Santhet: Jurnal Sejarah, Pendidikan Dan Humaniora
Vol. 9, No.4 Agustus 2025
Available online at https://ejournal.unibabwi.ac.id/index.php/santhet DOI:10.36526/js.v3i2.5845

Research Article e-ISSN: 2541-6130 p-ISSN: 2541-2523

# CIRCULAR ECONOMY-BASED WASTE MANAGEMENT IN TOMOHON CITY: TOWARD A GREEN ECONOMY THROUGH INNOVATIVE AND PARTICIPATORY APPROACHES

**Elsje Hanna Lintong[1]*, Deisy Agnes Pertiwi Juita Pangkey[2], Hendry C.M. Runtuwene[3]**

[123]Universitas Kristen Indonesia Tomohon

[1] elsjelintongels@gmail.com
[2]juitadeisy@gmail.com
[3]hendrymc17@gmail.com

(*)Corresponding Author
elsjelintongels@gmail.com

**How to Cite: Elsje Hanna Lintong**. (2025). Circular Economy-Based Waste Management In Tomohon City: Toward A Green Economy Through Innovative And Participatory Approaches doi: **10.36526/js.v3i2.5845**

Received : 08-06-2025
Revised : 05-08-2025
**Accepted: 06-08-2025**

**Keywords:**
Circular Economy, Green Economy, Sustainable Development, Waste Management, MSMEs

**Abstract**
This study aims to identify the potential for implementing a circular economy in waste management in Tomohon City as an effort to support the transition toward a green economy. A descriptive qualitative approach was employed, using field observation, in-depth interviews with environmental and economic actors, and policy document analysis. The research was conducted in strategic locations such as the Final Disposal Site (TPA), traditional markets, waste banks, and tourist destinations that serve as centers of community activity and tourism. Findings show that the current waste management system in Tomohon still follows a linear model, resulting in significant environmental pressures. However, local initiatives such as plastic recycling by MSMEs, organic composting, and active participation in waste banks provide early indications of successful circular practices. Nevertheless, scalability and integration of these models into the regional economy remain limited due to infrastructure constraints, technical capacity, and weak policy coordination. Based on these findings, recommendations include the need for investment in waste processing infrastructure, institutional strengthening of waste banks, formulation of local policies oriented toward circular economy principles, and increased community participation through education and economic incentives. With the implementation of these recommendations, Tomohon has the potential to become a model for sustainable waste management based on the circular economy in Indonesia's mountainous urban regions.

## Background

Urban population growth in Indonesia has significantly increased waste volume, one of which occurs in Tomohon City as an urban area in North Sulawesi. This issue has become more complex due to suboptimal waste management systems and minimal community participation in recycling and waste processing (Brotosusilo et al., 2020; Subri et al., 2025; Tarigan et al., 2020). In addition, modern consumption patterns that tend to increase plastic waste production have become a distinct challenge for sustainable waste management efforts (Glavič, 2021; Idumah & Nwuzor, 2019; Macheca et al., 2024; Mihai et al., 2021). This problem is exacerbated by limited collection and processing infrastructure unevenly distributed across the city. Locally, Tomohon faces similar challenges in maintaining environmental cleanliness while ensuring that waste management does not negatively impact tourism sites that are characteristic of the region. Therefore, an innovative approach is required to transform the perspective of waste management from being merely a problem into a high-value economic resource. One strategic alternative identified is the implementation of circular economy principles to support the transition toward a green economy in urban areas such as Tomohon. This approach aims not only to reduce environmental burdens but also to generate economic added value through the reuse of waste materials (Berezyuk et al., 2019; Caro et al., 2024; Russell & Nasr, 2023; Schützenhofer et al., 2022).

Santhet: Jurnal Sejarah, Pendidikan Dan Humaniora
Vol. 9, No.4 Agustus 2025
Available online at https://ejournal.unibabwi.ac.id/index.php/santhet DOI:10.36526/js.v3i2.5845
Research Article e-ISSN: 2541-6130 p-ISSN: 2541-2523

Tomohon City has a unique geographical character with hilly terrain and small rivers that are vulnerable to pollution if waste is not managed properly. The linear waste management pattern—from production to disposal—has contributed to declining environmental quality and increased risks of non-natural disasters such as floods and landslides. Additionally, low public awareness regarding the importance of source-based waste sorting is a key factor contributing to the high accumulation of organic and inorganic waste at final disposal sites (TPA) (Cheela et al., 2021; Muliarta, 2023; Singer et al., 2019). This condition highlights the need for a cultural transformation and a more collaborative and participatory waste management system. Local initiatives such as waste banks and organic composting have begun to be implemented, though scalability and integration of these models with the local economy remain limited (Blanchard et al., 2023; Dirks, 2021; Gibovic & Bikfalvi, 2024; Mihai et al., 2023). Meanwhile, the economic potential of household waste, traditional markets, and the tourism sector has not been fully optimized. The circular economy model is considered a holistic solution that not only addresses environmental issues but also provides long-term economic benefits to urban communities. Thus, the development of a circular economy-based waste management framework in Tomohon must be supported by empirical data and multidimensional analysis of implementation opportunities and constraints.

