

Eco-Friendly Concept Training for MSMEs in Tanjung Rejo Mangrove Tourism Village, Deli Serdang

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ABSTRACT

Climate change, environmental degradation, and ecosystem destruction demand the adoption of eco-friendly practices in economic activities. Beyond environmental benefits, such practices enhance economic competitiveness, particularly for Micro, Small, and Medium Enterprises (MSMEs). Tanjung Rejo Mangrove Tourism Village in Medan Belawan exemplifies the integration of sustainable tourism with mangrove ecosystem conservation and local economic empowerment through homestays, tour guides, and environmentally-based products. This study evaluates the effectiveness of eco-friendly training for 30 local MSMEs using participatory methods with pre-test and post-test instruments. Results indicate significant improvements across ten indicators (25%-56%), notably in production waste management (56%) and consumer awareness of eco-friendly products (45%). The training successfully catalyzed behavioral transformation toward sustainable business practices, yielding dual impacts on ecosystem preservation and MSME economic competitiveness. Findings demonstrate that structured capacity-building programs can drive collective environmental awareness while strengthening local economies. Recommendations include developing advanced training modules, fostering multi-sector collaboration, and establishing incentive systems for MSMEs consistently implementing eco-friendly practices.

ABSTRAK

Perubahan iklim, degradasi lingkungan, dan kerusakan ekosistem menuntut penerapan praktik ramah lingkungan dalam aktivitas ekonomi masyarakat. Selain memberikan manfaat ekologis, praktik tersebut meningkatkan daya saing ekonomi, khususnya bagi Usaha Mikro, Kecil, dan Menengah (UMKM). Desa Wisata Mangrove Tanjung Rejo di Medan Belawan mengintegrasikan pariwisata berkelanjutan dengan konservasi ekosistem mangrove dan pemberdayaan ekonomi lokal melalui homestay, pemandu wisata, serta produk berbasis lingkungan. Penelitian bertujuan mengevaluasi efektivitas pelatihan eco-friendly terhadap 30 pelaku UMKM lokal menggunakan metode partisipatif dengan instrumen pre-test dan post-test. Hasil menunjukkan peningkatan signifikan pada sepuluh indikator (25%-56%), terutama pengelolaan limbah produksi (56%) dan kesadaran konsumen terhadap produk ramah lingkungan (45%). Pelatihan berhasil mengkatalisasi transformasi perilaku menuju praktik bisnis berkelanjutan yang berdampak ganda pada pelestarian ekosistem dan daya saing ekonomi UMKM. Temuan mendemonstrasikan bahwa program penguatan kapasitas terstruktur mampu mendorong kesadaran lingkungan kolektif sekaligus memperkuat ekonomi lokal. Rekomendasi meliputi pengembangan modul pelatihan lanjutan, penguatan kolaborasi multisektor, dan pembentukan sistem insentif bagi UMKM yang konsisten menerapkan praktik ramah lingkungan.

ARTICLE HISTORY

Received 17 September 2025

Accepted 10 October 2025

Published 30 October 2025

KEYWORDS

Eco-Friendly Training; MSMEs; Mangrove Tourism; Tanjung Rejo Village.

KATA KUNCI

Pelatihan Ramah Lingkungan; UMKM; Wisata Mangrove; Desa Tanjung Rejo.

1. Introduction

Climate change, environmental degradation, and ecosystem destruction have emerged as the most pressing challenges of the 21st century, requiring immediate and fundamental shifts in human behavior and economic practices (Kiswantoro *et al.*, 2022). Eco-friendly practices—including waste management, renewable energy adoption, and sustainable consumption—are no longer optional measures but moral imperatives to safeguard intergenerational environmental justice (Han & Indra, 2021; Wardhana *et al.*, 2020). The urgency of adopting such practices becomes increasingly apparent as communities worldwide grapple with the tangible consequences of environmental neglect.

Tanjung Rejo Mangrove Tourism Village in Medan Belawan District stands as a compelling example of how ecological conservation can be integrated with community-based economic development. The village has successfully transformed its mangrove ecosystem into both a conservation site and an ecotourism asset, creating income opportunities through homestays, guided tours, and locally-produced goods. With an average of 250 monthly visitors recorded by the Medan City Tourism Office (2022), the village has demonstrated its potential as a sustainable tourism destination. However, beneath the surface of apparent success lies a troubling reality: local Micro, Small, and Medium Enterprises (MSMEs) have not yet fully embraced eco-friendly production standards that would align with the village's sustainability vision.

