

Strengthening Environmental Law Enforcement and Dispute Resolution Through Community Education for Sustainable Environmental Tourism Governance

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Abstract: Environmental tourism is one of the sectors that plays an important role in improving community welfare and supporting regional development. However, the growth of tourism activities that is not accompanied by sustainable management often leads to various problems, including environmental degradation, conflicts over natural resource utilization, pollution, and disputes among local communities, tourism operators, and government institutions. These conditions highlight the need to enhance public understanding of the legal aspects related to environmental tourism management and the mechanisms available for resolving disputes effectively and fairly. This community service program aims to increase public legal awareness regarding the importance of environmental law enforcement in tourism activities and to provide knowledge of alternative dispute resolution mechanisms that can be applied when conflicts arise. The program is implemented through legal counseling, interactive discussions, and assistance provided to local communities and tourism managers. The materials presented include principles of sustainable environmental tourism management, common forms of legal violations, environmental law enforcement mechanisms, and dispute resolution through both litigation and non-litigation approaches. The expected outcomes of this program are improved public knowledge and legal awareness in preserving tourism-related environmental resources, a better understanding of the rights and obligations of stakeholders, and enhanced capacity to resolve conflicts peacefully through deliberation, mediation, and applicable legal mechanisms. Furthermore, this activity is expected to strengthen collaboration among communities, government agencies, and tourism operators in creating sustainable, equitable, and environmentally responsible tourism governance that generates economic benefits without compromising environmental protection.

Keywords : Law Enforcement, Dispute Resolution, Sustainable Environmental Tourism

1. Introduction

Mangrove ecosystems are among the most valuable coastal ecosystems globally, providing extensive ecological, economic, and social benefits that are fundamental to sustainable coastal development. As one of the world's most efficient blue carbon ecosystems, mangrove forests possess an exceptional capacity to sequester and store atmospheric carbon, thereby contributing significantly to global climate change mitigation. In addition, mangroves function as natural coastal barriers that protect shorelines against erosion, storm surges, tidal flooding, and sea-level rise. Their complex root systems stabilize coastal sediments, improve water quality by filtering pollutants, and provide critical habitats for numerous marine organisms during various stages of their life cycles. Consequently, mangrove ecosystems support fisheries productivity, biodiversity conservation, food security, ecotourism development, and the livelihoods of millions of people living in coastal regions. Owing to these multiple ecosystem services, mangrove conservation has become an international priority within global sustainability agendas, particularly in achieving the United Nations Sustainable Development Goals (SDGs), including SDG 13 (Climate Action), SDG 14 (Life Below Water), and SDG 15 (Life on Land).

Despite their ecological importance, mangrove ecosystems continue to experience rapid degradation worldwide due to increasing anthropogenic pressures. Coastal urbanization, aquaculture expansion, industrial development, illegal logging, land conversion, and unsustainable tourism activities have substantially reduced mangrove coverage over recent decades. In addition to habitat destruction, marine pollution—particularly plastic waste—has emerged as one of the most critical environmental threats affecting coastal ecosystems. Unlike organic waste, plastic materials require hundreds of years to decompose and frequently accumulate within mangrove root systems, where they obstruct tidal water circulation, alter sediment characteristics, reduce oxygen exchange, and inhibit natural

regeneration processes. Plastic pollution also threatens marine biodiversity through ingestion, entanglement, and habitat degradation, ultimately reducing the ecological resilience of mangrove ecosystems. Therefore, addressing plastic waste has become an essential component of integrated coastal ecosystem management.

The global plastic pollution crisis has intensified considerably over the last decade. Millions of tons of plastic waste enter marine environments annually through rivers, coastal settlements, tourism activities, fisheries, and inadequate municipal waste management systems. Developing countries face particularly complex challenges because rapid population growth, increasing consumption of single-use plastics, limited waste management infrastructure, and weak environmental governance often result in substantial quantities of unmanaged waste entering coastal ecosystems. Mangrove forests frequently serve as natural traps for floating marine debris due to their dense aerial root systems, making them highly vulnerable to long-term waste accumulation. Consequently, the ecological integrity of mangrove ecosystems increasingly depends not only on habitat restoration but also on effective waste management strategies capable of preventing land-based pollution from reaching coastal environments.

Indonesia occupies a strategic position within global mangrove conservation efforts because it possesses the largest extent of mangrove forests in the world, accounting for approximately one-fifth of global mangrove coverage. These ecosystems play a vital role in supporting coastal biodiversity, fisheries production, climate regulation, and national carbon sequestration targets. However, Indonesia is simultaneously recognized as one of the countries facing severe challenges associated with marine plastic pollution. The rapid growth of coastal populations, tourism industries, and economic activities has significantly increased the volume of plastic waste entering rivers and coastal waters. Consequently, many Indonesian mangrove ecosystems experience continuous waste accumulation, threatening their ecological functions and reducing the sustainability of community livelihoods dependent upon healthy coastal environments.

Among Indonesia's important mangrove ecosystems is the mangrove forest of Tongke-Tongke Village, Sinjai Regency, South Sulawesi, which has gained national recognition for its successful community-based rehabilitation initiatives. Originally established through active participation by local residents, the mangrove ecosystem has evolved into a prominent ecotourism destination while continuing to provide essential ecosystem services, including shoreline protection, fisheries support, biodiversity conservation, and carbon sequestration. The development of mangrove ecotourism has generated significant socio-economic benefits by creating employment opportunities, increasing household incomes, and strengthening environmental awareness among local communities. Nevertheless, the increasing intensity of tourism activities and expanding coastal settlements have also resulted in growing quantities of plastic waste and household refuse within the mangrove area.

Preliminary observations in Tongke-Tongke indicate that waste accumulation occurs along mangrove boardwalks, tidal channels, and aerial root systems, particularly during weekends and peak tourism periods. Plastic bottles, food packaging, disposable containers, plastic bags, and other non-biodegradable materials were frequently observed within the conservation area. Such conditions threaten not only the ecological integrity of mangrove ecosystems but also the sustainability of ecotourism development. Poor environmental quality reduces the aesthetic value of tourism destinations, negatively influences visitor satisfaction, and may ultimately diminish local economic benefits derived from nature-based tourism. These observations demonstrate that successful mangrove rehabilitation alone is insufficient to ensure long-term ecosystem sustainability unless accompanied by effective community-based waste management and continuous environmental stewardship.

