

Bridging Local Knowledge and Environmental Sustainability: Community Empowerment Strategies in Coastal Areas of Eastern Indonesia

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Abstract

This study examines community empowerment strategies grounded in local knowledge to foster ecological awareness and strengthen pro-environmental behavior among coastal communities in Eastern Indonesia. The research also investigates the integration of modern environmental education with local socio-cultural values in supporting community-based coastal sustainability. The study was motivated by increasing coastal environmental degradation caused by low ecological awareness, inadequate household waste management, shifting community lifestyles, and the declining integration of local knowledge into environmental practices. A qualitative method with a community-based participatory research approach was employed, positioning local communities as active participants throughout the research and empowerment process. Data were collected through participatory observation, in-depth interviews, documentation, and focus group discussions involving village authorities, customary leaders, religious leaders, and coastal residents in Leahari Village, Leitumur Selatan District. The findings reveal that participatory empowerment grounded in local cultural values significantly enhances community understanding and awareness of coastal environmental sustainability. The integration of customary values, local social structures, and community leadership effectively encouraged behavioral changes related to household waste management, coastal vegetation preservation, and sustainable environmental practices. The study proposes a culturally embedded environmental empowerment model that bridges local knowledge with modern ecological education through a bottom-up participatory approach. This research contributes to environmental sociology and community-based sustainable development studies, while offering practical recommendations for culturally adaptive environmental engagement programs in coastal communities.

Keywords: Community Empowerment, Coastal Sustainability, Environmental Education, Environmental Sociology, Local Knowledge



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INTRODUCTION

Environmental sustainability in coastal areas has become one of the most pressing global concerns in the context of climate change, ecological degradation, and rapid socio-economic transformation. Coastal communities, particularly those living in archipelagic regions, face increasing environmental vulnerability resulting from unmanaged waste

disposal, ecosystem destruction, declining coastal vegetation, and unsustainable patterns of resource utilization. In many developing countries, including Indonesia, environmental degradation in coastal settlements is not merely caused by structural limitations or weak environmental governance, but also by the gradual erosion of ecological awareness within communities themselves (Aditya et al., 2025; Charina et al., 2022b). Coastal environments that were once culturally respected as sources of life and collective identity are increasingly perceived as unlimited spaces for waste disposal and uncontrolled exploitation. This condition reflects a broader crisis in the relationship between society and nature, where environmental sustainability is often subordinated to short-term practical needs and shifting social lifestyles (Gunansyah, 2022; Hidayat et al., 2022; Wiyono et al., 2023).

The urgency of addressing environmental issues in small island communities is particularly evident in Eastern Indonesia, where coastal societies remain highly dependent on natural ecosystems for their livelihoods and social continuity. In many coastal villages, household waste is still disposed of in open spaces surrounding residential areas or directly into marine environments, while large trees and coastal vegetation are frequently removed without adequate ecological considerations. Such practices gradually weaken environmental resilience and threaten long-term ecological sustainability. These environmental pressures are intensified by limited environmental literacy, inadequate waste management systems, and the weakening of local ecological values due to modernization and changing consumption patterns (Samsu et al., 2022; Widyaningtyas & Wahidah, 2022; Yuliati et al., 2026).

Within this context, environmental education and community empowerment have increasingly been recognized as essential strategies for promoting sustainable environmental behavior. Environmental sustainability cannot rely solely on regulatory approaches or state-centered interventions, particularly in culturally embedded communities where social norms, customary institutions, and collective values continue to shape everyday practices. Several studies have argued that sustainable environmental governance requires active public participation and community-based engagement capable of transforming ecological awareness into collective social action (Arief et al., 2022; Rizki & Augustine, 2022; Yusuf & Fajri, 2022). Community empowerment approaches therefore become important because they position local communities not merely as policy beneficiaries, but as active agents capable of producing environmental knowledge, negotiating ecological values, and sustaining local conservation practices through participatory processes.

Previous studies have explored various dimensions of environmental sustainability and community participation in coastal regions. Research conducted by Setiawan et al. (2023) and Shobahiya et al. (2022) demonstrated that local ecological knowledge plays a crucial role in maintaining environmental resilience and adaptive capacity within traditional societies. Similarly, Pradana et al. (2023) and Prahara et al. (2023) highlighted the importance of social-ecological systems in understanding how communities respond to environmental change through local institutional arrangements and collective adaptation strategies. Other scholars have emphasized that environmental sustainability in coastal communities depends heavily

on the integration of social capital, participatory governance, and locally embedded cultural values (Rismansyah et al., 2024; Robbani et al., 2024; Sugiyanto et al., 2024). These studies collectively underline that ecological sustainability is deeply interconnected with social structures and community participation rather than being solely dependent on technical environmental management.