A baseline survey conducted in 2023 by the village community group uncovered concerning patterns in local business practices. The data revealed that 45% of MSME products continue to rely on single-use plastics, while merely 25% of business operators have implemented any form of waste reduction strategy. These figures expose a fundamental disconnect between the village's environmental aspirations and the actual practices of its economic actors. The consequences of maintaining such unsustainable approaches extend far beyond immediate pollution concerns—they actively undermine the ecological integrity of the mangrove ecosystem and threaten the village's long-term viability as a tourism destination. When visitors seek authentic eco-tourism experiences, they expect consistency between environmental messaging and observable practices. The current gap between rhetoric and reality risks eroding visitor trust and damaging the village's reputation.

Research across various sectors has consistently shown that eco-friendly business practices deliver multiple tangible benefits. Businesses adopting sustainable approaches experience enhanced brand reputation, increased consumer appeal, and often discover opportunities for cost reduction through resource efficiency (Mardius *et al.*, 2023). The market increasingly rewards environmental responsibility, particularly among younger consumers who prioritize sustainability in their purchasing decisions. Conversely, businesses that neglect environmental considerations face mounting risks: declining consumer trust, direct environmental harm, and diminished attractiveness in competitive markets (Pratiwi, 2023). For tourism-dependent communities like Tanjung Rejo, the stakes are particularly high, as environmental degradation directly threatens the primary asset upon which livelihoods depend.

Recognizing the urgency of bridging the gap between current practices and sustainability goals, the present study introduces a structured eco-friendly training intervention targeting 30 MSMEs in Tanjung Rejo. The program seeks to catalyze genuine behavioral transformation by equipping participants with practical knowledge, applicable skills, and intrinsic motivation to adopt sustainable production principles. Rather than imposing external mandates, the intervention emphasizes collaborative learning and peer support, recognizing that lasting change emerges from internal conviction rather than external pressure. The anticipated outcomes extend beyond individual business improvements to encompass broader community benefits: fostering collective environmental consciousness, strengthening ecosystem resilience, and ultimately enhancing community welfare through sustainable economic practices that honor both present needs and future generations.

2. Methodology

This Community Service (PkM) program employed a community organizing framework that prioritized active participation of Micro, Small, and Medium Enterprises (MSMEs) in Tanjung Rejo Mangrove Tourism

Village, Medan Belawan District, Medan City. The site was selected based on two criteria: first, the presence of a critical mangrove ecosystem supporting coastal resilience; and second, the identified gap between ecotourism potential and the adoption of eco-friendly business practices among local MSMEs. Community action planning followed a collaborative model involving university faculty, village government officials, and MSME representatives. Stakeholder engagement commenced at the problem identification stage and extended through needs assessment and training curriculum design (Usada & Murni, 2020). This bottom-up approach ensured that interventions addressed authentic community needs rather than externally imposed solutions (Kiswanto *et al.*, 2022). The organizing strategy adhered to three core principles: participatory engagement, collaborative decision-making, and sustainability orientation (Han, 2021).

The training intervention utilized a mixed-method participatory approach comprising interactive lectures, facilitated group discussions, hands-on practical sessions, and pre-post assessment using structured instruments (Wardhana *et al.*, 2020). The pre-test measured baseline knowledge of eco-friendly concepts, while the post-test quantified knowledge gains following the intervention (Mardius *et al.*, 2023). Assessment items covered seven domains: foundational eco-friendly principles, MSME-specific benefits, production process adaptation, sustainable packaging strategies, green marketing techniques, waste management systems, and implementation barriers (Hermawan *et al.*, 2023). Program implementation followed three sequential phases. The preparation phase included site reconnaissance and stakeholder mapping, coordination meetings with village administration, and training module development with material validation. The implementation phase consisted of an opening ceremony and program orientation, pre-test administration, material delivery through interactive sessions, practical skill-building workshops, post-test administration, and collective reflection with action planning. The evaluation phase involved quantitative analysis of pre-post test scores, qualitative assessment of participant feedback, and synthesis of findings for program refinement.