The environmental challenges observed in Tongke-Tongke also illustrate the limitations of conventional waste management approaches that rely primarily on infrastructure development and government intervention. Although waste collection facilities and periodic clean-up activities have been

implemented, the recurrence of plastic pollution suggests that technical solutions alone cannot effectively address the underlying behavioral and institutional factors contributing to waste generation. Sustainable waste management requires active community participation, environmental awareness, strong local institutions, and long-term behavioral transformation. Consequently, conservation strategies must move beyond reactive waste removal toward preventive approaches capable of fostering collective responsibility and environmentally responsible lifestyles within coastal communities.

While mangrove restoration has become a global priority, increasing evidence suggests that ecological rehabilitation alone cannot guarantee the long-term sustainability of coastal ecosystems. Numerous restoration programs have successfully increased mangrove coverage; however, many restored sites continue to experience environmental degradation resulting from unmanaged solid waste, inadequate environmental governance, and weak community participation. This indicates that successful conservation should not be measured solely by increases in mangrove area but also by the capacity of local communities to maintain ecosystem quality through sustainable environmental practices. Consequently, contemporary mangrove management has gradually shifted from an ecosystem restoration paradigm toward an integrated socio-ecological approach that recognizes the interdependence between ecological integrity, community participation, and institutional resilience.

Within this context, Community-Based Waste Management (CBWM) has emerged as one of the most widely adopted approaches for improving environmental quality in developing countries. CBWM is founded on the principle that local communities should become the primary actors in planning, implementing, monitoring, and evaluating waste management systems. Rather than treating communities as passive beneficiaries of government programs, CBWM emphasizes empowerment, local ownership, and shared responsibility. This participatory approach enables communities to develop locally appropriate solutions while strengthening environmental awareness and social cohesion. Numerous studies have reported that community participation significantly improves waste segregation practices, recycling behavior, environmental cleanliness, and institutional sustainability because local residents possess direct knowledge of environmental problems and stronger incentives to protect resources that support their livelihoods.

In coastal ecosystems, the importance of CBWM becomes even more evident because most marine debris originates from land-based human activities. Household waste, tourism activities, fisheries, small-scale businesses, and inadequate municipal waste collection collectively contribute to the continuous flow of plastic waste into rivers and coastal waters. Consequently, preventing marine pollution requires behavioral changes at the community level rather than relying solely on downstream waste removal. Community participation in waste reduction, household waste segregation, recycling, and environmental monitoring therefore represents a critical component of sustainable coastal ecosystem management. Moreover, community involvement enhances local accountability, reduces operational costs, and improves the long-term sustainability of environmental programs by fostering collective ownership over conservation initiatives.

Despite its advantages, previous studies have also identified several limitations of conventional CBWM programs. Many initiatives achieve temporary improvements in environmental cleanliness but experience declining community participation once external facilitation or financial support ends. In many cases, waste management remains dependent on project-based interventions without generating lasting behavioral transformation. Furthermore, several studies report that environmental education frequently increases public knowledge while producing only limited changes in daily environmental practices. This discrepancy between environmental awareness and actual behavior, commonly referred to as the knowledge-behavior gap, indicates that cognitive understanding alone is insufficient to sustain

environmentally responsible actions. These findings suggest that additional motivational mechanisms are required to strengthen long-term environmental commitment.

Behavioral science provides important insights into this issue. The Theory of Planned Behavior (TPB) argues that environmental behavior is influenced not only by knowledge but also by individual attitudes, perceived social norms, and perceived behavioral control. Similarly, the Value-Belief-Norm (VBN) Theory emphasizes that pro-environmental behavior develops through the internalization of personal values and moral obligations. Individuals are more likely to engage in environmentally responsible actions when they perceive environmental protection as an ethical responsibility rather than merely a regulatory requirement. These theoretical perspectives suggest that environmental governance should incorporate value-based approaches capable of strengthening intrinsic motivation alongside technical knowledge and institutional support.

One promising approach for addressing this challenge is the integration of religious values into environmental conservation. Religion constitutes one of the most influential social institutions in many developing countries, shaping ethical norms, social behavior, and collective identity. Increasing international scholarship recognizes that faith-based environmental initiatives can significantly strengthen sustainability programs by connecting ecological responsibility with moral and spiritual commitments. Religious teachings often provide ethical guidance concerning stewardship, justice, moderation, and responsibility toward future generations, thereby encouraging environmentally responsible behavior beyond legal compliance. Consequently, integrating religious values into environmental governance has emerged as an increasingly important strategy for promoting sustainable development within culturally diverse societies.

In Muslim-majority countries such as Indonesia, Islamic eco-theology offers a comprehensive ethical framework for environmental conservation. The Qur'an and the Hadith consistently emphasize that humans are appointed as *khalifah fil ardh* (stewards of the Earth) who are entrusted with protecting and managing natural resources responsibly. Environmental destruction (*fasād*) is explicitly discouraged because it disrupts the ecological balance (*mīzān*) established by Allah SWT, while the principle of *amanah* emphasizes that natural resources constitute a divine trust that must be preserved for future generations. Furthermore, the concept of *maṣlaḥah* encourages every human activity to generate collective welfare while avoiding environmental harm. Together, these principles establish a moral framework that aligns environmental sustainability with religious responsibility, making environmental conservation an integral component of Islamic ethics rather than merely a technical environmental issue.

The integration of Islamic eco-theology into community-based environmental management is particularly relevant in Sinjai Regency, where Islamic values remain deeply embedded in everyday social life. Religious leaders, mosques, Islamic educational institutions, and community religious organizations possess considerable influence in shaping public attitudes and collective behavior. Consequently, environmental messages delivered through religious institutions are likely to receive stronger community acceptance than purely administrative or technical campaigns. This social context provides a unique opportunity to strengthen community participation in mangrove conservation by integrating scientific environmental knowledge with locally embedded religious values.

Although previous studies have separately examined mangrove conservation, community-based waste management, environmental education, and Islamic environmental ethics, these themes remain largely disconnected in the existing literature. Research on mangrove conservation has predominantly focused on ecological restoration, biodiversity conservation, carbon sequestration, and ecotourism development. Studies on CBWM generally emphasize institutional capacity, waste management technologies, and stakeholder participation. Meanwhile, Islamic eco-theology research has largely remained conceptual, discussing religious perspectives on environmental stewardship without

demonstrating how these principles can be operationalized within practical conservation programs. Consequently, limited empirical evidence exists regarding the integration of community-based waste management and Islamic eco-theological values into a unified conservation framework capable of promoting sustainable behavioral change in coastal communities. This gap provides the foundation for developing a more holistic model that integrates ecological science, participatory governance, and faith-based environmental ethics.