Global climate change has placed sustainability as a priority within national and regional development agendas (Alves et al., 2020; Ermolina et al., 2021; Salvia et al., 2019; Tan et al., 2021). Cities in Indonesia, including Tomohon, are expected to adapt to stricter environmental management standards to support low-carbon emission targets. In this context, the circular economy is established as an important mechanism to achieve these goals through efficient resource use and waste reduction. Implementation of the circular economy in the urban waste sector has shown positive results in several regions, such as Surabaya and Bandung, where landfill burdens have been reduced while generating new job opportunities (Rahmasary et al., 2020; Wikurendra, 2022, 2025; Wikurendra et al., 2024). However, adoption of similar models in eastern Indonesia, particularly in Sulawesi, remains limited due to technological capacity constraints, policy support, and local actor participation. Human and natural resource potentials in Tomohon indicate that the region possesses sufficient social and environmental capital to promote circular economy initiatives. Nevertheless, lack of coordination among government institutions, private actors, and the community remains a major obstacle in developing innovative waste management models. Therefore, this research aims to provide evidence-based recommendations on how the circular economy can be effectively applied in Tomohon City as part of a sustainable development strategy.

Several studies have identified the potential of the circular economy in reducing environmental pressures caused by increasing urban waste (Boelee et al., 2019; Zhang et al., 2021). This concept has been implemented in various waste management schemes, including organic composting, plastic recycling, and the development of high-value recycled products. At the regional level, large cities such as Jakarta and Medan have adopted this approach to improve waste management efficiency while creating new business opportunities (Safri, 2024; Utami et al., 2021). Research in West Java has demonstrated that the application of the circular economy in the waste sector can increase income for micro, small, and medium enterprises (MSMEs) by up to 30% (Wikurendra, 2022). A study in Surabaya proved that digital-based waste bank programs successfully enhance citizen participation and improve waste distribution efficiency. Internationally, countries such as the Netherlands and Sweden have successfully integrated the circular economy into national policies aimed at achieving zero waste growth (Chioatto & Sospiro, 2023; Ogunmakinde, 2019; Roleders et al., 2022). Research by Blomberg at al., emphasizes the importance of multi-stakeholder collaboration in promoting the adoption of the circular economy in urban areas (Blomberg et al., 2023). However, implementation in developing regions remains constrained by regulatory limitations, economic incentives, and public awareness.

In North Sulawesi, several circular economy-based waste management initiatives have emerged, although they have not yet been systematically coordinated. Waste bank programs in Manado have provided an initial indication of the potential for community economic empowerment

Santhet: Jurnal Sejarah, Pendidikan Dan Humaniora
Vol. 9, No.4 Agustus 2025
Available online at https://ejournal.unibabwi.ac.id/index.php/santhet DOI:10.36526/js.v3i2.5845
Research Article e-ISSN: 2541-6130 p-ISSN: 2541-2523

through waste utilization. However, limited access to technology and low human resource capacity remain major obstacles in developing more inclusive and sustainable models. Educational institutions play a vital role in promoting awareness and skills related to the circular economy among young generations. University participation in developing recycling laboratories has also made a tangible contribution to campus waste reduction. Collaboration between local governments and non-governmental organizations has proven to be an effective strategy for expanding community-based waste management services (Abiddin et al., 2022; Arantes et al., 2020; Kalra, 2019; Xie et al., 2022). A study by Maitimu et al. (2021) recommends the decentralization of policies so that each city in Sulawesi can develop waste management models suited to its local potential (Alfian, 2020; Kubota et al., 2020). Nonetheless, research specifically on the application of the circular economy in Tomohon remains very limited, highlighting an important gap that needs to be addressed.

Previous studies have contributed significantly to understanding the concept of the circular economy at both national and regional levels; however, specific studies on its implementation in Tomohon City remain scarce. Most existing research focuses primarily on major cities in Java and Sumatra, leaving the potential and challenges in eastern Indonesia, particularly North Sulawesi, inadequately documented. Moreover, the approaches used are generally descriptive or evaluative without offering adaptive and contextual implementation models tailored to mountainous urban areas like Tomohon. Limitations in primary data and insufficient participation of local actors in policy formulation hinder the development of inclusive frameworks. Studies exploring the relationship between the circular economy, green economy, and sustainable development at the local level are also limited. This results in a lack of references that can serve as a basis for planning and decision-making by local governments. Therefore, more in-depth research is needed to address this gap. The findings of this study are expected to serve as a foundation for developing more innovative and sustainable waste management policies in Tomohon City.

This study is distinctive in its approach, integrating spatial analysis, circular economy, and green economy concepts within the context of urban waste management in mountainous regions. Unlike previous research that primarily focused on technical or macroeconomic aspects, this study emphasizes the importance of local and participatory dimensions in designing waste management strategies. Furthermore, it will produce a framework tailored to the social, cultural, and environmental conditions of Tomohon City, known for its agrarian and tourism characteristics. The methodological approach employed offers a more holistic understanding of the opportunities and challenges associated with implementing the circular economy. Another innovation involves the development of locally applicable performance indicators to evaluate the effectiveness of the proposed model. The outcomes of this research will also be presented as operational and easily understood policy recommendations for local decision-makers. It is anticipated that this approach will serve as a reference for other cities in Indonesia with similar geographic and economic characteristics. Overall, this study will contribute new scientific insights to the literature on circular economy-based waste management in mountainous urban areas.