In the Indonesian context, studies on coastal environmental governance have also increased significantly over the past decade. Research by Maharani et al. (2024) and Rahayuningrum (2024) demonstrated that traditional coastal management systems in Indonesia contain valuable local wisdom capable of supporting sustainable marine resource management. Likewise, Charina et al. (2022a) and Nuryadin et al. (2023) examined the role of community-based marine conservation in strengthening environmental stewardship among coastal populations. Several studies have further explored the relationship between environmental literacy and community participation in waste management programs, particularly in rural and coastal areas (Aulia et al., 2024; Rahardjanto et al., 2022; Wajdi et al., 2022). These studies generally conclude that environmental awareness and participatory engagement contribute positively to improving local environmental practices.

Other scholars have specifically focused on the role of environmental education in shaping pro-environmental behavior. According to Nur et al. (2022) and Tuti Rumiati et al. (2022), environmental behavior is influenced not only by knowledge acquisition but also by emotional attachment, social norms, and cultural contexts. This perspective has encouraged the development of community-based environmental education models that emphasize participatory learning and contextual understanding. In Southeast Asian communities, environmental education programs rooted in local traditions have shown greater effectiveness in encouraging behavioral transformation compared to purely formal or technocratic interventions (Agustin et al., 2022; Prajuhana et al., 2023). Furthermore, community engagement models based on bottom-up participation have been increasingly promoted in sustainability studies because they allow communities to actively define their environmental priorities and collectively negotiate solutions relevant to their socio-cultural realities (Azalia et al., 2024; N. P. S. R. Dewi et al., 2024; Kurniati et al., 2023).

Research on environmental sociology has also contributed important insights into how environmental degradation is socially constructed and reproduced through patterns of human interaction, institutional arrangements, and modern development paradigms. Scholars such as Herutomo et al. (2023) and Telaumbanua et al. (2024) argued that environmental crises cannot be understood solely through ecological analysis but must also consider broader social and cultural dynamics. More recent studies have emphasized the importance of ecological consciousness and collective environmental ethics in shaping sustainable social behavior (Asiraf et al., 2023; Puspitasari & Kasri, 2023; Setyowati et al., 2022). These perspectives suggest that ecological sustainability requires transformative social learning processes capable of reshaping the relationship between communities and their surrounding environment.

Despite the growing body of scholarship on environmental sustainability, several limitations remain evident within existing studies. Much of the current literature still prioritizes structural governance, conservation policy, or technical waste management systems, while relatively limited attention has been given to the cultural dimensions of environmental empowerment in small island communities. In particular, studies examining how local knowledge can be integrated with modern environmental education through participatory community empowerment approaches in Eastern Indonesian coastal societies remain scarce. Existing research often treats local knowledge as a complementary element rather than positioning it as an active foundation for ecological transformation and behavioral change within communities. Moreover, many environmental programs continue to adopt top-down intervention models that insufficiently accommodate local social structures, customary authority, and culturally embedded communication practices.

Against this backdrop, the present study seeks to provide a more contextually grounded understanding of environmental sustainability by examining how community empowerment strategies rooted in local knowledge can strengthen ecological awareness and encourage pro-environmental behavior in coastal communities of Eastern Indonesia. Rather than viewing local communities merely as recipients of environmental campaigns, this study approaches them as active social actors whose cultural values, social interactions, and collective experiences shape environmental practices in meaningful ways. By focusing on participatory empowerment processes within the coastal community of Leahari Village, Leitimur Selatan District, this research highlights the dynamic interaction between local ecological values, social structures, and contemporary environmental education in constructing sustainable environmental behavior.

This study therefore aims to analyze community empowerment strategies based on local knowledge in fostering ecological awareness and strengthening pro-environmental behavior among coastal communities in Eastern Indonesia. It further seeks to examine how the integration of modern environmental education with local socio-cultural values contributes to the development of community-based coastal sustainability. Through this approach, the research contributes to the broader discourse on environmental sociology, participatory sustainability, and community-based development by offering a culturally embedded perspective on environmental empowerment in archipelagic societies.

RESEARCH METHOD

The research employed a qualitative method using a community-based participatory research (CBPR) approach integrated with a bottom-up community empowerment strategy. This approach was selected because the study was not solely intended to academically examine the issue of coastal environmental degradation, but also to foster collective ecological awareness through the active involvement of local communities in every stage of the research and empowerment process. A qualitative approach was considered appropriate because coastal environmental problems cannot be adequately understood through

statistical data or quantitative measurements alone; rather, they require an in-depth understanding of social experiences, cultural values, patterns of social interaction, and the ways communities interpret and engage with their environment in everyday life. According to Amirudin et al. (2022) and Nasrulloh & Sutiyono (2022), qualitative approaches enable researchers to understand social realities contextually through narratives, lived experiences, and meanings constructed by the community itself. In the context of this study, such an approach was essential because changes in ecological behavior among coastal communities are strongly influenced by social structures, customary values, and local cultural dynamics embedded within island societies.