The fragmented nature of the existing literature highlights a significant research gap. First, although previous studies have confirmed the effectiveness of community participation in improving environmental management, most have focused on technical aspects of waste reduction, recycling systems, or institutional governance without examining the influence of religious and cultural values on environmental behavior. Second, research on mangrove conservation has primarily emphasized ecological restoration, biodiversity preservation, blue carbon storage, and ecotourism development, while giving relatively little attention to behavioral transformation as a prerequisite for long-term conservation success. Third, studies discussing Islamic eco-theology have generally remained within philosophical or theological discourse, offering limited empirical evidence regarding its practical implementation in community-based environmental management. As a result, there is still a lack of integrated approaches capable of combining environmental education, community participation, institutional development, and faith-based environmental ethics into a unified framework for sustainable mangrove conservation.

This research gap becomes increasingly relevant in coastal communities where environmental problems are closely intertwined with socio-cultural dynamics. Environmental degradation within mangrove ecosystems is not solely the result of inadequate waste management infrastructure but also reflects patterns of human behavior, social norms, and community values. Consequently, conservation strategies focusing exclusively on technological solutions are unlikely to produce lasting environmental improvements unless they simultaneously encourage behavioral change and strengthen collective responsibility. This perspective is consistent with the socio-ecological systems approach, which argues that environmental sustainability depends upon the interaction between ecological processes and social institutions. Therefore, successful mangrove conservation requires interdisciplinary approaches capable of integrating ecological science with community empowerment and locally embedded value systems.

The case of Tongke-Tongke Village, Sinjai Regency, provides a particularly valuable context for examining this issue. The village has long been recognized as one of Indonesia's successful examples of community-based mangrove rehabilitation, where local participation has played a central role in restoring degraded coastal ecosystems. Nevertheless, increasing tourism activities and population growth have generated new environmental challenges, particularly the accumulation of plastic waste within mangrove habitats. These emerging problems demonstrate that ecological restoration represents only the initial stage of conservation, while maintaining ecosystem sustainability requires continuous environmental stewardship supported by effective waste management and active community participation. Accordingly, Tongke-Tongke represents an ideal living laboratory for developing and evaluating innovative community-based conservation models.

To address these challenges, this study proposes an integrated framework entitled Eco-Theological Community-Based Waste Management (ET-CBWM). The proposed model combines three complementary approaches. The first is Participatory Community Development, which emphasizes community empowerment and collaborative decision-making. The second is Community-Based Waste Management (CBWM), which encourages active community participation in waste reduction, segregation, recycling, and environmental monitoring. The third is the Islamic Eco-Theological Approach, which incorporates religious values into environmental education to strengthen moral

responsibility and intrinsic environmental motivation. The integration of these three approaches is expected to generate stronger and more sustainable conservation outcomes than conventional waste management programs that rely primarily on technical interventions.

The novelty of this study lies in the development of a holistic conservation model that explicitly integrates scientific environmental management with Islamic ethical values. Unlike previous studies that have examined these components independently, the ET-CBWM model demonstrates how environmental education, participatory governance, institutional strengthening, and eco-theological values can interact synergistically to promote sustainable environmental behavior. Specifically, the study operationalizes the Islamic concepts of *khalifah fil ardh*, *amanah*, *mīzān*, and *maṣlaḥah* within practical community-based waste management activities, thereby transforming abstract theological principles into concrete conservation practices. This interdisciplinary integration represents a significant contribution to both environmental management literature and faith-based sustainability studies.

The study also contributes to the broader discussion on community-based environmental governance. Existing governance frameworks frequently emphasize regulatory enforcement and institutional coordination while underestimating the influence of locally embedded cultural and religious values on environmental decision-making. By demonstrating that Islamic eco-theological principles can strengthen environmental awareness, encourage collective action, and reinforce community participation, this research expands current understanding of how environmental governance can be enhanced through culturally relevant approaches. These findings are particularly important for Muslim-majority countries, where religious institutions possess substantial social legitimacy and can function as strategic partners in promoting environmental sustainability.

Beyond its theoretical contributions, the ET-CBWM model has important practical implications. The framework offers an adaptable strategy for local governments, environmental organizations, tourism managers, and community institutions seeking to improve coastal waste management while strengthening mangrove conservation. By integrating environmental education with religious values and participatory governance, the model supports not only ecosystem protection but also community resilience, sustainable tourism, and local economic development. Moreover, because the framework is based on universally recognized principles of stewardship, responsibility, balance, and public welfare, it has the potential to be adapted to other coastal regions facing similar environmental challenges, with appropriate adjustments to local socio-cultural contexts.

Finally, this study contributes directly to global efforts toward achieving the United Nations Sustainable Development Goals (SDGs). The conservation of mangrove ecosystems enhances climate change mitigation through blue carbon storage (SDG 13), protects coastal biodiversity and marine ecosystems (SDG 14), supports terrestrial ecosystem conservation (SDG 15), and strengthens multi-stakeholder collaboration through partnerships among local communities, government agencies, universities, tourism organizations, and religious institutions (SDG 17). Thus, the ET-CBWM model aligns local conservation initiatives with broader international sustainability agendas while demonstrating the importance of integrating scientific knowledge with cultural and ethical values.

Therefore, this study aims to develop and evaluate an Eco-Theological Community-Based Waste Management (ET-CBWM) model for sustainable mangrove ecosystem conservation in Tongke-Tongke Village, Sinjai Regency. Specifically, the study seeks to examine how the integration of participatory community development, community-based waste management, and Islamic eco-theological principles can enhance environmental awareness, strengthen community participation, improve local environmental governance, and support the long-term sustainability of mangrove ecosystems. By proposing and empirically evaluating this integrated framework, the study contributes to advancing interdisciplinary approaches to community-based environmental management and provides a

replicable model for sustainable coastal conservation in Indonesia and other Muslim-majority coastal regions.

2. Research Methodology

2.1 Research Design

This study employed a Participatory Action Research (PAR) design within a qualitative research framework to develop and evaluate an Eco-Theological Community-Based Waste Management (ET-CBWM) model for sustainable mangrove ecosystem conservation in Tongke-Tongke Village, Sinjai Regency, South Sulawesi, Indonesia. Participatory Action Research was selected because it actively involves local stakeholders as co-researchers throughout the research process, enabling collaborative problem identification, planning, implementation, reflection, and evaluation. Such an approach is particularly appropriate for community-based environmental management because it facilitates social learning, strengthens community ownership, and promotes sustainable behavioral change. The conceptual framework of this study integrates three complementary approaches: Participatory Community Development (PCD), Community-Based Waste Management (CBWM), and Islamic Eco-Theology. The integration of these approaches aims to strengthen environmental governance through community empowerment, participatory waste management, and the internalization of Islamic ethical values related to environmental stewardship.