The purpose of this research is to identify the potential and constraints of implementing a circular economy in waste management within Tomohon City. Additionally, the study aims to design a waste management model based on circular economy principles that align with the local context of Tomohon. Another objective is to assess the economic, environmental, and social impacts of the proposed model. The study also seeks to provide policy recommendations to local governments in support of the transition toward a green economy. The analysis will encompass technical, institutional, and participatory aspects of model implementation. It is expected that the findings will form the basis for developing guidelines for sustainable waste management at the local level. Furthermore, this research aims to enrich academic literature on the circular economy in mountainous urban regions. Practically, the study is intended to directly benefit the community by raising awareness and encouraging greater participation in waste management practices.

This research provides significant implications at both theoretical and practical levels, particularly in the development of circular economy-based waste management policies in

Santhet: Jurnal Sejarah, Pendidikan Dan Humaniora
Vol. 9, No.4 Agustus 2025
Available online at https://ejournal.unibabwi.ac.id/index.php/santhet DOI:10.36526/js.v3i2.5845
Research Article e-ISSN: 2541-6130 p-ISSN: 2541-2523

mountainous urban areas such as Tomohon. Theoretically, the findings are expected to enrich academic literature on the application of the circular economy within a unique geographical and socio-cultural context, contributing to the development of localized green economy concepts. At the practical level, the designed waste management model can serve as a reference for local governments in formulating waste reduction strategies while generating economic added value through more efficient resource utilization. Additional implications include expanding community participation in waste management through the strengthening of MSME groups, waste bank operators, and environmental stakeholders. Moreover, the study provides recommendations for enhancing synergy among governmental institutions, the private sector, and educational institutions in promoting sustainable innovation. Consequently, the findings of this research are directed toward supporting the achievement of sustainable development goals (SDGs), particularly those concerning sustainable cities and communities (SDG 11) and climate action (SDG 13).

## METHOD

This study will be conducted using a descriptive qualitative approach to gain an in-depth understanding of the implementation of the circular economy in waste management in Tomohon City. This approach is chosen as it enables a contextual and holistic examination of the social, institutional, and economic phenomena related to urban waste systems. Data collection will be carried out through multiple primary techniques, including in-depth interviews with relevant stakeholders such as local government representatives, MSME actors, waste bank operators, and environmental activists. In addition, direct observation will be conducted at strategic locations such as final disposal sites (TPA), recycling centers, and traditional markets to obtain firsthand data on existing waste management practices. Document analysis will also be performed to assess local policies, spatial planning documents, and environmental programs that are relevant to the research context.

Data analysis will be carried out systematically through stages including data reduction, data presentation, and verification of findings, based on the conceptual framework of the circular economy. Thematic analysis will be applied to identify patterns, issues, and factors that support or hinder the implementation of the circular economy model at the local level. The validity of findings will be enhanced through triangulation, comparing information obtained from various sources such as interview results, field observations, and policy documents. As such, the findings are expected to provide evidence-based recommendations for the development of sustainable waste management policies in Tomohon City, and serve as a reference for the application of green economy principles in other mountainous urban areas across Indonesia.

## RESULT AND DISCUSSION

### *RESULT*

1. Identification of Economic Potential from Waste in the MSME and Waste Bank Sectors

Field observations indicate that the waste management system in Tomohon still follows a linear approach: production–consumption–disposal. Waste is collected from its source and directly transported to the Final Disposal Site (TPA) without undergoing significant recycling processes. Interviews with sanitation officers revealed that the current capacity of the TPA is nearly saturated, necessitating alternative solutions to reduce waste volume. Some organic composting initiatives have been implemented by community groups in residential areas, although on a small scale. Observational findings show that traditional markets in Tomohon generate high volumes of organic waste, which has potential as raw material for compost fertilizer. Interviews with market traders suggest that awareness regarding waste segregation remains low, despite some business actors beginning to separate plastic and paper waste. These findings indicate an opportunity to apply circular economy principles by utilizing waste as an economic resource. Interviews with MSME actors in the recycling sector reveal that several micro-enterprise groups have begun using plastic waste as raw material for value-added products. Examples of such products include handicrafts. Although limited in number, these groups have provided economic benefits to their members in the form of

Santhet: Jurnal Sejarah, Pendidikan Dan Humaniora
Vol. 9, No.4 Agustus 2025
Available online at https://ejournal.unibabwi.ac.id/index.php/santhet DOI:10.36526/js.v3i2.5845
Research Article e-ISSN: 2541-6130 p-ISSN: 2541-2523

additional income. Recycling activities are generally carried out manually, without adequate technological support.

2. The Role of the Tourism Sector in Circular Economy-Based Waste Management

Observations at natural tourist destinations such as Pasar Tradisional Beriman indicate that waste management at these sites is not yet well-structured. Waste generated from tourist activities is often disposed of improperly or merely collected without sorting. Interviews with tourism site managers imply that there is currently no integrated waste management system linked to the local economy. However, some homestay operators and tourism businesses have started segregating organic waste for composting purposes. Additionally, several food and beverage entrepreneurs near tourist locations have begun selling plastic packaging waste to collectors. Field observations show that the potential of waste generated by the tourism sector is substantial but not yet optimally utilized. Data from the Department of Tourism in Tomohon indicates that tourist visits increase annually, leading to a corresponding rise in waste volume. These findings suggest that the tourism sector plays an important role in supporting the implementation of a circular economy if managed through more innovative approaches.