The study was conducted in Leahari Village, Leitimur Selatan District, Ambon City. The research site was selected purposively on the grounds that Leahari remains one of the coastal areas facing persistent environmental management problems, including poor household waste management, the removal of water-supporting vegetation, and the practice of disposing household waste in backyard areas and coastal spaces. In addition, the community of Leahari continues to maintain strong customary social structures, close communal relations, and local knowledge systems that are actively practiced in everyday life. These conditions made Leahari a relevant site for examining how local knowledge and modern environmental education can be integrated through culturally grounded community empowerment strategies. The selection of this location was also based on the consideration that coastal communities in archipelagic regions possess distinctive social characteristics that require participatory, humanistic, and context-sensitive approaches to environmental education.

The informants in this study consisted of 18 participants, including village government officials, customary leaders, religious leaders, community leaders, youth representatives, housewives, and coastal residents directly involved in daily environmental management practices. Informants were selected purposively based on their involvement, experience, and knowledge regarding the social and environmental conditions of Leahari Village. Village government representatives were included because of their role in local governance and policy implementation, while customary and religious leaders were selected due to their strong socio-cultural influence in shaping community behavior. Coastal residents were involved to provide insights into everyday environmental practices and the dynamics of ecological behavioral change occurring at the community level.

Data collection was conducted through participatory observation, in-depth interviews, documentation, and community group discussions. Participatory observation was carried out to directly understand environmental conditions, patterns of social interaction, and community practices related to waste management and the utilization of coastal spaces in everyday life. In-depth interviews were used to explore community experiences, perspectives, and interpretations regarding environmental issues, social change, and the importance of local knowledge in sustaining environmental resilience. Meanwhile, group discussions served as a collective reflection space between researchers and community

members to identify environmental problems and formulate empowerment strategies appropriate to the socio-cultural context of island communities. The bottom-up approach applied throughout this process enabled community members to act not merely as research objects, but as active subjects in the process of social transformation and ecological awareness-building (A. A. Dewi et al., 2024; Supangkat et al., 2024).

Data analysis was conducted descriptively and interpretatively through several stages, including data reduction, categorization, data presentation, and conclusion drawing based on the social patterns identified in the field. To ensure data validity, the study employed source triangulation, method triangulation, and time triangulation techniques. Source triangulation was conducted by comparing information obtained from village authorities, customary leaders, religious leaders, and coastal residents. Method triangulation involved comparing findings from observations, interviews, and documentation, while time triangulation was applied through data collection conducted at different periods to examine the consistency of information and changes in community behavior toward coastal environmental management.

RESULTS AND DISCUSSION

Social-Ecological Conditions and Coastal Environmental Crisis in Leahari Village

The initial stage of this study revealed that environmental degradation in Leahari Village, Leitimur Selatan District, cannot be understood merely as an ecological or technical issue, but rather as part of a broader social transformation occurring within coastal communities in Eastern Indonesia. Through participatory observation and in-depth engagement with local residents, the research identified significant changes in community-environment relations, particularly regarding household waste management, coastal vegetation preservation, and the shifting ecological values embedded in everyday life. The coastal environment, which was previously perceived as a shared living space requiring collective protection, has gradually experienced functional changes due to modern consumption patterns, population growth, and weakening traditional environmental norms.

Field observations conducted during the early phase of the community-based participatory research process showed that household waste disposal practices had become increasingly concentrated in coastal backyards and unmanaged open spaces surrounding residential areas. Plastic waste, organic refuse, and domestic garbage were frequently found accumulating near drainage areas and along the coastal edge. Several residents explained that such practices had become normalized over time due to the absence of integrated waste management facilities and the long-standing perception that coastal areas remained “open spaces” capable of absorbing household waste indefinitely. These findings illustrate how environmental problems are socially produced and culturally reproduced through routine practices within the community.



Figure 1 Coastal environmental conditions and household waste accumulation in residential areas of Leahari Village

Source: Authors' Documentation, 2025

The process of identifying community problems was conducted using a bottom-up approach that emphasized direct interaction with residents and active community participation. Rather than positioning the community as passive research objects, the research team sought to understand how local people themselves perceived environmental change and ecological challenges within their daily lives. Participatory observation was therefore carried out not only in public spaces, but also through visits to residential neighborhoods, household environments, and informal community gathering areas. This approach enabled the researchers to observe patterns of settlement organization, waste disposal behavior, and the broader socio-spatial relationship between residents and their surrounding environment.