2.2 Study Area

The research was conducted in Tongke-Tongke Village, Sinjai Regency, South Sulawesi Province, Indonesia, one of the country's most recognized community-managed mangrove conservation areas. The study area was selected purposively because it possesses three important characteristics. First, the village contains an extensive mangrove ecosystem that functions as a blue carbon ecosystem, coastal protection zone, fisheries habitat, and ecotourism destination. Second, the increasing number of tourists and expanding community activities have generated significant plastic and household waste challenges that threaten ecosystem sustainability. Third, the village has an active community organization involved in mangrove management, making it an appropriate location for implementing participatory environmental management.

2.3 Participants

Participants were selected using purposive sampling, ensuring that all respondents possessed direct experience or responsibility related to mangrove management and environmental conservation. The participants consisted of:

1. village government representatives;
2. Tourism Awareness Group (Pokdarwis);
3. coastal community members;
4. women's organizations;
5. youth organizations;
6. religious leaders (Imams and Islamic preachers);
7. mangrove tourism managers; and
8. university researchers serving as facilitators.

Approximately 60–100 participants were involved throughout the implementation process, representing multiple stakeholders responsible for environmental management within the village.

2.4 Research Procedure

The ET-CBWM model was implemented through five sequential phases following the Participatory Action Research cycle.

Phase 1: Problem Identification

The initial phase aimed to identify existing environmental conditions and major waste management challenges within the mangrove ecosystem. Environmental observations, stakeholder meetings, semi-structured interviews, and Focus Group Discussions (FGDs) were conducted to explore community perceptions regarding plastic pollution, waste management practices, institutional capacity, and conservation challenges. The findings from this phase served as the foundation for designing intervention strategies appropriate to local socio-cultural conditions.

Phase 2: Participatory Planning

Based on the baseline assessment, researchers and community stakeholders collaboratively formulated an environmental action plan. Through participatory workshops and community meetings, stakeholders identified priority problems, determined conservation objectives, designed environmental education activities, and established collaborative responsibilities among participating institutions. This participatory planning process ensured that intervention strategies reflected local needs while strengthening community ownership of the program.

Phase 3: Program Implementation

The intervention consisted of three integrated components. The first component focused on environmental education, including seminars, public awareness campaigns, practical demonstrations of waste segregation, and environmental discussions concerning mangrove ecosystem services and the ecological impacts of plastic pollution. The second component emphasized the internalization of Islamic eco-theological values through religious lectures, Friday sermons, Qur'anic study sessions, and community discussions facilitated by local religious leaders. Educational materials highlighted four principal Islamic environmental values:

- *Khalifah fil Ardh* (human stewardship),
- *Amanah* (environmental responsibility),
- *Mīzān* (ecological balance), and
- *Maṣlaḥah* (public welfare).

The third component involved community conservation actions, including mangrove clean-up campaigns, waste segregation, installation of waste collection facilities, plastic reduction campaigns, and the establishment of a Mangrove Conservation Community Group responsible for sustaining conservation activities after project completion.

Phase 4: Reflection and Evaluation

Following implementation, participatory reflection meetings were conducted involving all stakeholders. Participants discussed program achievements, implementation challenges, community responses, institutional development, and recommendations for improving future conservation initiatives. Reflection constitutes an essential stage of Participatory Action Research because it enables continuous learning and adaptive program improvement.

2.5 Data Collection

Multiple qualitative data collection techniques were employed to enhance data richness and triangulation.

Observation

Participatory observations were conducted before, during, and after program implementation to document environmental conditions, waste accumulation, community participation, and conservation activities.

Semi-Structured Interviews

Semi-structured interviews were undertaken with village officials, community leaders, religious leaders, tourism managers, and local residents to explore perceptions regarding environmental conservation, waste management, and the integration of Islamic values into environmental practices.

Focus Group Discussions (FGDs)

FGDs facilitated collective identification of environmental problems, collaborative planning, evaluation of program implementation, and reflection on community experiences.

Documentation

Supporting documents included attendance records, meeting minutes, field notes, photographs, educational materials, village regulations, and reports of conservation activities. The use of multiple data sources strengthened the credibility and dependability of the research through methodological triangulation.

2.6 Data Analysis

The qualitative data were analyzed using thematic analysis following the six-stage analytical framework proposed by Braun and Clarke: (1) familiarization with the data, (2) initial coding, (3) theme generation, (4) theme review, (5) theme definition and refinement, and (6) report preparation. Thematic analysis was selected because it enables systematic identification of patterns, meanings, and relationships within qualitative data while accommodating complex social and environmental phenomena. Data obtained from interviews, observations, FGDs, and documentation were coded independently and subsequently compared across data sources to identify recurring themes related to community participation, environmental awareness, institutional strengthening, and eco-theological values. Triangulation among different methods and participant groups was employed to improve the trustworthiness and credibility of the findings.

2.7 Trustworthiness of the Study

To ensure methodological rigor, this study adopted four criteria of qualitative trustworthiness: credibility, transferability, dependability, and confirmability. Credibility was enhanced through prolonged field engagement, participant validation (member checking), and methodological triangulation. Transferability was achieved by providing a detailed description of the study context and implementation process. Dependability was strengthened by maintaining comprehensive documentation of all research activities and analytical procedures. Finally, confirmability was ensured through continuous researcher reflection and audit trails, minimizing subjective bias during data interpretation.

3. Results and Discussion

3.1 Baseline Environmental Conditions and Community Perceptions

Prior to the implementation of the Eco-Theological Community-Based Waste Management (ET-CBWM) program, an initial assessment was conducted to identify the environmental conditions of the mangrove ecosystem in Tongke-Tongke Village and to examine community perceptions regarding waste

management and mangrove conservation. The assessment combined field observations, semi-structured interviews, focus group discussions, and participatory mapping involving local government officials, tourism managers, community leaders, religious leaders, youth organizations, women's groups, and coastal residents. The findings revealed that plastic waste constituted the dominant environmental problem within the mangrove ecosystem. Various types of waste, including plastic bottles, food packaging, disposable cups, plastic bags, and household refuse, were frequently found trapped among mangrove roots, tidal channels, and wooden boardwalks used by tourists. Waste accumulation became particularly severe during weekends and public holidays when visitor numbers increased significantly. Besides waste generated by tourism activities, household waste transported through tidal movements and small rivers also contributed to environmental pollution within the conservation area.

