



## ***Community-Based Circular Economy Practices and Social Innovation: A Case Study from Bone Regency, Indonesia***

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### **Abstract**

This study examines the implementation of circular economy practices and their contribution to social innovation and strengthening the local economy in Bone Regency, South Sulawesi. The research was motivated by the high volume of agricultural and fishery waste that has not been optimally managed, as well as the potential of inorganic materials that can be reused as products with commercial value. This study employs a qualitative approach with a case study design, involving 15 informants comprising micro-entrepreneurs, village officials, community leaders, youth groups, and community facilitators. Data were collected through in-depth interviews, observations, and document reviews, and analyzed using the interactive model of Miles and Huberman. The research findings revealed six main themes: utilization of agricultural and fishery waste, reuse of inorganic materials, community collaboration, environmental education, regulatory support, and institutional challenges. The results show that circular economy practices in Bone evolve through, supported by local institutions and cultural values of cooperation. These practices diversify income, raise environmental awareness, and create a more inclusive social ecosystem, though challenges remain in digital marketing and institutional capacity. The study highlights the importance of multi-stakeholder collaboration and adaptive policy support to sustain the circular economy at the local level and demonstrates its potential as a replicable model for other rural areas in Indonesia.

**Keywords:** Circular Economy; Social Innovation; Local Community; Waste Management; Rural Development

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## INTRODUCTION

Indonesia faces serious challenges in realizing a sustainable economic system amid threats of environmental crises, increasing waste volumes, and social inequality (Abbassy et al., 2024; Arifin et al., 2024). Data from the Ministry of Environment and Forestry in 2023 shows that Indonesia produces around 3.2 million tons of waste annually (Arisman & Fatimah, 2023; Yuniar & Ginting, 2024), with more than 60% coming from residential areas and only 13% being recycled (Ratnasari & Aschemann, 2024; Ummamah et al., 2024; Wikurendra et al., 2024). This situation highlights the low utilization of household, agricultural, and fisheries waste as productive resources, particularly in rural areas (García-Quevedo et al., 2020; Marrucci et al., 2021). The concept of a circular economy has emerged as a strategic approach to address these issues, based on waste reduction, reuse, and recycling of resources within a sustainable cycle (Mandpe et al., 2023; Oliveira et al., 2021). Rural areas like Bone Regency are critical loci for circular economy research, since rural waste streams are often overlooked in national strategies.

Bone Regency in South Sulawesi serves as a concrete example of these challenges. As an area with high agricultural, fisheries, and household activities, Bone generates significant amounts of organic and inorganic waste, averaging 350 tons daily (Ismail & Marhati, 2024). However, most of this waste is not managed productively. In contrast, local community initiatives that process waste into compost, crafts, or recycled products remain sporadic and have not been integrated into a systematic circular economy framework. Yet, this sector holds great potential to drive social innovation and create new economic opportunities for local communities. This part highlights the direct connection between local community practices and broader circular economy frameworks, clarifying the local-to-global significance.

Previous research has primarily focused on the circular economy in the context of large industries or macro-level studies on the green economy (Ghazanfari, 2023; Johannes, 2024; Rifal et al., 2024; Stankevičienė, 2020; Van Bueren et al., 2021), while studies delving into the role of communities, social innovation, and local institutions remain limited (Dagilienė et al., 2021; Deniz, 2021; Marchesi & Tweed, 2021). However, rural communities have unique dynamics that require a different approach from formal industrial models. This gap motivates this study to analyze circular economy practices at the local community level, while examining the social innovations and institutional roles that support them. This explicitly identifies the research gap—lack of studies on community-driven circular economy in rural Indonesia—and positions this study to fill that gap.

This study uses a community-based circular economy development framework that emphasizes optimizing local resources, citizen-based social innovation, and institutional governance for sustainability (Choudhary et al., 2021; Ede, 2021; Vragoteris & Gritzas, 2024). This approach is considered relevant for understanding how communities in Bone can transform waste into new economic resources while strengthening social solidarity and environmental awareness. The main questions addressed in this study are (1) in what ways do community-based practices in Bone contribute to circular economy development, and (2) how do social innovations and institutional supports interact to sustain these practices?

This study offers novelty by integrating analysis of circular practices, social innovation, and institutional roles in a rural context that has been largely unexplored, thereby potentially contributing conceptual and practical insights for formulating circular economy development strategies at the local level. The novelty lies both in the conceptual contribution—linking circular economy with social innovation and institutions in rural settings—and in the practical contribution—policy strategies for replication in similar regions.