3. Condition of Waste Management Infrastructure and Technology in Tomohon City

Field findings reveal that waste management infrastructure in Tomohon remains limited and does not yet support the concept of a circular economy. The landfill located in Tara-Tara has only one unit for processing organic waste and lacks facilities for recycling inorganic waste. Waste collection infrastructure at the village level is unevenly distributed, with some areas lacking temporary waste disposal points (TPS). Interviews with sanitation officers indicate that the main constraints are limited transport equipment and waste collection fleets. Furthermore, the absence of government-managed recycling centers results in high-value recyclable materials such as plastics and metals being collected exclusively by private parties. These findings highlight the need for infrastructure and technological investments to support circular economy-based waste management. Without improvements in physical and technical capacity, the development of a circular economy in the waste sector will face significant barriers.Interviews with residents in several villages indicate that public awareness of waste segregation remains low.

A majority of respondents admitted to not knowing the economic benefits of recycling or composting. However, in certain areas such as Woloan and Kinilow Villages, there are active community groups involved in household waste management. These groups have established independent composting systems and sell the resulting compost as organic fertilizer to local farmers. Observational data show that the involvement of community leaders and youth plays a crucial role in encouraging citizen participation in waste management. Locals acknowledged the outreach programs conducted by the local government, although they reported that these programs are infrequent and unevenly distributed. A simple survey conducted during the research indicated that 60% of respondents were willing to participate in waste management if clear economic incentives were available. These findings suggest that increasing community participation requires more inclusive and sustainable strategies.

Document analysis shows that the Tomohon City Government has developed a Regional Action Plan (RAD) for waste management. However, the principles of the circular economy have not yet been explicitly incorporated into this document. Interviews with environmental officials indicate that the concept of the circular economy is increasingly recognized but has not yet been integrated into regional strategic planning. Several environmental programs, such as waste banks and composting initiatives, continue to operate in isolation without strong policy backing. Regulations concerning source-level waste separation have not been consistently implemented. Data from the Department of Environment in Tomohon indicate that inter-agency coordination remains weak, hindering cross-sectoral integration. Private sector participation in waste management is also suboptimal due to a lack of policy incentives. These findings suggest that the development of more inclusive and circular economy-oriented policies is essential to drive systemic change.

Santhet: Jurnal Sejarah, Pendidikan Dan Humaniora
Vol. 9, No.4 Agustus 2025
Available online at https://ejournal.unibabwi.ac.id/index.php/santhet DOI:10.36526/js.v3i2.5845
Research Article e-ISSN: 2541-6130 p-ISSN: 2541-2523

***Discussion***

**1. Discussion on the Economic Potential of Waste in the MSME and Waste Bank Sectors**

The findings indicate that the waste management system in Tomohon remains largely linear, with minimal emphasis on recycling or resource recovery. This approach has led to a growing reliance on landfilling, which is increasingly unsustainable due to limited space and environmental degradation. Interviews with sanitation officers confirm that the Final Disposal Site (TPA) is nearing full capacity, highlighting the urgency for alternative waste processing strategies. The absence of a structured recycling system exacerbates this issue, as valuable materials are lost rather than being reintegrated into the economic cycle. Despite these challenges, small-scale composting initiatives have emerged, particularly in residential areas, demonstrating early signs of community engagement. These efforts, although localized, suggest an existing willingness among some groups to participate in sustainable waste practices. However, the lack of institutional support limits their scalability and long-term impact. Therefore, integrating circular economy principles can help transform waste from a burden into a productive resource.

Observational data show that traditional markets in Tomohon generate significant amounts of organic waste, offering a promising feedstock for compost production. Market traders generally recognize the presence of waste but remain unaware of its potential economic value. Some actors have begun segregating plastic and paper waste, indicating initial awareness of material separation. Nonetheless, systemic implementation of waste segregation remains absent, resulting in low levels of recycling and reuse. The current scenario reflects a missed opportunity to leverage market-generated waste as a source of income and environmental improvement. If properly managed, organic waste could be converted into high-value compost, supporting local agriculture and reducing dependency on chemical fertilizers. Similarly, non-organic waste such as plastics could be redirected toward micro-enterprises engaged in upcycling activities. Thus, targeted interventions are needed to educate stakeholders about the economic benefits of waste valorization.

Interviews with MSME actors in the recycling sector reveal that several micro-enterprise groups have started utilizing plastic waste as raw material for handicrafts and other value-added products. These initiatives provide additional income to participants and contribute to local employment generation. However, the scale of these operations remains small due to limited access to technology and market linkages. Most recycling activities are conducted manually, lacking mechanization that could improve efficiency and output quality. The absence of formalized supply chains further restricts the ability of these enterprises to grow and integrate into broader markets. Moreover, inadequate policy support prevents these businesses from accessing financial assistance or technical training. As a result, the potential contribution of MSMEs to a circular economy remains underdeveloped. Strategic investment in infrastructure, skills development, and market access is therefore essential to unlock the full potential of this sector.

Community-based waste banks play a critical role in promoting resource recovery, yet their reach remains limited across Tomohon. While some villages have established functional waste banks, many others lack even basic facilities for waste sorting and collection. Interviews highlight that public participation in waste banking is often driven by individual initiative rather than systematic encouragement from local authorities. Limited awareness and inconsistent incentives reduce the effectiveness of these institutions in mobilizing community action. Additionally, the absence of standardized operating procedures leads to variability in performance and sustainability. Strengthening the institutional capacity of waste banks through better regulation and funding could enhance their contribution to the circular economy. Collaborative models involving schools, religious institutions, and local NGOs may also help expand their influence. Overall, improving the visibility and accessibility of waste banks is key to fostering widespread behavioral change.

