalui Pelatihan Menyulam Pada Ibu-Ibu Di Desa Pabuaran Kecamatan Sukamakmur Kabupaten Bogor. *Jurnal Sarwahita*, *11*(2), 82–86. https://doi.org/10.21009/sarwahita.112.04

Lasibani, M., & Kamal, E. (2010). Pola Penyebaran Pertumbuhan "Propagul" Mangrove Rhizophoraceae Di Kawasan Pesisir Sumatera Barat. *Jurnal Mangrove Dan Pesisir X*, *1*.

Le Vay, L., Ut, V. N., & Walton, M. (2007). Population ecology of the mud crab Scylla paramamosain (Estampador) in an estuarine mangrove system; a mark-recapture study. *Marine Biology*, *151*(3). https://doi.org/10.1007/s00227-006-0553-4

Lee, S. Y., Hamilton, S., Barbier, E. B., Primavera, J., & Lewis, R. R. (2019). Better restoration policies are needed to conserve mangrove ecosystems. In *Nature Ecology and Evolution* (Vol. 3, Issue 6). https://doi.org/10.1038/s41559-019-0861-y

Mahmuda, R., Aritonang, D., Evitrisna, & Harefa, M. S. (2023). Mengatasi Dalam Rehabilitasi Di Kawasan Mangrove Di Paluh Merbau, Tanjung Rejo, Kabupaten Deli Serdang. *Humantech: Jurnal Ilmiah Multi Disiplin Indonesia* , *2*(3), 553–565.

Malik, A. (2017). Dampak Eksploitasi SDA Terhadap Kesejahteraan Masyarakat dalam. *NIZHAM*, *5*(2), 59–76.

Mirera, O. D. (2011). Trends in exploitation, development and management of artisanal mud crab (Scylla serrata-Forsskal-1775) fishery and small-scale culture in Kenya: An overview. In *Ocean and Coastal Management* (Vol. 54, Issue 11). https://doi.org/10.1016/j.ocecoaman.2011.08.001

Nurbaiti, Hasibuan, R. R. A., & Siregar, S. N. (2023). Konsep Sustainable Development (Pembangunan Berkelanjutan) Berbasis Sosial dan Ekonomi Terhadap Perlindungan Sumber Daya Alam Perspektif Maqashid Syariah. *Jurnal Masharif Al-Syariah: Jurnal Ekonomi Dan Perbankan Syariah*, *8*(2), 1390–1402. https://doi.org/10.30651/jms.v8i2.19939

Pomeroy, R., Parks, J., Mrakovcich, K. L., & LaMonica, C. (2016). Drivers and impacts of fisheries scarcity, competition, and conflict on maritime security. *Marine Policy*, *67*. https://doi.org/10.1016/j.marpol.2016.01.005

Rahmayana, L., & Handayani, W. (2019). Ketahanan Masyarakat Pesisir Kecamatan Kampung Laut Dalam Menghadapi Penyusutan Laguna Segara Anakan. *Jurnal Pembangunan Wilayah Dan Kota*, *15*(2), 96–107. https://doi.org/10.14710/pwk.v15i2.22157

Safuridar, & Andiny, P. (2019). Dampak Pengembangan Ekowisata Hutan Mangrove terhadap Sosial dan Ekonomi Masyarakat di Desa Kuala Langsa, Aceh. *Jurnal Samudra Ekonomi Dan Bisnis*, *11*(1), 43–52. https://doi.org/10.33059/jseb.v11i1.1882

Salim, A., Maulany, R. I., & Oka, N. P. (2020). Optimalisasi Pengelolaan Ekosistem Mangrove di Kawasan Bungkutoko Sulawesi Tenggara sebagai Kawasan Ekowisata. *Jurnal Hutan Dan Masyarakat*, *12*(1), 24–38.

Salomon, A. K., Quinlan, A. E., Pang, G. H., Okamoto, D. K., & Vazquez-Vera, L. (2019). Measuring social-ecological resilience reveals opportunities for transforming environmental governance. *Ecology and Society*, *24*(3). https://doi.org/10.5751/ES-11044-240316

Siregar, L. G. (2010). Filsafat Lingkungan Paradigma Baru Untuk Para Arsitek. *Jurnal Bumi Lestari*, *10*(1), 136–145.

Spalding, M. D., McIvor, A., Tonneijck, F. H., Tol, S., & van Eijk, P. (2014). Mangroves for coastal defence: guidelines for coastal managers & policy makers. *Wetlands International and The Nature Conservancy*.

Steenbergen, D. J., Clifton, J., Visser, L. E., Stacey, N., & McWilliam, A. (2017). Understanding influences in policy landscapes for sustainable coastal livelihoods. *Marine Policy*, *82*. https://doi.org/10.1016/j.marpol.2017.04.012

Stone, M., & Wall, G. (2004). Ecotourism and Community Development: Case Studies from Hainan, China. In *Environmental Management* (Vol. 33, Issue 1). https://doi.org/10.1007/s00267-003-3029-z

Tan, T. J. A., & Siregar, L. H. (2021). Peranan Ekosistem Hutan Mangrove Pada Migitasi Bencana Bagi Masyarakat Pesisir

Pantai. *Prosiding Mitigasi Bencana*, *1*, 27–35. https://proceeding.dharmawangsa.ac.id/index.php/PROSUNDHAR/article/view/4/27

Thompson, B. S., Gillen, J., & Friess, D. A. (2018). Challenging the principles of ecotourism: insights from entrepreneurs on environmental and economic sustainability in Langkawi, Malaysia. *Journal of Sustainable Tourism*, *26*(2). https://doi.org/10.1080/09669582.2017.1343338

Utomo, D. K. S., & Pulungan, A. R. (2023). Ekowisata Mangrove dalam Pariwisata Berkelanjutan di Sumatera Utara. *Masyarakat Pariwisata: Journal of Community Services in Tourism*, *4*(2), 46–60. https://doi.org/10.34013/mp.v4i2.1393

Whitney, C. K., Bennett, N. J., Ban, N. C., Allison, E. H., Armitage, D., Blythe, J. L., Burt, J. M., Cheung, W., Finkbeiner, E. M., Kaplan-Hallam, M., Perry, I., Turner, N. J., & Yumagulova, L. (2017). Adaptive capacity: From assessment to action in coastal social-ecological systems. *Ecology and Society*, *22*(2). https://doi.org/10.5751/ES-09325-220222