## RESEARCH METHODS

This study uses a qualitative approach with a case study design (Yin, 2018) to gain an in-depth understanding of implementing circular economy practices and their contribution to social innovation and the strengthening of local communities. A qualitative approach was chosen because it enables exploration of complex social phenomena, including actor interactions, institutional dynamics, and socio-economic transformations, which are not easily captured through quantitative surveys. The case study design focuses on communities in Mare Subdistrict,

Bone Regency, which were selected due to their unique characteristics: they have agricultural, fishing, and household activities with significant waste production, as well as the existence of local initiatives that have started independent recycling practices but have not yet been integrated into a systematic circular economy framework. This purposive site selection strengthens contextual depth and ensures the study reflects rural realities of waste management and community innovation.

Informants were selected purposively to ensure their direct involvement in circular economy practices, either as waste-based micro-entrepreneurs, village institutional managers, or community facilitators. A total of 15 informants were interviewed: six micro-enterprise operators in waste processing, three representatives from the village government and relevant agencies (environment and cooperatives), four local community leaders, and two community facilitators or partner institutions. This composition ensured variation in perspectives across economic actors, governance institutions, and civil society groups, thereby capturing multi-stakeholder dynamics. The selection of informants considered the diversity of their roles and experiences in managing waste and creating community-based social innovations.

Data collection was conducted using three complementary techniques. First, field observations were used to directly observe waste management practices, recycling processes, and community involvement in circular economy activities. These observations also recorded social interaction dynamics, division of roles among residents, and supporting infrastructure conditions. Second, in-depth interviews were conducted to explore actors' and stakeholders' perceptions, motivations, challenges, and strategies in developing circular economy practices. The interview guide was developed based on literature review results and initial findings from preliminary observations, ensuring flexibility while remaining focused on the research objectives. Third, document studies were conducted on village policies, environmental management program reports, waste-based SME data, and relevant regional development planning documents to complement the understanding of structural support for circular economy practices. The integration of these three techniques strengthened data triangulation and increased reliability.

The collected data were analyzed using Miles and Huberman's (2019) interactive model, which involves three main stages: data reduction, data presentation, and conclusion drawing and verification. In the data reduction stage, information from interviews, observations, and documents was sorted to identify patterns, themes, and categories relevant to the research focus. Data presentation is carried out through thematic narratives and visual matrices that map the interrelationships between circular practices, social innovation, and the role of local institutions. Conclusions are then drawn through an iterative process involving researcher reflection and verification with key informants (member checking) to ensure the accuracy of interpretations and enhance the validity of findings. This iterative process was essential to minimize researcher bias and strengthen interpretative validity.

Data validity is ensured through both source and method triangulation techniques. Source triangulation is done by comparing the perspectives of various informant groups—business actors, village officials, community leaders, and community facilitators—while method triangulation combines the results of interviews, observations, and document analysis. These strategies ensured that findings were grounded, consistent across data sources, and reflective of real field conditions. The selected research location, Mare District, represents a rural context with waste-based economic potential but facing infrastructure and institutional challenges, so the findings of this study are expected to be relevant not only for Bone Regency but also for other coastal and rural areas in Indonesia with similar characteristics. Nevertheless, the case study design limits generalizability, and the focus on one district means the findings should be seen as context-specific but transferable to comparable rural settings.

## **RESULTS AND DISCUSSION**

### **Results**

#### ***Utilization of Agricultural and Fishery Waste***

Using agricultural and fishery waste has become one of the main circular economy practices developing in the local community of Mare Subdistrict, Bone Regency. People who previously

discarded or burned crop residues are now beginning to reuse them for other production needs, such as organic fertilizer and animal feed. This change has occurred due to increased environmental awareness and the desire to reduce production costs in agriculture and livestock farming. In addition to agricultural waste, fisheries waste, which was previously considered worthless, is now processed into fish meal for chicken feed, providing a new source of income for fishing communities. This initiative emerged from individual awareness and institutional support from the village, which offered simple facilities such as organic shredders and socialization on household waste sorting. This condition shows a shift in community practices from conventional waste disposal to more productive utilization. This finding resonates with rural-based circular economy literature showing that local resource reuse can trigger both cost efficiency and environmental benefits. The following views of informants reinforce this picture of change.

