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PLASTIC WASTE DIVERSIFICATION FOR ENVIRONMENTAL SUSTAINABILITY: EMPOWERING COASTAL COMMUNITIES

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Abstract

The plastic waste problem in Sungai Kunyit Village, Mempawah Regency, has to significant environmental pollution, particularly in coastal and riverine areas. This community service program aimed to empower residents by diversifying plastic waste into economically valuable products, supporting environmental conservation, and enhancing the community's economic well-being. The method employed was Participatory Action Research (PAR), which actively involved the community at every stage of the program, from problem identification and plastic waste processing training to the marketing of recycled products. The program's results indicated that more than 80% of participants gained an increased understanding of the negative impacts of plastic waste and demonstrated behavioral changes in their household waste management. In addition, the community began developing community-based businesses by utilizing digital platforms to market recycled products such as shopping bags and flower pots. This program not only significantly improved environmental awareness but also created positive economic impacts that support the sustainability of coastal community livelihoods.

Keywords: plastic waste, community empowerment, product diversification, environmental conservation, digital marketing

Abstrak

Masalah sampah plastik di Desa Sungai Kunyit, Kabupaten Mempawah, telah menyebabkan polusi lingkungan yang signifikan, terutama di daerah pesisir dan sungai. Program pengabdian masyarakat ini bertujuan untuk memberdayakan masyarakat dengan mendiversifikasi sampah plastik menjadi produk bernilai ekonomi, mendukung konservasi lingkungan, serta meningkatkan kesejahteraan ekonomi masyarakat. Metode yang digunakan adalah Participatory Action Research (PAR), yang melibatkan masyarakat secara aktif dalam setiap tahap kegiatan, mulai dari identifikasi masalah, pelatihan pengolahan sampah plastik, hingga pemasaran produk daur ulang. Hasil program menunjukkan bahwa lebih dari 80% peserta mengalami peningkatan pemahaman terhadap dampak negatif sampah plastik dan menunjukkan perubahan perilaku dalam pengelolaan sampah rumah tangga. Selain itu, masyarakat mulai mengembangkan usaha berbasis komunitas dengan memanfaatkan platform digital untuk pemasaran produk daur ulang seperti tas belanja dan pot bunga. Program ini tidak hanya berhasil meningkatkan kesadaran lingkungan secara signifikan, tetapi juga menciptakan dampak ekonomi positif yang mendukung keberlanjutan kehidupan masyarakat pesisir.

Kata Kunci: *sampah plastik, pemberdayaan masyarakat, diversifikasi produk, konservasi lingkungan, pemasaran digital*

INTRODUCTION

Kalimantan Province the region is known for its abundant natural resources, particularly in the fisheries and marine sectors. Most of the local population work as traditional fishermen or operate Small and Medium-sized Enterprises (SMEs) focused on seafood processing. However, the overall education level in the community remains relatively low, and access to information and training on sustainable environmental management is still limited.

From a socio-economic perspective, Sungai Kunyit Village is classified as a lower-middle-income area. Basic infrastructure such as waste management, sanitation, and access to clean water is not yet optimal. This condition contributes to the low level of public awareness regarding waste management, including household plastic waste. One of the most pressing issues faced by the village is the increasing environmental pollution caused by plastic waste. Plastic waste from household activities and river flows directly pollutes the coastal and marine areas. This has led to ecosystem degradation, declining water quality, and reduced fish catches negatively impacting the economic well-being of coastal communities.

Data from the Mempawah Environmental Agency (DLH Mempawah, 2023) indicate that unmanaged waste in coastal areas, including Sungai Kunyit Village, exceeds 2 tons per week. Local media reports such as Pontianak Post and Tribun Pontianak have also highlighted the issue of coastal pollution and environmental degradation caused by plastic waste in the area.

Socially and economically, the coastal community of Sungai Kunyit relies heavily on marine resources as their its main primary source of livelihood. Plastic pollution not only harms the environment but also directly impacts the community's income, especially that of local fishermen (Barnes, 2019). Moreover, most residents lack the skills and knowledge to transform plastic waste into economically valuable products, resulting in the underutilization of recycling opportunities. This indicates a pressing need for interventions that enhance environmental awareness while simultaneously empowering highlights a pressing need for interventions that promote environmental awareness while also supporting the local economy (Li, X., Wang, J., Zhang, T., Yang, S., Sun, M., Qian, X., Wang, T., & Zhao, Y. (2023)

Based on previous scientific studies, various approaches have been developed for plastic waste managing plastic waste. For instance, (Awoyera and Adesina (2020) explored the use of plastic waste in construction materials but focused more on industrial applications rather than community empowerment. Similarly, (Balu et al. (2022) examined upcycling as part of the circular economy concept but did not address the social dimension in coastal communities. Other studies, such as those by Damayanti et al. (2022), Kumar et al. (2021), & Maitlo et al. (2022) emphasize the technical and industrial aspects of plastic waste utilization but overlook the social impact on communities directly affected by pollution. Likewise, Faraca and Astrup (2019), and Hahladakis et al. (2020), & Hahladakis et al. (2020) focused on plastic waste characterization and the circular economy without linking it to coastal community empowerment.