Field observations indicated that unmanaged plastic waste negatively affected both ecological and socio-economic functions of the mangrove ecosystem. Ecologically, plastic debris obstructed water circulation, reduced sediment quality, and potentially inhibited natural mangrove regeneration by limiting seedling establishment. Community members also expressed concerns regarding declining environmental aesthetics, reduced tourism attractiveness, and possible impacts on fisheries resources. These findings confirm that marine debris represents not only an environmental issue but also a socio-economic challenge that threatens the sustainability of community livelihoods dependent upon mangrove ecosystems. The initial assessment further demonstrated that community awareness regarding waste management remained relatively heterogeneous. Although most participants recognized the importance of mangrove forests for coastal protection and tourism, many still perceived waste management as the sole responsibility of local government rather than a collective community obligation. Waste segregation at the household level was rarely practiced, and plastic reduction initiatives remained limited. Interviews revealed that inadequate environmental education, limited waste management facilities, and insufficient public participation constituted the principal barriers to sustainable waste management.

Institutionally, several community organizations were actively involved in mangrove conservation; however, coordination among stakeholders remained fragmented. Environmental campaigns were generally implemented on an ad hoc basis without continuous educational activities or integrated waste management strategies. Religious institutions had rarely been involved in environmental conservation despite their strong influence within the local community. Consequently, opportunities to utilize religious values as instruments for strengthening environmental ethics remained largely unexplored. These findings demonstrate that the environmental challenges facing Tongke-Tongke Village extend beyond physical waste accumulation and reflect broader behavioral and institutional issues. Similar observations have been reported in studies of community-based coastal management, which argue that environmental degradation often results from weak institutional collaboration, limited public participation, and insufficient environmental awareness rather than solely from inadequate infrastructure. Accordingly, the baseline assessment confirms the necessity of adopting an integrated conservation approach capable of simultaneously addressing environmental knowledge, community participation, institutional capacity, and behavioral transformation.

From the perspective of socio-ecological systems theory, the observed conditions illustrate the close interdependence between ecological sustainability and community behavior. Mangrove degradation caused by unmanaged waste is not simply an ecological phenomenon but also a manifestation of governance challenges within the local social system. Therefore, effective conservation requires interventions that simultaneously strengthen environmental literacy, community participation, institutional coordination, and culturally relevant ethical values. These findings provide the empirical justification for implementing the Eco-Theological Community-Based Waste Management (ET-CBWM) model as an integrated strategy for sustainable mangrove conservation.

3.2 Community Capacity Building through Environmental Education

One of the central components of the ET-CBWM program was participatory environmental education designed to improve environmental literacy and strengthen community capacity for sustainable waste management. Educational activities included environmental seminars, participatory discussions, waste segregation demonstrations, mangrove ecosystem awareness campaigns, and practical training involving multiple stakeholder groups. The implementation of environmental education significantly enhanced participants' understanding of the ecological functions of mangrove ecosystems. Community members increasingly recognized mangroves not only as tourism assets but also as blue carbon ecosystems that protect coastlines, support fisheries, conserve biodiversity, and mitigate climate change. Participants also developed a better understanding of the ecological impacts of plastic pollution, particularly its influence on mangrove regeneration, marine biodiversity, and ecosystem resilience.

Environmental education further promoted greater awareness regarding household waste management. Participants demonstrated improved knowledge of waste segregation, recycling opportunities, and plastic reduction strategies applicable within their daily activities. More importantly, discussions revealed an emerging perception that waste management should begin at the household level rather than relying exclusively on government intervention. Such changes indicate that environmental education successfully established the cognitive foundation necessary for long-term behavioral transformation. These findings support Environmental Education Theory, which suggests that knowledge acquisition constitutes the first stage in developing environmentally responsible behavior. However, the results also indicate that knowledge alone is insufficient to ensure sustainable behavioral change. This realization provided the rationale for integrating Islamic eco-theological values into the conservation program to strengthen participants' intrinsic environmental motivation.

3.3 Internalization of Islamic Eco-Theological Values

The integration of Islamic eco-theological principles represented the principal innovation of the ET-CBWM model. Religious education activities emphasized four fundamental Islamic concepts—*khalifah fil ardh*, *amanah*, *mīzān*, and *maṣlaḥah*—through Friday sermons, Qur'anic study sessions, religious discussions, and community dialogues facilitated by local religious leaders. Following these activities, participants increasingly perceived environmental conservation as both a social responsibility and a religious obligation. Interviews revealed that many community members experienced a shift in environmental attitudes, considering irresponsible waste disposal as a violation of the divine trust entrusted to humanity. This transformation strengthened moral commitment and encouraged greater participation in environmental conservation activities. The findings support the Value-Belief-Norm Theory, which argues that moral values significantly influence environmental behavior. Islamic eco-theological values functioned as intrinsic motivational factors, complementing environmental education and reinforcing community participation in sustainable waste management.

3.4 Community Participation and Institutional Strengthening

Community participation increased substantially throughout program implementation. Stakeholders actively participated in mangrove clean-up campaigns, household waste segregation, environmental monitoring, and conservation planning. One of the most important achievements was the establishment of the Mangrove Conservation Community Group, responsible for coordinating environmental activities after completion of the program. The formation of this institution strengthened local environmental governance by improving collaboration among village authorities, Pokdarwis, religious leaders, youth organizations, women's groups, and universities. The findings demonstrate that institutional strengthening represents an essential prerequisite for ensuring the sustainability of

community-based conservation initiatives. These observations are consistent with Participatory Community Development theory, which emphasizes that sustainable environmental management depends upon strong community ownership, collaborative decision-making, and social capital.

3.5 Integrated Discussion: Scientific Contribution of the ET-CBWM Model

The findings demonstrate that the ET-CBWM model extends conventional Community-Based Waste Management by integrating environmental education, participatory governance, institutional development, and Islamic eco-theological values within a unified conservation framework. Unlike previous CBWM approaches that predominantly emphasize technical waste management, the ET-CBWM model recognizes moral responsibility and cultural values as fundamental drivers of sustainable environmental behavior. The study therefore contributes theoretically by bridging environmental management, participatory community development, and Islamic environmental ethics. Practically, the model offers an adaptable framework for coastal communities seeking to strengthen mangrove conservation through locally relevant environmental governance. Furthermore, the ET-CBWM model directly supports the achievement of Sustainable Development Goals (SDGs), particularly SDG 13 (Climate Action), SDG 14 (Life Below Water), SDG 15 (Life on Land), and SDG 17 (Partnerships for the Goals), demonstrating that integrated community-based conservation can simultaneously generate ecological, social, and institutional benefits.