Interviews with village authorities, customary leaders, religious leaders, and local residents further revealed that environmental degradation in Leahari was closely connected to changing lifestyles and weakening intergenerational transmission of local ecological knowledge. An informant identified as H.L., a customary community leader, explained that previous generations maintained stronger cultural restrictions regarding tree cutting and waste disposal because the environment was viewed as part of communal life rather than individual property. However, modernization and increasing dependence on packaged consumer goods have gradually altered these perceptions, particularly among younger generations. Similar concerns were expressed by another informant, identified as M.S., who stated that environmental care practices once embedded in customary values are now less visible in everyday social interactions.

These findings align with the argument proposed by Nadlifah et al. (2024) and Syafrizal et al. (2023), who emphasize that environmental sustainability is deeply dependent on the resilience of social-ecological systems and the adaptive capacity of communities to preserve local values amid global socio-environmental change. In Leahari, the weakening of local ecological norms was not solely caused by economic transformation, but also by reduced

collective reflection regarding the relationship between humans and nature. The decline of local knowledge transmission has contributed to a gradual erosion of communal responsibility toward environmental stewardship.



Figure 2 Participatory observation activities conducted within residential and coastal areas in Leahari Village

Source: Authors' Documentation, 2025

The identification stage also demonstrated that community members possessed varying interpretations of environmental problems based on their social roles and lived experiences. Village officials tended to frame environmental degradation as an issue of public awareness and infrastructure limitations, while customary and religious leaders emphasized the moral and cultural dimensions of ecological responsibility. Meanwhile, women managing household activities frequently highlighted practical concerns related to waste accumulation and declining water quality around residential areas. These differences illustrate that environmental crises in coastal communities are multidimensional and socially embedded, requiring approaches that integrate ecological education with local socio-cultural realities.

The mapping of community aspirations subsequently became an important part of the empowerment process. Rather than imposing externally designed intervention programs, the research team facilitated collective discussions to identify priority issues considered most urgent by the community itself. This process reflected the principles of participatory empowerment, where local residents actively contributed to defining both the problems and the potential solutions. As argued by Riskawati (2023) and Sukayat et al. (2023), identifying community problems resembles diagnosing an illness; addressing visible symptoms without understanding the structural causes may result in ineffective interventions. In the context of Leahari, environmental degradation was ultimately understood not simply as a matter of waste disposal behavior, but as part of broader social changes involving lifestyle transformation, weakening local ecological values, and declining collective environmental responsibility.

Local Knowledge as Social Capital for Coastal Environmental Sustainability

The findings of this study demonstrate that local knowledge in Leahari Village continues to function as an important form of social capital within community life, particularly in shaping collective understandings of environmental responsibility and the relationship between humans and nature. Although socio-economic transformation and modernization have gradually altered everyday ecological practices, various forms of indigenous environmental values remain embedded within local social structures, customary norms, and communal interactions. Through participatory observation and in-depth interviews conducted during the community empowerment process, the research identified that local residents still perceive the coastal environment not merely as a physical space for economic activity, but also as part of a shared social and cultural ecosystem that sustains collective life.

In many conversations with community members, environmental stewardship was closely associated with moral obligations inherited from previous generations. Several customary leaders explained that earlier community practices emphasized balance between human activities and ecological preservation, particularly regarding the protection of coastal vegetation and water resources. An informant identified as A.L. stated that large trees surrounding residential areas were traditionally maintained because they were believed to protect groundwater sources and regulate environmental balance within the village. Cutting such vegetation without communal consideration was once socially discouraged because environmental damage was understood to affect the entire community rather than individual households alone.

These findings indicate that local ecological knowledge in Leahari operates not only as practical environmental wisdom, but also as a social mechanism that historically regulated human interaction with the surrounding ecosystem. In this context, local knowledge functions as social capital because it creates shared norms, collective trust, and communal responsibility regarding environmental management. However, the study also found that these values have gradually weakened due to changing lifestyles, increasing dependence on consumer products, and the declining transmission of ecological knowledge across generations. Younger community members, particularly those more exposed to urban lifestyles and modern consumption patterns, were found to possess less familiarity with traditional ecological norms compared to older generations.



Figure 3 Community discussions on local ecological values and environmental sustainability in Leahari Village

Source: Authors' Documentation, 2025

The weakening of ecological traditions does not necessarily indicate the disappearance of local knowledge altogether. Rather, the findings suggest that local knowledge still retains strong social legitimacy, but lacks revitalization within contemporary community life. During focus group discussions, many residents expressed that traditional values concerning environmental care remained meaningful, yet were rarely integrated into present-day environmental programs or educational initiatives. This condition created a gap between inherited ecological values and modern environmental practices. As explained by an informant identified as M.R., environmental discussions within the village often focused on practical cleanliness issues without reconnecting them to broader cultural understandings regarding communal responsibility and ecological ethics.