3. Results

The implementation of the Community Service (PkM) program in Tanjung Rejo Mangrove Tourism Village resulted in a significant increase in the understanding of eco-friendly concepts among MSMEs. Evaluation was conducted through pre- and post-tests administered to 30 participants, with assessment indicators covering basic understanding, benefits, environmental impacts, production implementation, packaging, marketing strategies, consumer awareness, waste management, utilization of environmentally friendly resources, and identification of obstacles and solutions. The test results demonstrated an increase in average scores from a range of 48–60 in the pre-test to 78–85 in the post-test, with percentage improvements ranging from 25% to 56%. This increase reflects a transformation in participants' understanding of the importance of implementing environmentally friendly practices in their businesses. Furthermore, the mentoring activities also led to behavioral changes, such as heightened awareness of reducing single-use plastics, willingness to experiment with organic raw materials, and participants' enthusiasm for marketing products with an environmentally friendly identity. The anticipated social changes are beginning to emerge, including the formation of a core group of MSMEs willing to serve as catalysts for eco-friendly practices in the village. Local champions have also emerged who are actively promoting environmentally friendly packaging innovations and developing digital-based collaborative marketing initiatives.

3.1 Pre-test and Post-test Results

Based on the evaluation of 30 participants through pre-test and post-test assessments, there was a significant improvement in understanding eco-friendly concepts within the MSME business context. Table 1 demonstrates that all ten indicators showed positive progress, with score increases ranging from 25% to 56%.

Table 1. Pre-test and Post-test Results Based on Indicators

No	Indicator	Average Pre-Test Score	Average Post-Test Score	Improvement (%)
1	Basic Understanding of the Eco-Friendly Concept	51	83	32%
2	Benefits of Implementing Eco-Friendly Practices for MSMEs	48	79	31%
3	Impact of Eco-Friendly Practices on the Environment	55	82	27%
4	Implementation of Eco-Friendly Practices in Production	60	85	25%
5	Eco-Friendly Packaging	55	80	25%
6	Eco-Friendly Marketing Strategies	60	85	25%
7	Consumer Awareness of Eco-Friendly Products	55	80	45%
8	Waste and Production By-Products Management	50	78	56%
9	Utilization of Eco-Friendly Resources	55	80	45%
10	Barriers and Solutions in Implementing Eco-Friendly Practices	58	83	43%

Source: Data processed by the author.

For the first indicator, Basic Understanding of the Eco-Friendly Concept, the average score increased from 51 in the pre-test to 83 in the post-test, representing a 32% improvement. This indicates that participants gained a stronger foundation in recognizing eco-friendly principles. Similarly, the second indicator, Benefits of Implementing Eco-Friendly Practices for MSMEs, increased from 48 to 79, reflecting a 31% improvement and demonstrating better awareness of how sustainability can enhance efficiency, reduce costs, and improve competitiveness. The third indicator, Impact of Eco-Friendly Practices on the Environment, showed a 27% improvement, with scores rising from 55 to 82. Participants demonstrated enhanced recognition of the role of eco-friendly practices in pollution reduction, resource conservation, and ecosystem protection. In production-related aspects (Indicator 4), scores increased from 60 to 85, representing a 25% improvement and demonstrating better knowledge of practical applications such as renewable energy use and waste reduction. For packaging (Indicator 5) and marketing strategies (Indicator 6), improvements of 25% each highlighted the growing capacity to design sustainable packaging and adopt effective eco-friendly promotional methods.

Consumer-related aspects also showed substantial progress. Consumer Awareness of Eco-Friendly Products (Indicator 7) rose from 55 to 80, representing a 45% improvement and underlining the importance of market demand and consumer trust in sustainable products. The highest increase occurred in Waste and Production By-Products Management (Indicator 8), with scores increasing from 50 to 78, representing a 56% improvement. This reflects participants' enhanced understanding of waste separation, recycling, and zero-waste approaches. For Indicator 9, Utilization of Eco-Friendly Resources, scores increased by 45%, rising from 55 to 80, demonstrating greater awareness of renewable energy, organic materials, and recycled inputs. Finally, Indicator 10, Barriers and Solutions in Implementing Eco-Friendly Practices, increased from 58 to 83, representing a 43% improvement and indicating that participants were better able to identify challenges such as costs and resource limitations while also recognizing practical solutions through collaboration and gradual adaptation. The training effectively enhanced participants' knowledge, awareness, and readiness to integrate eco-friendly practices into their businesses. These improvements are expected to contribute not only to the sustainability of local MSMEs but also to the long-term preservation of the mangrove ecosystem in Tanjung Rejo.

4. Discussion

The results demonstrate a significant transformation in the knowledge, attitudes, and readiness of MSMEs to implement eco-friendly concepts (Han, 2021). An average score improvement of up to 56% across several indicators reflects the effectiveness of the participatory training strategy utilizing pre-test and post-test assessments in enhancing community understanding (Wardhana *et al.*, 2020). These findings also reveal the emergence of social transformation manifested in three dimensions: first, collective community awareness of the importance of environmental sustainability; second, the formation of MSME groups actively promoting eco-friendly practices; and third, the emergence of local champions with the potential to become change agents in environmentally friendly business innovation. This phenomenon aligns with community empowerment theory, which posits that increasing individual capacity can catalyze structural change at the community level (Mardius *et al.*, 2023).