What sets this community engagement program apart is its integrated approach that not only addresses the technical aspects of plastic waste processing but also aims to enhance the capacity and welfare of coastal communities. The program responds to three main issues faced by the partners: (1) environmental pollution caused by plastic waste, (2) lack of skills in plastic waste processing, and (3) limited access to marketing recycled products. To address these problems, the program offers training in transforming plastic waste into creative and marketable products such as reusable shopping bags, flower pots, and other handicrafts.

The program employs the Participatory Action Research (PAR) method, involving the local community at every stage from problem identification and evaluation and follow-up planning. This active involvement is expected to foster a sense of ownership and ensure long-term sustainability. The target outcomes of this program include: (1) the creation of recycled products such as bags, flower pots, and decorative items; (2) increased public awareness regarding the importance of plastic waste management; (3) the establishment of community-based business groups for plastic waste processing; and (4) increased household income through product sales. The main benefits of this program are a cleaner, healthier environment and the creationprimary benefits of this program include a cleaner and healthier

environment, as well as the development of sustainable economic opportunities for coastal communities.

METHOD

The community service activities were from October to November 2024. The program was implemented over several sessions, with approximately 50 participants involved in each session. The participants came from various segments of the local population, including fishermen, homemakers, and youth groups, representing the Sungai Kunyit village's demographic diversity. The program employs the Participatory Action Research (PAR) method, involving the local community at every stage from problem identification and evaluation and follow-up planning.

The activity design aimed to foster active community participation through an integrated approach that included technical training, educational sessions, mentoring, and practical simulations. The program began with hands-on training sessions that provided participants with skills in processing plastic waste into economically valuable products, such as shopping bags, flower pots, and decorative crafts. The techniques taught were adapted to the participants' capabilities and utilized simple tools and materials, ensuring that the processes could be replicated independently.

In addition to technical training, awareness sessions were conducted to educate participants about the environmental impact of plastic waste and the economic opportunities available through recycling. These sessions were delivered through visual presentations and interactive discussions, helping participants understand the importance of protecting river and coastal ecosystems. Participants also received continuous support through individual and group consultations with facilitators, covering both technical production aspects and business planning, including marketing strategies.

To support the program's sustainability, community workgroups were established to take responsibility for the collection, sorting, and processing of plastic waste. These groups were also trained in product marketing techniques, including the use of social media for promotion. Practical simulations were conducted to

replicate real market conditions, allowing participants to practice selling their products, receive feedback, and refine their marketing skills.

Materials provided during the program included modules on plastic waste recycling, step by step production guides, and marketing templates. The achievement of program targets was measured through active participant engagement, the ability to independently produce recycled goods, and an understanding of business and marketing practices. Evaluation was conducted periodically through observation, group discussions, and reflection sessions to ensure participants could internalize the knowledge and sustain the activities beyond the program period. This evaluation framework also served as the basis for planning follow-up initiatives to ensure long-term impact at the community level.

RESULT AND DISCUSS

At the initial stage of the program, structured discussions were conducted with local residents to explore the root causes and impacts of plastic waste pollution in the village. These activities were facilitated through direct collaboration with the Head of Terusan Village, located in Mempawah Hilir District, as an effort to build a shared understanding of the environmental issues faced by the local community. Terusan, a coastal village in Mempawah Regency, faces significant challenges in managing plastic waste, which has adverse effects on soil, water, and public health.

The outcomes of the initial meetings revealed that the level of community awareness regarding the dangers of plastic waste was still low. However, through a participatory awareness-raising phase, a post-activity survey indicated that over 80% of participants experienced an increased understanding of the negative impacts of plastic waste on the environment and human health. This cognitive shift provided a strong foundation for more active community engagement in the subsequent phases of the program.

Figure 1 Discussion with the head of Terusan, Mempawah Community

Problem Awareness and Identification

Following problem identification, the community underwent hands-on training sessions on processing plastic waste. These sessions enabled participants—comprising housewives, youth, and creative groups—to transform waste into usable products such as shopping bags and flower pots. The training emphasized the use of simple tools and local materials, enhancing replicability and sustainability. Participants not only gained technical skills but also a creative outlook, becoming active producers rather than passive learners.

