

Digitizing Waste Banks To Increase Efficiency and Transparency in Waste Management

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Abstract: The primary issue addressed by this community service project is the high volume of waste generated in the city of Semarang, which reaches 1,182 tons per day, with the majority consisting of food scraps and plastic. The activity focuses on improving the efficiency and transparency of waste management through the digitization of the waste bank in RW 01, Pleburan Village, South Semarang. The program aims to empower the community in waste sorting, strengthen financial literacy, and support a circular economy based on environmental sustainability. The methods used include outreach, technical training on waste sorting, the use of digital scales, and the implementation of a waste savings tracking app. This strategy is complemented by monitoring of community participation. The results of the community service initiative demonstrate increased community participation in waste saving, improved accuracy of transaction of records, additional household income, and a reduction in the volume of waste sent to landfills. The digitization of the waste bank has proven to be an innovative solution that strengthens community empowerment while supporting the national target of "Indonesia Free of Waste 2025"

Keywords: digitization, waste banks, circular economy, transparency in record-keeping, community empowerment

Introduction

Population growth and increasing consumption patterns have triggered a surge in waste volume, making it one of the most pressing environmental and social issues globally, including in Indonesia (Yusmanianti et al., 2024). The inability of conventional waste management systems to address this problem has led to various negative impacts, ranging from environmental pollution and threats to public health to economic losses.

In addressing these challenges, the concept of a **waste bank** emerges as an innovative solution that not only emphasizes reducing waste generation at Final Disposal Sites (FDS) but also shifts the public's perspective: from viewing waste as a byproduct to a resource with economic value (Rusydi et al., 2024).

Indonesia itself faces serious challenges in waste management. Data indicates that the majority of waste still ends up in landfills without adequate sorting, and some is even illegally dumped into rivers or vacant land (Adam Abidin et al., 2023). This situation contributes to soil, water, and air pollution, as well as increasing greenhouse gas emissions. Furthermore, traditional waste management practices often overlook the economic potential of recyclable materials. Consequently, the public loses the opportunity to derive added value from the waste they generate (Arwin Sanjaya et al., 2023).

The city of Semarang faces serious challenges in waste management. According to data from the *National Waste Management Information System* (SIPSN) **1.182,92 tons** or approximately **431.534 tons every year**, with the largest components being **food waste (39,36%)** and **plastic (19,73%)** (SIPSN Kementerian Lingkungan Hidup dan Kehutanan, 2025). The Jatibarang Landfill has a capacity of only about 900 tons per day, leading to accumulation and the risk of environmental pollution. The situation underscores the urgency of community-based waste management innovation (Data Semarang Kota, 2025).

The primary issue addressed by this community service initiative is the low efficiency and transparency of the manual waste bank system. Record-keeping is still done using paper ledgers, which are prone to errors and do not provide real-time data. The focus of the activities is on **digitizing the waste bank** as a strategy to improve the accuracy of record-keeping, resident participation, and financial literacy.

The service location was selected in **RW 01 Kelurahan Pleburan, South Semarang** because this area has a high population density, significant household waste accumulation, and potential for community participation through the RT/RW institutions. The selection of the location was also based on residents' real need for a more practical and transparent waste management system, as well as local government support for environmental programs.

The aim of this community service program are:

- To provide practical knowledge on the separation of organic and inorganic waste.
- To improve digital and financial literacy through the waste bank application.
- To support the circular economy by turning waste into a valuable resource.
- To reduce the volume of waste entering landfills, thereby contributing to the national target of "Indonesia Free of Waste 2025".

The literature review supports the urgency of this program. (Palahudin et al., 2024) assert that a digital-based waste bank management system has been proven to improve the efficiency and accuracy of record-keeping. (Al Fatah & Sancoko, 2023)

demonstrate that an Android-based application facilitates waste bank transactions and increases community engagement. (Muanifah, 2023) adds that the digitization of waste bank administration in South Tangerang strengthens citizen participation and management transparency. Based on this empirical and literature foundation, this program is expected to yield tangible impacts in the form increased community participation, strengthened local economies, and a cleaner environment.

Method

This community service program was implemented using a **community-based action research** approach, with residents of RW 01, Pleburan Village, South Semarang, serving as the primary beneficiaries. Residents were involved from the planning stage through community outreach and discussions, ensuring they are not merely beneficiaries but active participants in waste management.