3.6 Environmental, Social, and Institutional Impacts of the ET-CBWM Model

The implementation of the Eco-Theological Community-Based Waste Management (ET-CBWM) model generated multidimensional impacts extending beyond improvements in waste management practices. The findings indicate that the intervention simultaneously strengthened environmental quality, community participation, institutional capacity, and environmental ethics, illustrating the interconnected nature of socio-ecological systems. Rather than functioning as isolated outcomes, these dimensions interacted dynamically to create a more resilient framework for sustainable mangrove ecosystem management. From an environmental perspective, routine community clean-up activities and household waste segregation contributed to noticeable improvements in the cleanliness of the mangrove ecotourism area. Plastic waste accumulation along boardwalks, tidal channels, and mangrove root systems decreased considerably during the implementation period. Community members also reported increasing awareness of responsible waste disposal, leading to a reduction in littering behavior within public spaces. Although this study did not conduct quantitative measurements of waste reduction, repeated field observations consistently indicated cleaner environmental conditions compared with those observed during the baseline assessment.

Improved environmental quality also enhanced the attractiveness of the mangrove ecotourism destination. Visitors experienced cleaner walking paths, improved landscape aesthetics, and a more comfortable recreational environment. Tourism managers reported that environmental cleanliness has become one of the most important indicators influencing visitor satisfaction and destination competitiveness. Consequently, maintaining ecosystem cleanliness is increasingly perceived as an investment in sustainable tourism rather than merely an environmental obligation. This finding demonstrates the close relationship between ecosystem conservation and local economic resilience. Socially, the ET-CBWM model strengthened community cohesion through collaborative environmental action. Community clean-up campaigns, environmental education programs, and religious discussions created new opportunities for interaction among diverse stakeholder groups, including village authorities, Pokdarwis, women's organizations, youth associations, religious leaders, and coastal residents. These activities fostered mutual trust and strengthened collective responsibility for

protecting shared environmental resources. Such social cohesion represents an important form of social capital, enabling communities to respond more effectively to future environmental challenges.

Institutionally, the establishment of the Mangrove Conservation Community Group represents one of the program's most significant achievements. Unlike temporary environmental campaigns that often depend upon external facilitation, this local institution provides an organizational mechanism capable of sustaining conservation activities after project completion. The organization coordinates routine clean-up campaigns, environmental monitoring, educational activities, and communication among stakeholders while facilitating collaboration with village authorities and external institutions. Institutional continuity is particularly important because sustainable environmental governance requires long-term organizational capacity rather than short-term project implementation.

The strengthening of institutional capacity is closely associated with improved governance quality. The ET-CBWM model encouraged greater collaboration among governmental agencies, universities, religious institutions, tourism managers, and community organizations. This collaborative governance structure reduced fragmentation among stakeholders and promoted shared decision-making regarding environmental management. Such findings support collaborative governance theory, which argues that complex environmental problems cannot be effectively addressed through government intervention alone but require active cooperation among multiple actors possessing complementary knowledge, resources, and responsibilities. The integration of Islamic eco-theological values further enhanced institutional effectiveness by strengthening the ethical legitimacy of environmental governance. Religious leaders emerged as influential environmental communicators capable of translating scientific conservation messages into culturally meaningful moral guidance. Their participation increased public trust in conservation initiatives and encouraged voluntary environmental compliance. Consequently, environmental governance became supported not only by administrative regulations but also by shared ethical commitments rooted in local religious values.

These findings also demonstrate that environmental education and eco-theological internalization mutually reinforce one another. Environmental education provided participants with scientific understanding of mangrove ecosystems and waste management, whereas eco-theological values transformed this knowledge into moral commitment. This complementary relationship reduced the knowledge-behavior gap frequently observed in environmental education programs. Participants no longer viewed environmental conservation solely as a technical responsibility but increasingly perceived it as an ethical expression of faith and social responsibility. The ET-CBWM model therefore illustrates that behavioral transformation is a multidimensional process involving cognitive, affective, social, institutional, and spiritual components. Sustainable environmental behavior emerged through the interaction of environmental knowledge, community participation, religious values, and institutional support rather than through any single intervention. This finding supports contemporary sustainability literature emphasizing that environmental governance should integrate scientific knowledge with local cultural values and participatory institutions to achieve long-term conservation outcomes.

Comparison with previous studies further highlights the novelty of the proposed model. Earlier research on community-based waste management generally emphasized improvements in waste segregation, recycling, and institutional participation. Studies on Islamic eco-theology, meanwhile, predominantly focused on normative discussions concerning environmental ethics without demonstrating practical implementation within community development programs. In contrast, the present study operationalizes Islamic environmental ethics through concrete conservation activities, thereby providing empirical evidence that faith-based environmental values can strengthen community participation and improve environmental governance. This interdisciplinary integration distinguishes the ET-CBWM model from conventional community-based conservation frameworks.

Overall, the findings demonstrate that sustainable mangrove conservation cannot be achieved through ecological restoration alone. Long-term ecosystem resilience depends upon the simultaneous development of environmental awareness, ethical responsibility, institutional capacity, and community participation. The ET-CBWM model therefore provides an integrated framework capable of addressing the ecological, social, cultural, and governance dimensions of coastal environmental management. These outcomes suggest that similar approaches may be successfully adapted in other coastal communities facing comparable challenges related to marine plastic pollution, ecosystem degradation, and limited community engagement.

3.7 Proposed Eco-Theological Community-Based Waste Management (ET-CBWM) Model

One of the primary contributions of this study is the development of the Eco-Theological Community-Based Waste Management (ET-CBWM) model as an integrated framework for sustainable mangrove ecosystem conservation. Unlike conventional community-based waste management approaches, which primarily focus on technical waste handling and community participation, the ET-CBWM model incorporates Islamic eco-theological values as intrinsic drivers of environmental stewardship. This integration creates a multidimensional conservation framework in which environmental education, ethical values, institutional collaboration, and collective action reinforce one another to achieve long-term ecosystem sustainability.

The proposed model begins with environmental education, which functions as the foundation for increasing environmental literacy. Through participatory learning, community members acquire scientific knowledge regarding mangrove ecosystem services, plastic pollution, waste segregation, and sustainable resource management. Improved environmental knowledge encourages individuals to recognize the ecological consequences of improper waste disposal and strengthens their understanding of the relationship between environmental quality and community well-being. However, this study demonstrates that knowledge alone does not necessarily translate into environmentally responsible behavior. Therefore, environmental education is complemented by the internalization of Islamic eco-theological principles. Concepts such as *khalifah fil ardh* (human stewardship), *amanah* (trust and responsibility), *mīzān* (ecological balance), and *maṣlaḥah* (public welfare) provide ethical and spiritual foundations that encourage individuals to perceive environmental conservation as both a civic duty and a religious obligation. This moral dimension strengthens intrinsic motivation and reduces the knowledge-behavior gap commonly reported in environmental education literature.