The participatory empowerment process conducted in this study therefore attempted to bridge this gap by integrating local cultural values with contemporary environmental education. The educational materials designed collaboratively with the community adopted a contextual approach that respected existing social structures and customary systems within Leahari Village. Rather than introducing environmental knowledge as an external intervention detached from local realities, the program emphasized dialogue between scientific ecological understanding and indigenous community experiences. This approach was inspired by the principles of Contextual Action Research, which stresses the importance of maintaining structural and relational continuity within social systems while introducing transformative knowledge (Redi, 2023; Zuhra & Angkasari, 2023).



Figure 4 Participatory environmental education activities involving village authorities, customary leaders, and local residents
Source: Authors' Documentation, 2025

The implementation of environmental education activities was deliberately conducted through informal and dialogical interactions. Community meetings were organized in a relaxed atmosphere to avoid creating the impression that local knowledge was being replaced by external expertise. Instead, the process emphasized mutual learning, where local residents were encouraged to share their experiences and environmental practices while simultaneously reflecting on emerging ecological challenges. This participatory strategy proved significant in fostering community openness toward new environmental perspectives without generating resistance to cultural change.

During interviews, several participants acknowledged that they had previously perceived common waste disposal practices, including dumping household waste around residential land, as socially acceptable because such behavior had long been normalized within the community. However, through participatory discussions and ecological education, residents gradually began to understand the long-term environmental and health implications of unmanaged household waste. An informant identified as S.H. explained that integrating new environmental knowledge with familiar local values made the educational process easier to accept because it did not position the community as environmentally ignorant, but rather as a community capable of strengthening its existing ecological wisdom.

The study also revealed increasing community awareness regarding the ecological importance of maintaining coastal vegetation and preserving environmental balance within residential areas. Residents began associating tree preservation not only with traditional beliefs, but also with contemporary ecological concerns such as groundwater availability, air quality, and climate resilience. This transformation illustrates that local knowledge can evolve adaptively when connected to modern environmental understanding through culturally sensitive empowerment processes.

These findings strongly resonate with the emerging perspective of *Indigenous and Local Knowledge for Sustainability Transformation*, which emphasizes that sustainability transitions are more effective when rooted in culturally embedded ecological knowledge systems. Recent sustainability studies argue that indigenous and local knowledge provide

context-specific adaptive capacities that cannot easily be replaced by technocratic environmental interventions alone (Fosch et al., 2023). In Leahari, local knowledge became meaningful not because it represented a nostalgic return to tradition, but because it provided socially legitimate foundations for rebuilding ecological awareness within the community.

Culturally Embedded Participatory Empowerment Model in Environmental Education

One of the central findings of this study lies in the emergence of a culturally embedded participatory empowerment model that positioned local communities not merely as recipients of environmental programs, but as active actors in the process of ecological awareness transformation. The empowerment strategy implemented in Leahari Village was developed through a bottom-up participatory approach that emphasized dialogue, collective reflection, and community involvement throughout the stages of problem identification, program planning, environmental education, and social evaluation. This approach became particularly important because environmental issues in coastal communities are closely intertwined with local cultural structures, social relationships, and everyday practices that cannot be effectively addressed through top-down interventions alone.

The participatory process began with community-based identification of environmental concerns through observations, informal interactions, and in-depth discussions involving village authorities, customary leaders, religious leaders, women, youth groups, and coastal residents. Rather than introducing predetermined solutions, the research team facilitated spaces where community members could articulate their own experiences regarding environmental degradation and changing ecological conditions within the village. This process allowed environmental problems to be understood collectively as shared social challenges rather than as individual failures. During community discussions, residents openly reflected on household waste practices, declining coastal vegetation, and the gradual weakening of environmental responsibility among younger generations.

The findings indicate that participatory empowerment became effective because it was rooted in local social realities and cultural communication patterns. Educational activities were intentionally conducted in informal and dialogical settings to avoid creating social distance between facilitators and community members. Environmental education sessions were integrated with local narratives, customary values, and examples directly connected to the everyday experiences of coastal residents. An informant identified as R.T. explained that the community responded positively because the educational process did not position local traditions as outdated practices, but instead recognized them as important foundations for understanding environmental sustainability in contemporary contexts.

This culturally sensitive approach significantly strengthened community engagement during the empowerment process. Customary leaders and religious leaders played crucial roles as mediators between modern ecological knowledge and local cultural values. Their involvement provided social legitimacy to environmental messages delivered throughout the program. In Leahari, these figures possess strong moral authority within community life, enabling environmental education to become more persuasive and socially accepted. An

informant identified as H.M., a local religious figure, explained that community members often internalize environmental advice more deeply when it is connected to moral responsibility, collective well-being, and cultural identity rather than merely framed as administrative regulations or technical recommendations.