Finally, the integration of informal recyclers and micro-enterprises into formal waste management systems presents both opportunities and challenges. On one hand, these actors demonstrate adaptability and innovation in converting waste into usable goods. On the other, they

Santhet: Jurnal Sejarah, Pendidikan Dan Humaniora
Vol. 9, No.4 Agustus 2025
Available online at https://ejournal.unibabwi.ac.id/index.php/santhet DOI:10.36526/js.v3i2.5845
Research Article e-ISSN: 2541-6130 p-ISSN: 2541-2523

often operate without legal recognition, making it difficult to access government programs or formal markets. Policy frameworks must evolve to accommodate and empower informal actors within the broader context of circular economy development. Establishing cooperatives or associations for informal recyclers could facilitate knowledge sharing and collective bargaining power. Furthermore, providing access to credit, insurance, and training would strengthen their resilience and competitiveness. Without inclusive policies, the potential of grassroots-level recycling remains fragmented and inefficient. Therefore, creating an enabling environment for all stakeholders is crucial to advancing a more integrated and sustainable waste management ecosystem.

2. Discussion on the Role of the Tourism Sector in Circular Economy-Based Waste Management

Field observations at natural tourist attractions such as Pasar Tradisional Beriman indicate that waste management practices are largely unstructured and reactive. Waste generated by tourists is frequently disposed of improperly or collected without any form of sorting, leading to increased pollution risks. Interviews with site managers confirm that no formal system exists to link tourism-related waste with local economic opportunities. This disconnect represents a missed chance to incorporate waste streams into value creation processes that benefit the community. Given the increasing number of visitors each year, the volume of waste generated is expected to rise, compounding existing environmental pressures. A proactive strategy is therefore necessary to manage tourism waste in a way that aligns with circular economy principles. Developing a framework for waste segregation and recycling within tourism zones could serve as a model for sustainable visitor management.

Some homestay operators and tourism businesses have independently adopted waste reduction practices, including composting organic waste and selling plastic packaging to collectors. These initiatives reflect a growing awareness among certain business owners regarding the importance of responsible waste handling. However, such efforts remain isolated and lack coordination with municipal waste services or broader policy frameworks. The absence of official guidelines or incentives discourages wider adoption of sustainable practices across the tourism industry. Observations indicate that while there is interest in environmentally friendly operations, the lack of support mechanisms hinders progress. Integrating waste management into tourism planning and certification schemes could encourage more consistent implementation. Partnerships between tourism boards, private operators, and environmental organizations may also help standardize best practices. Ultimately, transforming tourism waste into a resource requires strategic alignment between environmental goals and business interests.

Data from the Department of Tourism shows that visitor numbers in Tomohon have been rising steadily, contributing to higher volumes of solid waste. This trend underscores the need for adaptive waste management strategies that can scale alongside tourism growth. The current reliance on landfill disposal is not only environmentally unsustainable but also economically inefficient. Redirecting tourism-generated waste toward recycling and upcycling channels could create new revenue streams for local communities. For instance, food waste from restaurants and accommodations can be turned into compost for urban gardens or agricultural use. Plastic and glass waste, if sorted and processed, can become inputs for creative industries or construction materials. By embedding circular economy thinking into tourism development plans, the city can mitigate environmental damage while enhancing economic returns. A coordinated approach involving all tourism stakeholders is essential to achieve this transformation.

The involvement of tourism entrepreneurs in waste management remains voluntary and sporadic, with no mandatory requirement compelling them to adopt sustainable practices. Interviews with food and beverage operators near tourist sites reveal that while some are willing to participate, they often lack the necessary tools and guidance. The absence of clear regulatory mandates or financial incentives reduces motivation for compliance and innovation. In contrast, cities like Bali have implemented successful waste diversion programs by linking tourism businesses with waste processors and recyclers. Adopting similar strategies in Tomohon could yield positive outcomes,

Santhet: Jurnal Sejarah, Pendidikan Dan Humaniora
Vol. 9, No.4 Agustus 2025
Available online at https://ejournal.unibabwi.ac.id/index.php/santhet DOI:10.36526/js.v3i2.5845
Research Article e-ISSN: 2541-6130 p-ISSN: 2541-2523

particularly if supported by local leadership and cross-sector collaboration. Training programs and demonstration projects could also raise awareness and build capacity among tourism operators. Encouraging peer-to-peer learning and showcasing success stories may further accelerate the adoption of circular practices in the sector.

Finally, developing a circular economy model tailored to the tourism sector requires a multi-dimensional strategy that includes infrastructure development, stakeholder engagement, and policy reform. Establishing designated waste collection points at tourist locations, introducing eco-friendly procurement standards, and promoting green certifications are among the possible interventions. Public-private partnerships can play a pivotal role in financing and implementing these initiatives. Educational campaigns targeting tourists could also foster greater responsibility and cooperation in waste management efforts. By leveraging the economic potential of tourism waste, Tomohon can position itself as a model for sustainable tourism in Indonesia. A comprehensive and participatory approach will be essential to ensure that waste becomes a catalyst for environmental and economic regeneration rather than a liability.