The activity location is centered at the RW 01 Community Hall, which serves as a waste collection point and coordination center. This location was chosen due to the high volume of household waste generated and the institutional support from the RT/RW units, which facilitates community organizations.

The planning process began with **problem identification**, namely the high volume of waste in Semarang (1,182 tons every day) and the limitations of the manual waste bank system, which remains prone to recording errors. This was followed by **outreach** to residents regarding the importance of waste sorting and the benefits of a digital waste bank.

The next phase involved **technical training**, covering the separation of organic and inorganic waste, the use of digital scales with a capacity of 0.5-200 kg and the determination of waste prices based on agreements with waste collectors. Residents were also trained to use the waste bank app, which enables automatic recording, transparency of savings balances, and ease of transactions.

Digitalization is implemented by introducing **electronic savings books** and an app-based recording system. Residents can view their waste savings balances in real-time, thereby increasing trust and motivation or participate.

The final stage is **monitoring and evaluation**, conducted through analysis of resident participation and the volume of waste successfully managed. This evaluation provides an overview of the program's tangible impact on increasing awareness, participation, and the efficiency of waste management.



Figure 1. Implementation Stage of Community Service

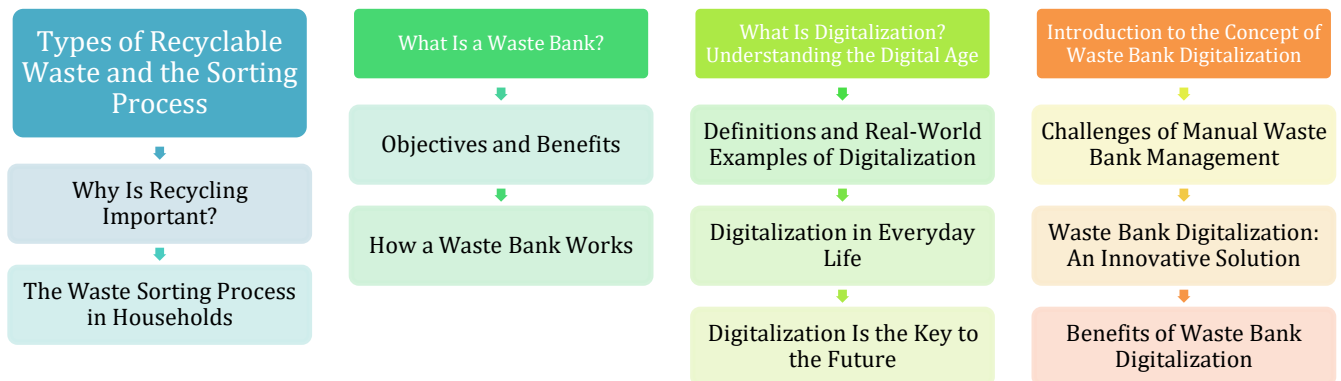


Figure 2. Problem Identification and Socialization Phase

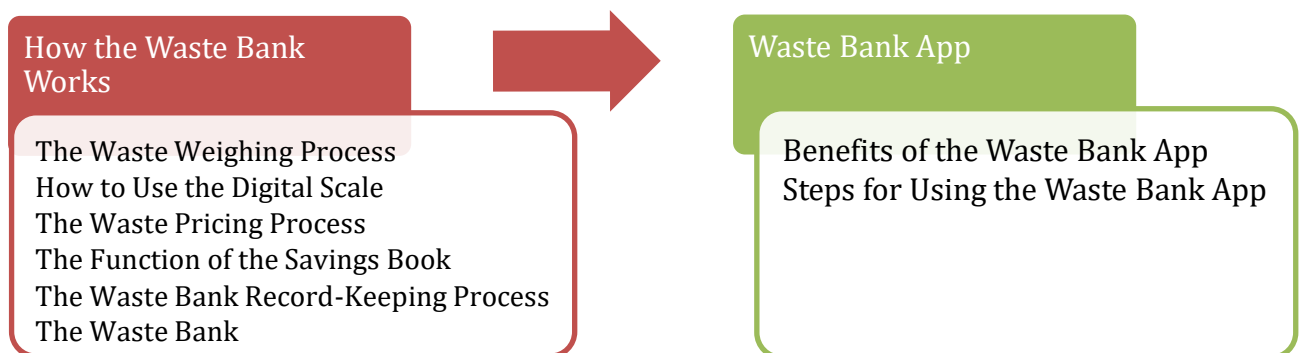


Figure 3. Technical Implementation Phase



Figure 4. Introducing the Electronic Savings Book and App-Based Recording

System



Figure 5. Group Photo of Training Participants

Result

The community service process in RW 01, Pleburan Village, proceeded dynamically by involving residents from the initial stage through the evaluation. The program initiative began with **outreach and education** regarding the importance of waste sorting and the benefits of a waste bank. This outreach successfully fostered a collective awareness that waste is not merely refuse, but a resource with economic value.

The next phase was **technical guidance**, during which residents were trained to sort organic and inorganic waste. Organic waste, such as food scraps and leaves, was directed to be turned into compost, while inorganic waste, such as plastic, paper, metal, and glass, was sorted by type to maximize its resale value. The guidance also includes the use of **digital scales** with a capacity of 0.5-200 kg, ensuring a more accurate and transparent weighing process.

In addition, residents were introduced to a **digital recording system** via the waste bank app. This app enables automatic recording, provides information on waste prices and customer savings balances, and ensures transaction transparency. With the electronic savings book, residents can monitor their balances in real time, thereby

increasing trust in the system.

The results of the mentoring show **an increase in residents' participation** in waste savings. Previously, manual record-keeping often led to doubts and administrative errors. After digitization, residents have been more active in depositing waste because they feel the process is fast, clear, and secure. Waste savings data shows a steadily increasing balance—from deposits of plastic bottles, paper, and metal to used cooking oil—with the total balance reaching Rp44,250 after several transactions.