*"We used to burn rice straw, but now we collect it and turn it into organic fertilizer for our chili gardens. It saves us money on chemical fertilizers." (Micro-business owner)*

*"We ferment corn waste from the harvest to feed our goats, rather than throwing it away." (Local farmer)*

*"We collaborate with the fish auction to dry fish waste and turn it into fish meal for chicken feed." (Fishermen group member)*

*"The local government provided organic shredders, so kitchen waste can be turned into compost, although not all households are participating yet." (Village government representative)*

*"I see a big change. There used to be a random garbage dump, but now there is a separation of organic and inorganic waste." (Community facilitator)*

These findings indicate a transformation in collective behavior triggered by economic needs and environmental awareness. Using straw, corn waste, and fish scraps reflects the community's creative adaptation to available resources, marking the beginning of a new value chain in the local economy. The role of village institutions in providing facilities and socialization has accelerated the adoption of these practices, although implementation is not yet uniform across all households. This change in waste management patterns not only improves production cost efficiency but also has the potential to reduce environmental pollution and strengthen community food security. This dual outcome—economic and ecological—demonstrates the integrated benefits of circular economy approaches at the community level.

### **Reuse of Inorganic Goods**

Reusing inorganic goods is an essential innovation in circular economy practices in the research community. Items previously considered waste, such as plastic, cans, and used bottles, are now being recycled into products that have utility and market value. This activity reduces the volume of inorganic waste in the village environment and creates new economic opportunities for residents, particularly women and youth. Recycled products such as shopping bags, flower pots, and decorative lanterns are now part of the village's creative activities and even marketed through online networks. This phenomenon demonstrates that the community can integrate creativity, environmental awareness, and economic needs into a mutually supportive ecosystem.

The following informants' views provide a concrete picture of the transformation of inorganic reuse practices at the local level:

*"We separate the plastic from the market, wash the clean ones, and sew them into shopping bags." (MSME recycling actor)*

*"Residents use used milk cans as flower pots, and now they are even a trend at PKK events." (Housewife, Pattiro Village)*

*"Young people in the youth organization make lanterns from used plastic bottles." (Local youth)*

*"We joined an online community and sell creative products made from patchwork fabric. There are many buyers from Makassar." (Home-based entrepreneur)*

Interpretation of these findings reveals that reusing inorganic materials is a waste management solution and a medium for social innovation that strengthens community cohesion. These activities open up opportunities for cross-generational collaboration—women are active in

home crafts, young people develop decorative creations, and entrepreneurs utilize digital platforms for marketing. The economic value generated further motivates the community to continue producing creative products based on recycling, while also changing perceptions of previously considered worthless waste.

### **Community-Based Collaboration**

Community-based collaboration is one of the main drivers of the successful implementation of the circular economy in the research area. This practice is evident in how small groups of residents, which initially numbered only a few, could develop into a broader business network through the active participation of various elements of society. The roles of youth, women's groups, local educational institutions, and community facilitators complement each other in waste management and marketing of recycled products. This collaboration not only enhances the technical capacity of the community, such as production skills and digital promotion, but also expands market access through external networks like university students and pesantren partners. This process demonstrates that the socio-economic transformation occurring is not individualistic but the result of coordinated and sustainable collective interaction.

The following interview excerpts illustrate this collaborative dynamic:

*"It started with just three people, but now our recycling business group has 15 active members."*  
(Business group leader)

*"The youth organization plays a big role; they taught us how to promote recycled products through Facebook and WhatsApp."* (Local youth)

*"We also collaborate with local Islamic boarding schools, where students learn how to process organic waste."* (Community facilitator)

*"We started learning how to sell products online with the help of KKN students."* (Female group member)

The interpretation of these findings indicates that the success of circular economy practices in Bone is closely tied to the strength of social networks and cross-group collaboration. The involvement of youth groups and Islamic boarding schools has significantly contributed to knowledge transfer and the development of collective awareness about the importance of waste management. Collaboration with KKN students has opened opportunities for innovation in digital marketing, while the participation of women's groups has enriched the variety of products produced. This phenomenon indicates the formation of an inclusive and adaptive community-based circular economy ecosystem capable of growing beyond individual groups to broader social networks.

### **Environmental Education and Awareness**

Increased environmental awareness in the research community has occurred through formal programs and participatory approaches rooted in local culture. Educational activities are carried out in simple yet effective ways, such as community service, practice-based training, and the involvement of school children in creative recycling activities. These efforts have instilled a basic understanding of waste sorting and utilization from an early age, while also strengthening habits of maintaining environmental cleanliness. In addition, using simple visual media such as market posters and environmental messages inserted in village events helped reach a wider audience. The role of institutions such as the Environmental Agency, which provided training on making environmentally friendly products, such as eco-enzymes from fruit waste, strengthened the capacity of residents to process waste into valuable products. This approach shows that the success of environmental education lies in integrating direct practice and community-based communication.