Furthermore, these results are consistent with previous literature, which confirms that implementing eco-friendly practices in MSMEs not only contributes to environmental conservation but also strengthens business competitiveness through product differentiation and enhanced customer loyalty (Hermawan *et al.*, 2023; Kiswanto *et al.*, 2022). The integration of sustainability principles into MSME operations creates a dual value proposition: environmental stewardship and economic resilience. This synergy is particularly critical in ecotourism contexts such as Tanjung Rejo Mangrove Tourism Village, where the health of natural ecosystems directly influences livelihood opportunities.

The substantial improvement in waste management understanding (56% increase) warrants particular attention, as it represents the most significant knowledge gain among all indicators. This finding suggests that participants recognized waste management as both an urgent environmental challenge and a practical entry point for implementing sustainable practices. The emphasis on waste separation, recycling, and zero-waste approaches reflects a shift from linear to circular economy thinking, which is essential for resource-constrained MSME settings (Usada & Murni, 2020). However, while knowledge gains are encouraging, the translation of awareness into sustained behavioral change remains a critical challenge. The literature indicates that barriers such as initial investment costs, limited access to eco-friendly materials, and market uncertainties can impede the adoption of sustainable practices despite strong intentions (Wardhana *et al.*, 2020). Therefore, continuous mentoring, peer learning networks, and access to green financing mechanisms are essential to bridge the gap between knowledge acquisition and practical implementation. Thus, this Community Service Program (PkM) activity successfully not only increased participants' technical knowledge but also fostered behavioral shifts toward sustainable business practices, which generate dual impacts on environmental preservation and local economic development. The emergence of local champions and collaborative MSME groups signals the potential for long-term institutionalization of eco-friendly practices within the community. Future interventions should focus on strengthening these nascent networks, facilitating market linkages for eco-friendly products, and establishing monitoring mechanisms to track the sustained adoption of sustainable practices over time.

5. Conclusion and Recommendations

Based on the results of the pre-test and post-test conducted with 30 participants in Tanjung Rejo Mangrove Tourism Village, the training program effectively enhanced participants' understanding of eco-friendly concepts within the MSME business context. The average scores increased significantly across all indicators, ranging from 25% to 56%, indicating substantial improvement in understanding various aspects such as production processes, waste management, eco-friendly packaging, and marketing strategies. This improvement underscores not only the success of the training intervention but also its relevance in providing practical knowledge essential for MSME sustainability. The participants acquired competencies in integrating eco-friendly principles into daily business operations, thereby reducing environmental impacts while simultaneously enhancing operational efficiency and market competitiveness. The training's effectiveness also reflects the critical importance of structured and needs-based education for MSMEs, as it raised awareness of their pivotal role in environmental preservation and community well-being. Beyond knowledge transfer, the program catalyzed behavioral shifts and fostered

the emergence of local champions committed to promoting sustainable business practices within their community.

However, sustained impact requires continuous support mechanisms. Therefore, it is recommended that similar training programs be continued and further developed with more specialized modules, such as the application of green technologies, renewable energy management, circular economy principles, and the establishment of robust eco-friendly marketing networks. Strengthened multi-stakeholder collaboration among government agencies, academic institutions, and the private sector is essential to support the broader implementation of sustainable practices and accelerate the transformation of MSMEs toward integrated environmental and economic sustainability.

Future interventions should also incorporate long-term monitoring and evaluation frameworks to assess the sustained adoption of eco-friendly practices, establish peer learning networks to facilitate knowledge exchange among MSMEs, and develop access to green financing mechanisms to overcome financial barriers. By addressing these dimensions, the momentum generated by this Community Service Program (PkM) can be institutionalized, ensuring that eco-friendly practices become embedded in the operational culture of MSMEs in Tanjung Rejo and serve as a replicable model for similar communities in Indonesia.

Acknowledgement

The authors express sincere gratitude to the community of Tanjung Rejo Mangrove Tourism Village for their active participation, to the MSME practitioners for their willingness to learn and implement eco-friendly practices, and to the academic team for their dedication in designing and delivering the training program. Appreciation is also extended to the local government and all supporting institutions whose collaboration and resources were instrumental in the success of this Community Service Program (PkM).

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