Figure 2 Mentorship and Behavioral Transformation

As training continued, participants received ongoing mentoring focused on habit formation and environmental responsibility. This resulted in behavioral changes among the majority of respondents, including the adoption of daily practices such as waste separation, reducing the use of single-use plastics, and consistently

using reusable bags. These behaviors signify an internalization of sustainability values and a movement toward long-term ecological responsibility.

Figure 3 Mentorship and Behavioral Transformation

Participants began producing a variety of recycled products, including aesthetically pleasing and durable flower pots and reusable bags. These items were recognized for their quality, resilience to weather conditions, and marketable design. This demonstrates the program's success in delivering practical training in sorting, molding, and decorative design, preparing the community to compete in local and regional markets.

Figure 4 Recycled Product Production and Quality Improvement

The program's evaluation phase conducted through group reflections, facilitator feedback, and participant observations, validated the effectiveness of the participatory approach in improving both individual capacity and social cohesion. The assessment revealed a measurable increase in community solidarity, adoption

of environmentally responsible practices, and a notable improvement in household economic outcomes. These impacts indicate that the initiative fostered not only technical skills but also a collective environmental ethic within the community.

Table 1 Evaluation and Community Transformation

Indicator	Pre-Program Status	Post-Program Result	Change (%)
Active Participation in Group Activities	35% of participants	92% of participants actively involved in workgroups	+57%
Average Monthly Household Income (from recycled products)	IDR 0 (no prior income from recycling)	IDR 250,000 – 500,000	New Source of Income
Understanding of Environmental Issues	22% reported basic understanding	85% reported clear understanding and concern	+63%
Community-led Environmental Initiatives	1 informal activity per month	4–6 organized clean-up events and meetings monthly	+300%
Social Cohesion (perceived solidarity score)*	5.2 / 10 (low to moderate)	8.6 / 10 (high collaboration and trust)	+65%

The program's impact was evaluated using pre- and post-program surveys combining quantitative and qualitative methods. Key indicators included: group participation, income from recycled products, environmental awareness, community initiatives, and social cohesion. For percentage-based indicators (e.g., participation, awareness, cohesion), changes were calculated using:

$$\text{Change (\%)} = \left(\frac{\text{Post} - \text{Pre}}{\text{Pre}}\right) \times 100$$

However, results are reported as absolute percentage point increases for clarity. For example: Active participation: 35% → 92% (+57%), Environmental awareness: 22% → 85% (+63%), Social cohesion: 5.2 → 8.6 out of 10 (+65% relative increase). Non-percentage indicators were compared descriptively. Before the program, there was no income from recycling (IDR 0); afterward, participants earned IDR 250,000–500,000/month. Community-led clean-up events also rose from one informal activity to 4–6 organized actions per month.

The proposed solutions, including training on recycling techniques and awareness programs, were effectively implemented. Participants actively engaged in all phases, from waste collection to production and marketing. Their involvement ensured a practical understanding of the recycling process and its economic benefits. The implementation of solutions involving training on recycling techniques and awareness programs can be effectively analyzed through the lens of previous studies in plastic waste management and recycling. For instance, the involvement of participants throughout all stages, from waste collection to production and marketing, aligns with the findings of Payne et al. (2019) , who emphasize the importance of a circular economy approach to plastic waste. By fostering active engagement, participants gain a practical understanding of the recycling process and its economic benefits, which aligns with the broader concept of closed-loop systems in plastic waste management, as discussed by Payne et al. (2020). They highlight the role of value-added products derived from recycled plastic, which enhances the economic viability of recycling programs.

Similarly, Qureshi et al. (2020) provide insight into the pyrolysis of plastic waste, noting that it offers opportunities for producing valuable chemicals and fuels, further supporting the economic benefits of such recycling processes. Training participants on these advanced recycling methods enables them to appreciate the economic potential of waste transformation. This practical knowledge ensures that the local communities involved can directly benefit from the recycling processes, enhancing both the environmental and economic financial sustainability of the efforts. The hands-on engagement of participants, including the production and marketing stages, is an essential encompassing both the production and marketing stages, is a crucial factor in fostering a practical understanding of the plastic recycling process and its value-added opportunities, as emphasized by Roy et al. (2021) in their study on strategic approaches to plastic waste valorization.