This is illustrated in the following statements from informants:

*"The most effective education is through cooperation, while directly practicing waste sorting."*  
(Village official)

*"Elementary school children are involved in making crafts from used bottles, so they learn from an early age."* (Elementary school teacher)

*"We put up posters on how to sort waste at the market, which is quite helpful for traders."*  
(Market manager)

*"Training from the DLH taught us how to make eco-enzymes from fruit waste, which residents now use as household cleaners."* (Housewife)

*"When there are events, we usually include messages about protecting the environment, so residents are more receptive."* (Community leader)

The interpretation of these findings shows that environmental education in Bone is comprehensive and inclusive, involving various age groups and segments of society. Through collective activities, sustainability messages are better received because they align with existing social values, such as cooperation. The involvement of schoolchildren is a long-term investment in shaping a more environmentally conscious generation. At the same time, technical training provides practical skills for residents to process waste into value-added products. The integration of environmental messages into routine village activities demonstrates an adaptive approach that is not coercive, making it easier for the wider community to accept.

### **Regulatory Support and Facilitation**

Regulatory support and facilitation are crucial in strengthening the research community's circular economy practices. Village-level policies such as prohibiting littering in rivers have proven effective in encouraging behavioral change among residents and providing a legal framework for waste management activities. In addition to regulations, local institutions such as Village-Owned Enterprises (BUMDes) are significant in integrating recycled products into broader market chains, including distribution to the city center of Bone. Additional facilitation is provided through temporary storage facilities for inorganic waste ready for sale to collectors, making it easier for residents to manage recycled products collectively. Collaboration with universities adds an innovative dimension, particularly in improving product design to make it more visually appealing and competitive. The combination of strict regulations, village institutional support, and academic collaboration demonstrates a maturing ecosystem to support the sustainability of circular economy practices at the local level.

The following interview excerpts clarify the dynamics of regulatory support and facilitation:

*"Village regulations prohibiting the disposal of waste into rivers have greatly helped change residents' behavior."* (Traditional leader)

*"BUMDes collects residents' recycled products and helps market them to the city of Bone."*  
(BUMDes manager)

*"We facilitate temporary storage for inorganic waste that will be sold to collectors."* (Village official)

*"Cooperation with universities helps us create more attractive product designs."* (Community facilitator)

Interpretation of these findings shows that the existing regulatory and facilitation framework has created an institutional foundation supporting collective and sustainable waste management. The ban on dumping waste into rivers has reduced pollution and strengthened new, more environmentally friendly social norms. The involvement of BUMDes in product marketing opens up broader economic access for residents. At the same time, university support brings an element of design innovation that strengthens the competitiveness of recycled products in the market. Thus, the synergy between village policies, local economic institutions, and external partners is a key factor in strengthening the circular economy ecosystem in this community.

### **Institutional Challenges and Expectations**

Institutional challenges are one of the factors affecting the sustainability of circular economy practices in the research community. Although collaboration and local regulations are in place, the community's limited capacity in business management, digital marketing, and long-term mentoring remains a significant obstacle. Many residents are not yet accustomed to using the internet to market recycled products, so the market reach is still limited to the local area. Additionally, business groups require enhanced managerial capacity to become self-reliant without constant external assistance. Community expectations for sustained mentoring and

program integration at the district level have also emerged to ensure that circular economy initiatives deliver broader and more sustainable benefits for the community.

The following views of informants provide an in-depth picture of these challenges and expectations:

*"Online marketing is still limited because many residents are not familiar with the internet."*  
(Young entrepreneur)

*"We hope there will be business management training so that this group can become independent."* (Recycling group leader)

*"We need continuous assistance, not just one-time training and then abandoned."* (Community leader)

*"We hope that there will be integration into district programs so that the results can be more beneficial."* (Village government representative)

Interpretation of these findings reveals that the sustainability of circular economy practices requires institutional support that is not only technical but also strategic. Low digital marketing capacity is an obstacle to expanding the market network for recycled products, while the lack of continuous assistance has the potential to hamper local institutional capacity building. Community expectations for program integration at the district level reflect an awareness that cross-level government support is crucial to expanding the socio-economic impact of these initiatives. This underscores the need for adaptive and collaborative institutional capacity-building policies grounded in communities' real needs.