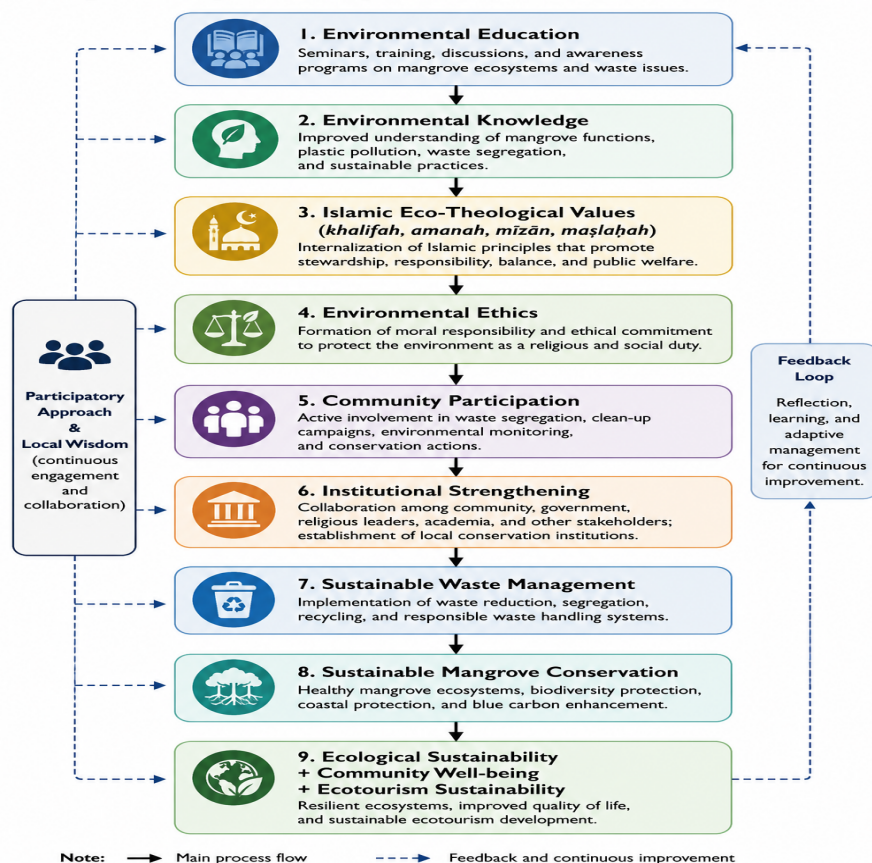
The integration of environmental knowledge and eco-theological values subsequently stimulates community participation. Community members become actively involved in waste segregation, mangrove clean-up campaigns, environmental monitoring, and awareness campaigns. Participation extends beyond individual behavioral change to include collective environmental action supported by local organizations, tourism managers, religious institutions, women's groups, and youth organizations. Such collective participation strengthens social capital while fostering shared responsibility for ecosystem conservation.

Active community participation further contributes to institutional strengthening. Continuous collaboration among community organizations, village government, universities, environmental agencies, and religious leaders creates a governance system capable of coordinating conservation initiatives over the long term. The establishment of the Mangrove Conservation Community Group illustrates how participatory governance can transform temporary environmental campaigns into sustainable community institutions. Strong institutions subsequently reinforce environmental education and community participation through continuous environmental monitoring, public awareness activities, and collaborative decision-making.

Ultimately, these interconnected processes lead to sustainable mangrove ecosystem conservation, characterized by cleaner environmental conditions, improved waste management practices, stronger community stewardship, enhanced ecosystem resilience, and greater sustainability of mangrove ecotourism. The model also contributes to climate change mitigation through the protection of blue carbon ecosystems while simultaneously supporting biodiversity conservation and local socio-economic development. The ET-CBWM model therefore represents a cyclical rather than a linear conservation process. Environmental education generates knowledge; eco-theological values transform knowledge into ethical commitment; ethical commitment encourages community participation; participation strengthens local institutions; and strong institutions ensure the continuity of environmental education and conservation activities. This positive feedback mechanism creates adaptive community resilience capable of responding to future environmental challenges.

From a theoretical perspective, the proposed model integrates three previously separate academic perspectives: Community-Based Waste Management, Participatory Community Development, and Islamic Eco-Theology. The resulting framework expands existing community-based environmental management theories by explicitly recognizing the role of faith-based environmental ethics as an internal mechanism influencing environmental behavior. Consequently, the ET-CBWM model contributes not only to environmental management literature but also to interdisciplinary research connecting sustainability science, community development, environmental sociology, and religious studies. The findings suggest that this conceptual framework may be adapted to other coastal communities, particularly within Muslim-majority regions where religious institutions possess substantial influence over community behavior. Although implementation strategies should be adjusted to local socio-cultural conditions, the fundamental principles of integrating environmental education, ethical values, community participation, and institutional collaboration provide a transferable model for promoting sustainable coastal ecosystem management.

Figure 3. Proposed Conceptual Framework of the ET-CBWM Model



3.8 Theoretical Contributions

The present study makes several important contributions to the literature on environmental management and community-based conservation. First, it extends the Community-Based Waste Management (CBWM) framework by incorporating Islamic eco-theological principles as intrinsic determinants of environmental behavior. Existing CBWM studies have generally focused on community participation, waste segregation, and institutional arrangements. While these factors remain important, the findings demonstrate that behavioral sustainability is significantly strengthened when environmental management is supported by culturally embedded moral values. Consequently, the ET-CBWM model broadens the conceptual scope of CBWM by integrating ethical and spiritual dimensions into environmental governance. Second, this study contributes to the development of Participatory Community Development Theory by illustrating how participatory governance can be strengthened through faith-based environmental education. Rather than viewing participation solely as a mechanism for improving project implementation, the findings indicate that participation also functions as a process of collective learning, social empowerment, and institutional development. This perspective reinforces contemporary theories emphasizing that sustainable development depends upon the interaction of knowledge, social capital, and local institutional capacity.