3. Discussion on the Condition of Waste Management Infrastructure and Technology in Tomohon City

Field assessments reveal that the physical infrastructure for waste management in Tomohon remains underdeveloped and ill-suited to support a circular economy. The landfill located in Tara-Tara is equipped with only a single unit for processing organic waste and lacks facilities for inorganic recycling. This limitation severely constrains the city's ability to recover resources from waste streams. Additionally, village-level waste collection systems are unevenly distributed, with many areas lacking temporary disposal points (TPS). Interviews with sanitation officials emphasize that outdated equipment and insufficient vehicle fleets hinder effective waste transportation and processing. The absence of centralized recycling centers further exacerbates inefficiencies, leaving valuable materials to be collected informally by private parties. As a result, the potential for resource recovery remains largely untapped. Addressing these infrastructural gaps is essential to enable a transition toward a more sustainable and economically beneficial waste management system.

Technological limitations pose another major challenge in advancing circular economy practices in Tomohon. Recycling and composting activities are predominantly carried out using manual methods, with little access to modern processing technologies. The lack of appropriate machinery prevents the efficient conversion of waste into reusable or marketable products. Consequently, the economic value of waste is significantly diminished. Investments in appropriate technologies—such as compactors, shredders, and composting units—are urgently needed to enhance productivity and product quality. Local governments and private investors should explore partnerships to develop shared processing facilities accessible to multiple stakeholders. Such infrastructure could serve as hubs for waste aggregation, treatment, and distribution. Without technological upgrades, the scalability and profitability of circular initiatives will remain constrained. Prioritizing technology transfer and capacity building is thus critical to strengthening the technical foundation of waste-based economies.

Public awareness and behavioral patterns also play a decisive role in shaping waste management outcomes. Survey results indicate that a majority of respondents lack knowledge about the economic benefits of recycling or composting. While some community groups in Woloan and Kinilow Villages have successfully implemented independent composting systems, these cases remain exceptions rather than norms. Observational data confirm that active community participation is often linked to the presence of influential leaders or youth-driven initiatives. Government-led outreach programs have had limited reach and frequency, failing to instill widespread behavioral change. A simple survey conducted during the study revealed that 60% of respondents expressed willingness to engage in waste management if provided with clear economic incentives. This suggests that motivational factors such as income generation and cost savings are powerful drivers of participation. Tailored communication strategies and incentive-based programs can therefore play a vital role in expanding public engagement.

Santhet: Jurnal Sejarah, Pendidikan Dan Humaniora
Vol. 9, No.4 Agustus 2025
Available online at https://ejournal.unibabwi.ac.id/index.php/santhet DOI:10.36526/js.v3i2.5845
Research Article e-ISSN: 2541-6130 p-ISSN: 2541-2523

Policy and institutional frameworks in Tomohon currently do not fully support the adoption of circular economy principles in waste management. Document analysis shows that while the Regional Action Plan (RAD) outlines general waste management objectives, it does not explicitly integrate circular economy concepts. Environmental officials acknowledge growing awareness of these principles but note that strategic planning has yet to incorporate them comprehensively. Existing programs such as waste banks and composting initiatives operate in isolation, without strong regulatory backing or inter-agency coordination. The lack of enforceable regulations on source-level waste separation further undermines implementation efforts. Data from the Department of Environment indicate that weak inter-agency collaboration impedes the integration of waste management with economic development goals. Private sector involvement remains limited due to the absence of supportive policies and financial incentives. Revising policy instruments to include circular economy targets and mechanisms is therefore essential to drive systemic improvements.

To effectively promote a circular economy, Tomohon needs a more cohesive and inclusive policy environment that encourages collaboration among government, private actors, and civil society. Establishing a dedicated task force or coordinating body could help align efforts across sectors and agencies. Regulatory reforms should focus on mandating waste separation at the source, encouraging extended producer responsibility, and supporting local recycling enterprises. Financial incentives such as tax breaks, subsidies, and grants can motivate private sector participation and entrepreneurship in waste management. Capacity-building initiatives should target municipal staff, community leaders, and informal recyclers to enhance technical and managerial capabilities. Finally, integrating circular economy indicators into local development monitoring systems would allow for ongoing evaluation and adjustment of strategies. With sustained political commitment and multi-stakeholder engagement, Tomohon can overcome existing barriers and move toward a more resilient and resource-efficient future.

Recommendation

As a follow-up action, several key recommendations are proposed to support the implementation of a circular economy in waste management in Tomohon: Strengthening Institutional Capacity and Infrastructure: The local government of Tomohon needs to improve waste collection, sorting, and processing facilities at the village level by providing more Temporary Collection Points (TPS) and recycling centers. Investment in transport equipment and waste processing technologies will enhance overall efficiency and capacity in waste management. Integration of Circular Economy into Local Policies: Principles of the circular economy should be incorporated into regional planning documents such as the Regional Action Plan (RAD), Medium-Term Development Plan (RPJMD), and waste management regulations. Mandatory source-level waste separation standards must be introduced, along with incentives for businesses and citizens actively participating in recycling activities. Enhancing Community Participation: Awareness campaigns and educational outreach programs should be conducted regularly and intensively to increase public understanding of the economic and environmental benefits of the circular economy. A participatory approach involving community leaders, youth groups, and educational institutions can help expand the reach of these initiatives.