## **Discussion**

This study highlights the dynamics of circular economy implementation in driving social and economic innovation in the local community of Bone Regency, South Sulawesi. Key findings indicate that changes in community behavior in waste management, particularly agricultural and fisheries waste, play a significant role in the transition toward sustainable practices that integrate economic needs and environmental awareness. These changes are in line with the concept of a circular economy, defined as a regenerative economic model that focuses on waste reduction, material reuse, and the creation of added value from existing resources (Kirchherr et al., 2017; Stankevičienė, 2020). Practices such as using straw for organic fertilizer, corn waste fermentation for animal feed, and fish waste processing into chicken feed flour reflect the application of circular principles in a rural context. This supports the findings of Marrucci et al. (2021), who found that circular economy practices in rural areas tend to develop from individual initiatives that are later integrated into community networks.

The application of circular concepts in Bone also demonstrates a strong dimension of social innovation, particularly in reusing inorganic materials. Creative products such as shopping bags made from used plastic, flower pots from cans, and lanterns from plastic bottles reduce waste accumulation and serve as additional income sources. This transformation reflects a shift in community perceptions of waste, from a burden to a valuable resource. This phenomenon aligns with the findings of Arisman & Fatimah (2023) and Ismail & Marhati (2024), which highlight the role of social innovation in driving community participation and building a new identity rooted in sustainability. The involvement of multiple generations—women active in home crafts, young people utilizing digital platforms, and homemakers marketing products at PKK events—demonstrates inclusivity in the innovation process. However, this dynamic also indicates challenges related to product quality and market access, which require technical and managerial capacity improvements, as Dagilienė et al. (2021) highlighted.

Community-based collaboration has emerged as one of the main drivers of the successful implementation of the circular economy in Bone. Research findings show that small recycling business groups have grown through social networks involving youth organizations, Islamic boarding schools, women's groups, and support from university students participating in community service programs. This collaboration facilitates knowledge transfer regarding waste processing techniques, digital marketing, and product design. This social network constellation aligns with the quadruple helix approach (Abbassy et al., 2024; Arifin et al., 2024), which emphasizes collaboration between communities, government, academia, and the private sector as a prerequisite for sustainable innovation. In the context of Bone, the role of communities and local

institutions is dominant. In contrast, support from universities and local governments remains limited but holds promise for expanding the impact in the future. This contrasts with the study by Van Bueren et al. (2021), which highlights the dominance of top-down interventions in implementing the circular economy in large industrial sectors; in Bone, initiatives develop organically from the bottom up (bottom-up).

The increased environmental awareness observed through community-driven activities, educational posters, and the involvement of elementary school children constitutes another critical dimension in this discussion. Practical, hands-on education has proven more effective than formal approaches, fostering new habits and norms aligned with local cultural contexts. Ede (2021) found that community-based environmental education can enhance the sustainability of community behavior more effectively than government-led formal education programs. The involvement of schoolchildren in recycling activities, such as making crafts from used bottles, is a long-term investment in shaping a more environmentally conscious generation. Integrating sustainability messages into village social activities, such as religious events or local festivals, also aligns with the findings of Choudhary et al. (2021), highlighting the importance of leveraging cultural momentum to reinforce sustainability messages.

Regulatory support and facilitation from local institutions, such as village regulations prohibiting littering in rivers and the role of BUMDes in marketing recycled products, are essential foundations for the sustainability of the circular economy in Bone. These regulations provide legal legitimacy and reinforce new social norms in the community. This aligns with the institutional work concept described by Lawrence et al. (2011), in which local institutions shape and maintain social practices through a combination of formal rules and informal norms. BUMDes bridges the community and the market, facilitating access to recycled products in Bone. Additionally, collaboration with universities in product design demonstrates that innovation does not originate solely from the community but from interactions with external actors who bring new knowledge. This supports the findings of Ghazanfari (2023), who emphasize the importance of cross-actor networks in fostering sustainable innovation.

Despite various advances, this study also highlights institutional challenges that hinder the optimization of the circular economy. Low digital marketing capacity, dependence on external assistance, and limited long-term mentoring are recurring interview obstacles. Community expectations for program integration at the district level indicate awareness that the sustainability of initiatives requires support across government levels. This phenomenon confirms the findings of Deniz (2021) and García-Quevedo et al. (2020), who stated that coordination gaps between policy levels often hinder the scale of circular economy implementation. In the context of Bone, despite progressive village policies, complete success still requires support from district or provincial policies that can provide adequate resources, training, and infrastructure.