The use of local language expressions and culturally familiar communication styles also became an essential component of the empowerment model. During participatory discussions, facilitators avoided overly technical environmental terminology and instead translated ecological concepts into narratives closely associated with community experiences. This strategy helped reduce resistance toward new environmental perspectives because community members felt that their existing knowledge systems were respected rather than displaced. The educational process therefore functioned not as a replacement of local knowledge, but as a collaborative effort to strengthen ecological awareness through the integration of traditional values and modern environmental understanding.

Another important aspect of this participatory model was the collective reflection process that emerged throughout community discussions and environmental education activities. Residents were encouraged to critically reflect on how daily practices, such as unmanaged household waste disposal and uncontrolled vegetation clearing, could affect long-term environmental sustainability within the village. Through this reflective process, environmental problems gradually shifted from being perceived as isolated household matters into collective social concerns affecting the future of the community as a whole. Several participants acknowledged during interviews that they had never previously connected routine domestic practices with broader ecological consequences, particularly regarding groundwater quality, coastal health, and intergenerational environmental security.

The findings further demonstrate that participatory empowerment rooted in local culture generated stronger emotional and social attachment to environmental responsibility compared to formalistic awareness campaigns. Community members became more willing to discuss environmental issues openly because the process emphasized mutual respect, collective learning, and social inclusion. An informant identified as M.L. noted that environmental discussions felt more meaningful because they were conducted “with the community” rather than “for the community.” This distinction became central to the success of the empowerment process, as residents experienced themselves as contributors to environmental solutions rather than passive audiences receiving external instructions.

Conceptually, the findings of this study align with the perspective of Community-Based Sustainability Transformation, which argues that sustainability transitions are more likely to succeed when built upon internal community capacities, local leadership, participatory engagement, and cultural identity reinforcement. Recent sustainability scholarship emphasizes that transformative environmental change cannot rely exclusively on state-centered policies or technological interventions, but must involve socially embedded processes that strengthen collective agency within local communities (Adnyana et al., 2023; Alimin et al., 2024; Suartama et al., 2024). In the context of Leahari Village, the empowerment

model demonstrated that environmental transformation became more sustainable when ecological education was integrated into existing social structures and cultural relationships.

Transformation of Ecological Awareness and the Emergence of Pro-Environmental Behavior

The empowerment process implemented in Leahari Village gradually contributed to significant changes in how community members perceived environmental sustainability and their relationship with the coastal ecosystem surrounding them. Although these transformations did not occur instantly, the findings indicate that continuous social interaction, participatory discussions, and culturally grounded environmental education created important shifts in ecological awareness among local residents. Through the community-based participatory approach applied in this study, environmental understanding evolved not merely as an accumulation of technical knowledge, but as a collective social reflection concerning the long-term sustainability of community life in coastal areas.

One of the most visible transformations emerging from the empowerment process was the increasing public awareness regarding household waste management. Prior to the educational activities, the disposal of household waste around residential land and coastal spaces had largely been normalized within everyday social practices. Waste accumulation was often perceived as an unavoidable consequence of domestic activities rather than a collective environmental problem requiring communal responsibility. However, participatory discussions enabled residents to critically examine the ecological and health implications of unmanaged waste disposal practices. Several participants acknowledged during interviews that they had previously underestimated the long-term consequences of plastic accumulation, drainage obstruction, and coastal pollution because such practices had become socially habitual over generations.

An informant identified as Y.L. explained that the educational process encouraged residents to reconsider practices that were once viewed as ordinary aspects of daily life. According to the informant, discussions facilitated by the research team and local leaders helped the community understand that environmental degradation could directly affect family health, water quality, and the future living conditions of younger generations. This finding demonstrates that ecological awareness in coastal communities is closely linked to the ability of individuals to connect environmental problems with their immediate social realities and everyday experiences.

In addition to waste management, increasing awareness regarding the ecological importance of coastal vegetation preservation also became evident throughout the empowerment process. Community members gradually recognized that trees and coastal vegetation functioned not only as physical elements within the landscape, but also as ecological protectors contributing to groundwater availability, air circulation, and climate stability in residential areas. Interviews with several residents revealed that environmental education activities helped reconnect traditional ecological beliefs with contemporary scientific explanations regarding ecosystem sustainability. An informant identified as A.R. stated that earlier generations preserved large trees mainly because of customary advice and

inherited beliefs, whereas current discussions allowed community members to understand the broader ecological functions of vegetation within coastal ecosystems.