The program's success in promoting active participation also reflects the challenges and opportunities identified by Ragossnig and Agamuthu (2021). They argue that integrating social awareness and participation is crucial to tackling plastic waste effectivelyfor effectively tackling plastic waste. By engaging communities in

waste collection and product manufacturing, the solution demonstrates a model where the practical involvement of local populations contributes to a more sustainable and efficient waste management process, which is also in line aligning with the findings of Weckhuysen (2020) on creating value from plastic waste.

The production and sale of recycled products served as tangible indicators of success. The establishment of community workgroups ensured the program's sustainability, as these groups will continue managing recycling activities independently. The economic benefits further validated the program's impact. The success indicators of the plastic recycling program, such as the production and sale of recycled products and the establishment of community workgroups, align with several key concepts from the literature on plastic waste management and the circular economy. According to Zhao et al. (2022), upcycling plastic waste is a critical aspect of achieving a circular economy, where waste is transformed into valuable products that can be reintegrated into the market. The sale of these recycled products serves as a tangible success indicator, reflecting the effectiveness of the program in turning indicator of success, reflecting the effectiveness of the program in converting plastic waste into economically viable materials.

Moreover, the sustainability of the program through the formation of community workgroups achieved through the formation of community workgroups, aligns with the principles of community-based waste management. These groups are essential in ensuring the continuation of recycling activities and the maintenance of ensuring the continuation of recycling activities and maintaining the program's long-term success, as they will be able to manage the activities independently. This approach is consistent with the findings of Syafari et al. (2024), who emphasize the importance of local community involvement in waste management strategies to ensure that solutions are not only practical but also sustainable. By empowering local communities to take charge of recycling efforts, the program ensures that recycling practices continue even after external support is reduced or eliminated.

Economic benefits further validate the program’s impact. As highlighted by Zhao et al. (2022), the economic viability of recycling programs is a crucial factor for their success, as they create their success, as it creates financial incentives for

communities and businesses to engage in recycling activities. This economic feedback loop not only drives the recycling process but also contributes to local development and job creation. Similarly, the involvement of local communities in managing the recycling activities ensures that the economic benefits are distributed among those most affected by plastic waste, thus contributing to their empowerment and improving their socio-economic conditions.

Additionally, Meijer et al. (2021) discuss the role of rivers as a key source of plastic pollution, particularly in low-income regions. By focusing on local recycling efforts, such as those implemented in riverbank communities, the program addresses both the environmental and socio-economic aspects of plastic waste. The establishment of community workgroups ensures that the waste is managed at the local level, potentially preventing further pollution of rivers and contributing to cleaner, more sustainable environments, as indicated by Syafari et al. (2024).

The success of the plastic recycling program was primarily driven by several key factors. Several key factors primarily drove the success of the plastic recycling program. The high motivation of participants played a crucial role, as individuals were eager to engage in the recycling process due to the perceived benefits of both environmental and economic significance. This aligns with findings from Zhao et al. (2022), who emphasize the importance of community willingness in achieving a circular economy. Furthermore, strong community support contributed significantly to the program's success. When local communities actively participate and work together, they create a sense of ownership, which enhances the program’s effectiveness and sustainability, as highlighted by Emmerik and Schwarz (2019). Additionally, the provision of accessible training materials ensured that participants were equipped with the necessary knowledge to engage in the recycling process. Zhao et al. (2022) stress the importance of making training materials accessible and culturally relevant, which in turn helps participants understand and apply recycling techniques more effectively.

Overall, the program successfully addressed the priority problems identified in the situational analysis. By combining technical training, community engagement, and marketing strategies, the program empowered the community to transform

plastic waste into valuable resources. This initiative not only improved the environmental conditions in Sungai Kunyit Village but also created new economic opportunities, laying the foundation for sustainable development.

CONCLUSION

This community service program successfully addressed the key challenges faced by Sungai Kunyit Village namely, environmental pollution from plastic waste and limited economic opportunities by empowering residents to transform plastic waste into marketable products. Through a participatory approach, the program enabled the community engage in environmental conservation while actively improving their livelihoods. Contributing factors to this success included the community's strong motivation, the accessibility of training materials, and the presence of collaborative group dynamics. Challenges such as limited access to raw materials and initial community resistance were effectively mitigated through ongoing mentorship and engagement. In line with the program's core objectives of community empowerment and environmental sustainability, it is recommended to strengthen the initiative by expanding access to various types of plastic waste through partnerships with surrounding villages, enhancing product design capabilities through advanced training, and building formal collaborations with regional markets and relevant stakeholders for improved product distribution. The authors extend their sincere appreciation to the local government of Mempawah Regency, the residents of Sungai Kunyit Village, and all supporting institutions for their vital contributions, which were instrumental in achieving the program's goals and ensuring its long-term impact.

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