Development of Waste-Based Business Models: The local government, together with MSMEs and waste bank operators, should develop innovative recycling business models, such as producing recycled paving blocks, organic fertilizer from market waste, and handicraft products. Technical assistance and market access support should be provided to improve product competitiveness. Multi-Stakeholder Collaboration and Technological Innovation: Synergy between the government, universities, non-governmental organizations, and the private sector is necessary to develop recycling laboratories and innovation centers for waste management. This collaboration can drive technology transfer, skills training, and the development of digital solutions for waste handling. With the implementation of these recommendations, Tomohon City has the potential to become a model city in Indonesia for successfully implementing a circular economy in waste

Santhet: Jurnal Sejarah, Pendidikan Dan Humaniora
Vol. 9, No.4 Agustus 2025
Available online at https://ejournal.unibabwi.ac.id/index.php/santhet DOI:10.36526/js.v3i2.5845
Research Article e-ISSN: 2541-6130 p-ISSN: 2541-2523

management, while preserving environmental sustainability and enhancing inclusive community welfare.

## Conclusion

Based on the findings and discussion of the research, it can be concluded that the waste management system in Tomohon City is still dominated by a linear approach, which contributes to increasing pressure on the Final Disposal Site (TPA) and environmental risks such as floods and landslides. Public awareness regarding waste segregation and reuse remains low, although there are several active community groups in Woloan and Kinilow that have successfully implemented self-managed composting systems as an initial model of a circular economy. The economic potential from the MSME and waste bank sectors has begun to show positive indications through the use of recycled plastic in value-added products; however, scalability remains limited due to technological constraints and lack of policy support. The tourism sector also generates significant amounts of waste, but its management is not yet optimized to support the transition toward a green economy. Waste management infrastructure and technology in Tomohon are still inadequate to support the implementation of a circular economy, thus requiring significant investment to improve regional capacity. Local policies have not fully integrated the principles of the circular economy, resulting in fragmented waste management programs without strong inter-sectoral coordination. Therefore, a holistic strategy involving community participation, policy support, and technological innovation is needed to effectively implement the circular economy concept in Tomohon City.

## REFERENCES

Abiddin, N. Z., Ibrahim, I., & Abdul Aziz, S. A. (2022). Non-governmental organisations (NGOs) and their part towards sustainable community development. *Sustainability*, *14*(8), 4386.

Alfian, A. (2020). *The Impact of Decentralization on Integrated Watershed Management (IWM): A Case Study in the Wanggu Watershed, Southeast Sulawesi, Indonesia*. The Ohio State University.

Alves, F., Leal Filho, W., Casaleiro, P., Nagy, G. J., Diaz, H., Al-Amin, A. Q., de Andrade, J. B. S. O., Hurlbert, M., Farooq, H., & Klavins, M. (2020). Climate change policies and agendas: Facing implementation challenges and guiding responses. *Environmental Science & Policy*, *104*, 190–198.

Arantes, V., Zou, C., & Che, Y. (2020). Coping with waste: A government-NGO collaborative governance approach in Shanghai. *Journal of Environmental Management*, *259*, 109653.

Berezyuk, S., Tokarchuk, D., & Pryshliak, N. (2019). Economic and environmental benefits of using waste potential as a valuable secondary and energy resource. *Journal of Environmental Management and Tourism. 2019. Vol. X. Issue 1 (33). P. 149-160.*

Blanchard, C., Harris, P., Pocock, C., & McCabe, B. K. (2023). Food and garden organic waste management in Australia: Co-benefits for regional communities and local government. *Sustainability*, *15*(13), 9901.

Blomberg, A., Kujala, J., & Heikkinen, A. (2023). Multi-stakeholder networks in a circular economy transition: A typology of stakeholder relationships. In *Stakeholder engagement in a sustainable circular economy: Theoretical and practical perspectives* (pp. 133–164). Springer International Publishing Cham.

Boelee, E., Geerling, G., van der Zaan, B., Blauw, A., & Vethaak, A. D. (2019). Water and health: From environmental pressures to integrated responses. *Acta Tropica*, *193*, 217–226.

Brotosusilo, A., Nabila, S. H., Negoro, H. A., & Utari, D. (2020). The level of individual participation of community in implementing effective solid waste management