Importantly, the findings indicate that behavioral transformation did not emerge primarily through formal instruction or external enforcement, but through social interaction and collective reflection within the community itself. The participatory character of the empowerment process created opportunities for residents to discuss environmental issues openly, share personal experiences, and negotiate new understandings regarding ecological responsibility. This collective dimension became essential because environmental practices within coastal communities are strongly shaped by social norms and communal expectations. Individuals were more likely to reconsider their environmental behavior when changes were discussed collectively and reinforced through community interactions rather than imposed through hierarchical directives.

The involvement of customary leaders, religious leaders, and village authorities further strengthened the social legitimacy of ecological transformation. Their participation contributed to the formation of new social narratives linking environmental care with moral responsibility, collective well-being, and cultural identity. As explained by an informant identified as H.T., environmental messages became more meaningful when delivered through culturally familiar social relationships because residents felt emotionally connected to the values being discussed. In this sense, pro-environmental behavior emerged not simply as an individual rational choice, but as part of a broader process of rebuilding collective ecological consciousness within the village community.

The study also found that behavioral transformation remained gradual and dynamic rather than linear. Some community members adopted environmentally conscious practices more quickly, while others continued negotiating between ecological concerns and practical economic realities. Several residents acknowledged that changing long-established habits was not easy, particularly when household routines, limited infrastructure, and daily economic pressures continued influencing community behavior. Nevertheless, the empowerment process created an important foundation for ongoing environmental reflection by encouraging residents to recognize that sustainability is a shared social responsibility requiring continuous adaptation and collective commitment.

These findings align with contemporary perspectives on pro-environmental behavior within environmental sociology, which emphasize that ecological behavior is deeply influenced by social norms, collective identity, cultural attachment, and community interaction rather than individual awareness alone (Amaruddin et al., 2024; Dwiputra et al., 2024; Parmawati et al., 2023). The case of Leahari Village illustrates that ecological transformation becomes more sustainable when environmental education is socially embedded within local cultural systems and collective social relationships. Behavioral change in this context emerged through the gradual reconstruction of shared meanings regarding environmental responsibility, community survival, and intergenerational ecological security.

Furthermore, the findings support recent arguments within community-based sustainability studies suggesting that environmental transformation in small island and coastal communities requires participatory processes capable of integrating emotional attachment, social trust, and local cultural identity into ecological education programs (Dorward et al., 2024; Sulistiadi et al., 2024). In Leahari, ecological awareness evolved through relational processes that connected environmental issues with lived community experiences rather than abstract environmental campaigns detached from local realities.

Bridging Local Knowledge and Modern Environmental Education: Toward a Culturally Embedded Environmental Empowerment Model

The overall findings of this study reveal that environmental sustainability in coastal communities cannot be effectively achieved through technocratic interventions, regulatory enforcement, or formal environmental campaigns alone. Instead, sustainable ecological transformation requires approaches that are socially grounded, culturally embedded, and participatory in nature. In the context of Leahari Village, the research demonstrates that the integration of local ecological knowledge, community social structures, customary values, and modern environmental education created a more meaningful and socially accepted pathway toward environmental awareness and behavioral change. This integration ultimately forms the basis of what this study conceptualizes as a culturally embedded environmental empowerment model.

The model emerged from the recognition that local communities possess their own ecological understandings, moral values, and social mechanisms that continue to shape environmental behavior despite ongoing social transformation. Rather than treating local knowledge as an outdated cultural remnant, the empowerment process positioned it as a living social resource capable of interacting constructively with contemporary ecological education. Through participatory discussions, observations, and community reflection sessions, the study found that residents were more receptive to environmental education when new ecological concepts were connected to familiar social values, local experiences, and culturally recognized forms of authority.

One of the most important characteristics of this empowerment model is its emphasis on relational engagement rather than instructional intervention. The educational process was not designed as a one-way transfer of scientific knowledge from facilitators to local residents. Instead, environmental understanding was collectively constructed through dialogue between community experiences and modern ecological perspectives. An informant identified as J.L. explained that community members felt respected throughout the process because the discussions acknowledged that local people already possessed valuable environmental knowledge derived from everyday interaction with coastal ecosystems. This participatory atmosphere reduced resistance toward new environmental perspectives and encouraged residents to actively reinterpret environmental responsibility within their own cultural context.

The findings further indicate that social legitimacy played a central role in determining the effectiveness of environmental empowerment. In Leahari Village, customary leaders, religious leaders, and village authorities acted as mediators connecting ecological education with local moral frameworks and communal values. Their involvement strengthened public trust and facilitated the internalization of environmental messages within everyday social life. Environmental sustainability therefore became associated not merely with ecological preservation, but also with moral responsibility, communal dignity, and intergenerational care. This finding confirms that environmental transformation in coastal communities is deeply influenced by social relationships and culturally embedded systems of meaning.