Compared to circular economy studies in other regions, this research's findings present similarities and interesting differences. Similar to the study by Mandpe et al. (2023) and Marchesi & Tweed (2021), community integration in waste management yields positive economic and social impacts while enhancing environmental awareness. However, unlike the Vietnamese model, which receives strong support from the private sector, Bone initiatives are primarily driven by the community with relatively limited support from local institutions. This provides a lesson that while external support is essential, the social capital of communities can be a practical starting point for initiating sustainable circular practices in rural areas. Theoretically, these findings enrich the literature on community-based circular economies by adding a social and institutional innovation dimension in the Indonesian rural context.

The practical implications of this study are highly relevant for formulating policies and programs for circular economic development at the local level. First, there is a need to strengthen community capacity through training in business management, digital marketing, and product design to enable circular practices to evolve into sustainable businesses. Second, village and district governments must expand regulatory support and infrastructure, including adequate waste processing facilities and transportation systems to distribute recycled products. Third, collaboration with academics and the private sector should be facilitated to bring technological innovations and broader market access. Fourth, educational strategies need to be expanded to

schools and indigenous communities to strengthen environmental awareness across generations. With multi-level policy integration and strengthened social networks, the community-based circular economy model found in Bone can be replicated in other rural areas in Indonesia that are facing similar challenges.

Overall, this discussion shows that circular economy practices in Bone serve as a technical solution for waste management and as a catalyst for social and economic transformation in the community. With substantial social capital, creative innovation, and local institutional support, the Bone community has successfully built an adaptive and inclusive ecosystem. However, long-term sustainability still requires consistent policy support, access to technology, and institutional capacity building to ensure that the benefits of the circular economy are felt equitably and sustainably.

## **CONCLUSION**

This study shows that implementing a circular economy in the local community of Bone Regency not only functions as a waste management strategy but also as a driver of social innovation and economic empowerment for coastal communities. The utilization of agricultural and fisheries waste for organic fertilizer, animal feed, and fish flour, as well as the reuse of inorganic materials into creative, marketable products, has formed a new economic ecosystem rooted in local resources. Community involvement through cross-group collaboration—youth, women, Islamic boarding schools, youth organizations, and support from community service students—demonstrates the characteristic bottom-up dynamics of rural development. Environmental education rooted in cooperation, practical training, and integrating sustainability messages into social activities strengthens community awareness and encourages collective behavioral change. Village regulations, BUMDes facilitation, and collaboration with universities form an essential institutional foundation for the sustainability of these practices. However, challenges remain regarding managerial capacity, digital marketing limitations, and the need for ongoing support. Taken together, these findings demonstrate that community-based circular economy practices represent both a technical solution to waste management and a catalyst for inclusive rural transformation.

Theoretically, this study contributes by linking circular economy practices with social innovation and local institutional roles in a rural Indonesian context, an area underexplored in existing literature. Practically, it provides lessons for policymakers and practitioners on how to strengthen community initiatives through multi-stakeholder collaboration, regulatory facilitation, and capacity-building programs.

Several limitations of this study should be noted. First, the research was conducted in a specific study area, so the findings cannot be generalized to other rural contexts with different social and economic conditions. Second, the qualitative approach allows for in-depth understanding but cannot measure quantitative impacts, such as increases in household income or measurable reductions in waste volume. Third, the study was conducted during a specific period following the program's initiation, so it does not capture long-term dynamics, including sustainability challenges and potential for replication at scale. Fourth, the perspective of consumers or external markets was not explored, even though understanding consumer preferences is crucial for developing more competitive recycled products. These limitations indicate that while the study offers depth of understanding, its transferability remains bounded to contexts with similar socio-cultural and institutional settings.

Future research is recommended to expand the scope of the study area to allow for comparisons between other coastal and rural areas in Indonesia. A mixed methods approach can combine qualitative and quantitative data, providing a more comprehensive picture of circular economy practices' socio-economic and environmental impacts. Subsequent research is also vital to explore consumer and market supply chain perspectives, so that marketing strategies for recycled products can be designed more effectively. In addition, cross-level policy analysis—from the village, district, and provincial levels—can also help formulate adaptive and sustainable circular economy governance models. Integrating digital technologies such as local e-commerce and waste chain mapping applications is also an interesting area to explore as future innovations.

By pursuing these directions, further research can strengthen the conceptual framework of community-based circular economy and enhance its practical applicability for replication across diverse rural settings.

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