Third, the study advances the emerging field of Islamic Eco-Theology by providing empirical evidence regarding its practical application within community-based environmental management. Previous research has predominantly discussed Islamic environmental ethics from philosophical or theological perspectives. In contrast, the present study demonstrates how eco-theological principles can be translated into concrete conservation practices capable of influencing environmental behavior, strengthening community participation, and improving local environmental governance. This empirical contribution bridges the gap between normative religious discourse and practical sustainability implementation. Finally, the ET-CBWM model contributes to interdisciplinary sustainability research by integrating environmental science, community development, and religious studies within a single analytical framework. Such interdisciplinary integration responds to increasing international calls for holistic environmental governance capable of addressing ecological, social, cultural, and ethical dimensions simultaneously. Consequently, the model provides a valuable theoretical foundation for future research examining faith-based approaches to sustainable natural resource management and community resilience.

4. Conclusions

4.1 Conclusion

This study proposed and implemented the Eco-Theological Community-Based Waste Management (ET-CBWM) model as an integrated approach to support sustainable mangrove ecosystem conservation in Tongke-Tongke Village, Sinjai Regency, Indonesia. The model combines three complementary dimensions: Participatory Community Development (PCD), Community-Based Waste Management (CBWM), and Islamic eco-theological values, creating a holistic framework that addresses the ecological, social, institutional, and ethical aspects of environmental management. The findings demonstrate that environmental education effectively enhanced community knowledge regarding the ecological functions of mangrove ecosystems, the impacts of plastic pollution, and sustainable waste management practices. More importantly, integrating the Islamic principles of *khalifah fil ardh, amanah, mizān*, and *maṣlaḥah* strengthened participants' moral responsibility and intrinsic motivation to protect the environment. This integration successfully transformed environmental stewardship from a purely technical activity into a shared ethical and religious commitment.

The implementation of the ET-CBWM model also strengthened community participation through collaborative environmental actions involving local government, Tourism Awareness Groups

(Pokdarwis), religious leaders, youth organizations, women's groups, universities, and coastal communities. The establishment of the Mangrove Conservation Community Group further enhanced local institutional capacity, ensuring that conservation activities continue beyond the completion of the program.

Overall, the study demonstrates that sustainable mangrove conservation cannot rely solely on ecological restoration or waste management infrastructure. Instead, long-term sustainability requires the integration of environmental education, ethical values, participatory governance, and institutional strengthening. The ET-CBWM model therefore provides an innovative and transferable framework for improving environmental governance in coastal communities while simultaneously supporting biodiversity conservation, blue carbon protection, sustainable ecotourism, and community well-being.

4.2 Theoretical Contributions

This study makes several important contributions to environmental management literature. First, it extends the theoretical framework of Community-Based Waste Management (CBWM) by incorporating Islamic eco-theological values as intrinsic determinants of environmental behavior. Previous studies have generally emphasized technical waste management, institutional participation, and community empowerment, whereas this study demonstrates that moral and religious values significantly reinforce environmental ethics and long-term behavioral change. Second, this research contributes to the development of Participatory Community Development theory by demonstrating that effective community participation depends not only on collaborative planning but also on shared ethical commitments and social values. The ET-CBWM model illustrates how participatory governance can simultaneously strengthen social capital, institutional resilience, and environmental stewardship.

Third, this study advances the field of Islamic eco-theology by providing empirical evidence regarding its practical application in community-based environmental management. Rather than discussing Islamic environmental ethics from a purely philosophical perspective, this study operationalizes Islamic principles within environmental education, waste management, and mangrove conservation activities. Consequently, the research bridges environmental science, sustainability studies, and religious ethics into an integrated conceptual framework.

4.3 Practical and Policy Implications

The findings have important implications for policymakers, environmental practitioners, and coastal communities. First, local governments should integrate community empowerment into coastal waste management policies by emphasizing environmental education, participatory planning, and long-term institutional development rather than relying exclusively on infrastructure-based interventions. Second, environmental governance in Muslim-majority communities can be strengthened through partnerships with religious institutions. Mosques, Islamic educational institutions, and religious leaders represent influential social actors capable of promoting environmentally responsible behavior through culturally relevant communication and moral leadership.

Third, universities should play a more active role in facilitating knowledge transfer, community capacity building, and continuous monitoring of environmental programs. Collaboration among academia, local government, tourism managers, community organizations, and religious institutions represents an effective governance model for sustainable coastal management. Finally, the ET-CBWM framework offers a practical model that can be replicated in other coastal regions experiencing similar challenges related to marine plastic pollution, mangrove degradation, and limited community participation. Although implementation should consider local socio-cultural characteristics, the integration of environmental education, ethical values, and participatory governance provides a flexible approach applicable across diverse coastal settings.

4.4 Limitations and Future Research

Despite its contributions, this study has several limitations. First, the research primarily adopted a qualitative Participatory Action Research approach. Consequently, ecological outcomes such as reductions in plastic waste volume, improvements in water quality, biodiversity recovery, and blue carbon sequestration were not quantitatively assessed. Future studies should integrate ecological indicators and quantitative environmental measurements to provide more comprehensive evaluations of conservation outcomes. Second, the study was conducted within a single case-study location characterized by strong community participation and a predominantly Muslim population. Comparative studies involving different geographical regions, socio-cultural contexts, and religious communities are necessary to examine the broader applicability and generalizability of the ET-CBWM model.

Third, the evaluation focused mainly on short-term implementation outcomes. Longitudinal studies are required to investigate whether improvements in environmental awareness, community participation, institutional performance, and ecosystem quality can be sustained over extended periods. Future research should also explore the integration of digital technologies—including Geographic Information Systems (GIS), remote sensing, Internet of Things (IoT)-based waste monitoring, artificial intelligence for environmental monitoring, and blue carbon assessment—within the ET-CBWM framework. Combining technological innovation with participatory governance and eco-theological values may enhance adaptive coastal management while providing stronger scientific evidence for environmental policy development.

4.5 Original Contribution of the Study

The principal originality of this study lies in the development of the Eco-Theological Community-Based Waste Management (ET-CBWM) model, which integrates environmental education, community-based waste management, participatory governance, and Islamic eco-theological principles into a unified framework for sustainable mangrove conservation. Unlike previous studies that have examined these dimensions separately, this research demonstrates their synergistic interaction in promoting environmental awareness, ethical responsibility, collective action, and institutional resilience. By integrating environmental science with faith-based environmental ethics, the ET-CBWM model offers a novel interdisciplinary approach to community-based conservation. This framework not only enriches the theoretical discourse on sustainable environmental governance but also provides a practical model that can support the implementation of the Sustainable Development Goals (SDGs), particularly SDG 13 (Climate Action), SDG 14 (Life Below Water), SDG 15 (Life on Land), and SDG 17 (Partnerships for the Goals). Therefore, the study contributes both academically and practically by presenting a scalable model for strengthening the sustainability of mangrove ecosystems in Indonesia and other coastal regions with similar environmental and socio-cultural characteristics.

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