Importantly, the study demonstrates that local communities should not be positioned as passive beneficiaries of environmental development programs. Instead, coastal residents function as active producers of ecological knowledge and agents of social transformation. Throughout the empowerment process, community members contributed practical experiences, local interpretations of environmental change, and culturally grounded strategies for sustainability. Residents were not only participants in educational activities, but also co-creators of environmental solutions relevant to the realities of island and coastal life. An informant identified as M.T. explained that community discussions became more meaningful because residents were invited to share their own experiences rather than simply being instructed on what they should or should not do.

This participatory orientation reflects broader shifts within contemporary sustainability scholarship, particularly within approaches emphasizing community-based sustainability transformation. Recent studies argue that sustainability transitions are more durable when communities are empowered to shape environmental agendas according to their social realities, cultural identity, and local ecological experiences (Rohmatulloh et al., 2023; Sumantri et al., 2026). Similarly, Makrooni et al. (2026) and Tumbelaka et al. (2024) emphasize that indigenous and local knowledge systems provide adaptive capacities essential for responding to ecological change, particularly in vulnerable coastal and island communities. The findings from Leahari Village support these perspectives by showing that environmental resilience is strengthened when sustainability initiatives are rooted in local social structures and collective cultural memory.

Another significant aspect of the culturally embedded empowerment model lies in its capacity to bridge generational and epistemological divides. The integration of local ecological values with contemporary environmental knowledge allowed younger community members to reinterpret traditional practices within modern sustainability discourses. Environmental care was no longer viewed solely as customary obligation inherited from older generations, but also as a rational response to current ecological risks such as waste accumulation, declining environmental quality, and climate-related vulnerability in coastal areas. This bridging process enabled local knowledge to remain socially relevant while simultaneously expanding community understanding of broader environmental challenges.

The findings also suggest that participatory environmental empowerment contributes to strengthening collective ecological identity within coastal communities. Through repeated discussions, social reflection, and collaborative educational activities, residents increasingly perceived environmental sustainability as a shared communal responsibility rather than an individual concern. This collective orientation became particularly important in small island communities where environmental degradation directly affects social life, economic survival, and long-term community resilience.

Conceptually, the culturally embedded environmental empowerment model proposed in this study contributes to the development of environmental sociology, community-based development studies, and socio-ecological sustainability research in coastal and island regions. The model highlights that environmental sustainability cannot be separated from social relations, cultural systems, and community participation. In developing coastal contexts such as Eastern Indonesia, sustainability initiatives become more effective when ecological transformation is approached not only as a technical process, but also as a cultural and social project grounded in local realities and collective community agency.

CONCLUSION

This study concludes that strengthening environmental sustainability in coastal communities of Eastern Indonesia requires empowerment strategies that are socially participatory, culturally embedded, and grounded in local ecological knowledge. The findings demonstrate that ecological awareness and pro-environmental behavior among coastal residents are more effectively developed when environmental education is integrated with local social values, customary structures, and community-based communication patterns rather than relying solely on formal regulations or technocratic interventions. In the context of Leahari Village, participatory engagement involving village authorities, customary leaders, religious leaders, and local residents enabled environmental issues to be collectively understood as shared social responsibilities connected to community well-being and intergenerational sustainability. The study further shows that local knowledge continues to function as an important source of social capital capable of supporting ecological transformation when revitalized through contextual and bottom-up educational approaches. The novelty of this research lies in the formulation of a culturally embedded environmental empowerment model that bridges indigenous ecological understanding with modern environmental education through participatory social interaction and collective reflection. This model positions coastal communities not as passive recipients of environmental programs, but as active agents in the production of ecological knowledge and sustainability transformation. Consequently, the study contributes to the development of environmental sociology and community-based sustainability studies by emphasizing that environmental resilience in coastal and island societies depends not only on ecological management, but also on the strengthening of cultural identity, social participation, and locally grounded environmental governance.

ETHICAL STATEMENT AND DISCLOSURE

This study was conducted in accordance with established ethical principles, including informed consent, protection of informants' confidentiality, and respect for local cultural values. Special consideration was given to participants from vulnerable groups to ensure their safety, comfort, and equal rights to participate. No external funding was received, and the authors declare no conflict of interest. All data and information presented were collected through valid research methods and have been verified to ensure their accuracy and reliability. The use of artificial intelligence (AI) was limited to technical assistance for writing and language editing, without influencing the scientific substance of the work. The authors express their gratitude to the informants for their valuable insights, and to the anonymous reviewers for their constructive feedback on an earlier version of this manuscript. The authors take full responsibility for the content and conclusions of this article.

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