policies. *Global Journal of Environmental Science and Management*, *6*(3), 341–354.
Caro, D., Lodato, C., Damgaard, A., Cristóbal, J., Foster, G., Flachenecker, F., & Tonini, D. (2024). Environmental and socio-economic effects of construction and demolition waste recycling in the European Union. *Science of the Total Environment*, *908*, 168295.
Cheela, V. R. S., Goel, S., John, M., & Dubey, B. (2021). Characterization of municipal solid waste based on seasonal variations, source and socio-economic aspects. *Waste Disposal & Sustainable Energy*, *3*(4), 275–288.
Chioatto, E., & Sospiro, P. (2023). Transition from waste management to circular economy: the European Union roadmap. *Environment, Development and Sustainability*, *25*(1), 249–276.
Dirks, A. (2021). *A community compost exchange manual: Reconnecting municipal organic waste and soil management*.
Ermolina, M., Matveevskaya, A., & Baranuk, M. (2021). Climate change and the UN 2030 agenda for sustainable development. In *Proceedings of Topical Issues in International Political Geography* (pp. 226–237). Springer.
Gibovic, D., & Bikfalvi, A. (2024). Informing scalability for social innovation: Evidence from a recycling initiative. *Waste Management & Research*, 0734242X251345349.
Glavič, P. (2021). Evolution and current challenges of sustainable consumption and production. *Sustainability*, *13*(16), 9379.
Idumah, C. I., & Nwuzor, I. C. (2019). Novel trends in plastic waste management. *SN Applied Sciences*, *1*(11), 1402.
Kalra, N. (2019). Community participation and waste management. In *Sustainable Waste Management: Policies and Case Studies: 7th IconSWM—ISWMAW 2017, Volume 1* (pp. 115–123). Springer.
Kubota, R., Horita, M., & Tasaki, T. (2020). Integration of community-based waste bank programs with the municipal solid-waste-management policy in Makassar, Indonesia. *Journal of Material Cycles and Waste Management*, *22*(3), 928–937.
Macheca, A. D., Mutuma, B., Adalima, J. L., Midheme, E., Lúcas, L. H. M., Ochanda, V. K., & Mhlanga, S. D. (2024). Perspectives on plastic waste management: challenges and possible solutions to ensure its sustainable use. *Recycling*, *9*(5), 77.
Mihai, F.-C., Gündoğdu, S., Markley, L. A., Olivelli, A., Khan, F. R., Gwinnett, C., Gutberlet, J., Reyna-Bensusan, N., Llanquileo-Melgarejo, P., & Meidiana, C. (2021). Plastic pollution, waste management issues, and circular economy opportunities in rural communities. *Sustainability*, *14*(1), 20.
Mihai, F.-C., Plana, R., Arizmendiarrieta, J. S., & Irigoyen, I. (2023). Business models of composting for a circular economy. In *Current Developments in Biotechnology and Bioengineering* (pp. 319–345). Elsevier.
Muliarta, I. N. (2023). The Concept of Circular Economy in the Implementation of Source-Based Waste Management in Bali. *Indonesian Journal of Agriculture and Environmental Analytics*, *2*(2), 125–132.
Ogunmakinde, O. E. (2019). A review of circular economy development models in China, Germany and Japan. *Recycling*, *4*(3), 27.
Rahmasary, A. N., Koop, S. H. A., & Leeuwen, C. J. (2020). Assessing Bandung's governance challenges of water, waste, and climate change: lessons from urban Indonesia. *Integrated Environmental Assessment and Management*, *17*(2), 434–444.
Roleders, V., Oriekhova, T., & Zaharieva, G. (2022). Circular economy as a model of achieving sustainable development. *Problemy Ekorozwoju*, *17*(2), 178–185.
Russell, J. D., & Nasr, N. Z. (2023). Value-retained vs. impacts avoided: the differentiated contributions of remanufacturing, refurbishment, repair, and reuse within a circular

economy. *Journal of Remanufacturing*, *13*(1), 25–51.

Safri, S. (2024). Policy Analysis of Sustainable Waste Management in DKI Jakarta: Public Health and Environmental Implications. *Administratio*, *15*(2), 29–49.

Salvia, A. L., Leal Filho, W., Brandli, L. L., & Griebeler, J. S. (2019). Assessing research trends related to Sustainable Development Goals: Local and global issues. *Journal of Cleaner Production*, *208*, 841–849.

Schützenhofer, S., Kovacic, I., Rechberger, H., & Mack, S. (2022). Improvement of environmental sustainability and circular economy through construction waste management for material reuse. *Sustainability*, *14*(17), 11087.

Singer, J., Kieu, K. T., & Pravitasari, A. E. (2019). Solid waste management in tourist destinations in developing nations: case studies in Hoi An, Vietnam, and Puncak, Indonesia. In *Environmental Sustainability and Education for Waste Management: Implications for Policy and Practice* (pp. 189–206). Springer.

Subri, U. S., Ghani, N. M., Rus, R. C., & Affandi, H. M. (2025). Waste no more: Empowering communities through education and participation in sustainable waste management. *Multidisciplinary Reviews*, *8*(7), 2025204.

Tan, X., Zhu, K., Meng, X., Gu, B., Wang, Y., Meng, F., Liu, G., Tu, T., & Li, H. (2021). Research on the status and priority needs of developing countries to address climate change. *Journal of Cleaner Production*, *289*, 125669.

Tarigan, L. B., Rogaleli, Y. C., & Waangsir, F. W. F. (2020). Community participation in waste management. *International Journal of Public Health Science (IJPHS)*, *9*(2), 115–120.

Utami, R., Khair, H., & Rachman, I. (2021). Waste-to-Energy Potential in Medan City, Indonesia: Challenges and Opportunities for Sustainable Urban Development. *Policy*, *19*, 20.

Wikurendra, E. A. (2022). Waste Management with Circular Economy Approach in Indonesia. *ECONOMIC*, 19.

Wikurendra, E. A. (2025). *Integration solid waste management with circular economy model in Surabaya, Indonesia*. Magyar Agrár-és Élettudományi Egyetem.

Wikurendra, E. A., Csonka, A., Nagy, I., & Nurika, G. (2024). Urbanization and benefit of integration circular economy into waste management in Indonesia: A Review. *Circular Economy and Sustainability*, *4*(2), 1219–1248.

Xie, L., Zhu, J., & Benson, D. (2022). Partnership building? Government-led NGO participation in China's grassroots waste governance. *Geoforum*, *137*, 32–41.

Zhang, Y., Sun, M., Yang, R., Li, X., Zhang, L., & Li, M. (2021). Decoupling water environment pressures from economic growth in the Yangtze River Economic Belt, China. *Ecological Indicators*, *122*, 107314.