The dynamics of the mentoring process also generated **new knowledge for the community**, namely :

- An understanding of the concept of the **circular economy**, where waste is treated as a resource.
- Digital literacy through the use of the waste bank app.
- Basic financial literacy, as residents learn to manage their waste savings just like a bank account.
- Greater environmental awareness, demonstrated by consistent waste sorting in households.

Overall, the results of this community service project demonstrate that the digitization of waste banks not only solves technical record-keeping issues but also encourages behavioral changes among residents toward a clean, productive, and sustainable lifestyle.

Discussion

The implementation of the community service program through the digitalization of the waste bank in RW 01, Pleburan Village, demonstrates that a community-based approach can yield tangible changes in behaviour and waste management systems. The results of the mentoring process show increased resident participation, improved recording accuracy, and heightened environmental awareness. These findings align with **the theory of community-based** development, which emphasizes the importance of community involvement as the primary actors in every empowerment program.

Theoretically, the digitization of the waste bank can be understood through the lens of **the circular economy**. According to this concepts, waste is No. longer viewed as refuse but as a resource that can be reused to create economic value. This is reflected in residents' practices of saving marketable inorganic waste—such as plastic, paper, metal, and used cooking oil—which is then converted into savings balances. Thus, this program reinforces the community's understanding of the *reduce, reuse, recycle (3R)* principles and integrates them into daily life.

Empirical findings from RW 01 Pleburan are also consistent with academic literature. (Palahudin et al., 2024), (Rinwantin et al., 2025) confirm that a digitalized waste bank management system improves the efficiency and accuracy of record-keeping. (Al Fatah & Sancoko, 2023) demonstrate that Android-based applications facilitate waste bank transactions and increase community engagement. (Muanifah, 2023), (Rinwantin et al., 2025) add that the digitalization of waste bank administration strengthens transparency and resident participation. Thus, the outcomes of community services in RW 01 reinforce the theoretical finding that digitalization is not merely a technical innovation but also an instrument of social empowerment.

From a literacy perspective, residents gain new knowledge regarding **digital literacy and basic financial literacy**. The mentoring process teaches them how to use the waste bank app, understand transaction recording, and manage savings balances much like a bank account. This knowledge expands the community's capacity to adapt to the digital era while boosting their confidence in managing household resources.

The service process from start to finish demonstrates a gradual transformation: beginning with awareness of the waste problem, engagement in outreach, technical training, and finally the implementation of digital applications. This transformation demonstrates that changes in community behavior do not occur instantly, but rather through a cycle of repeated and consistent mentoring. This aligns with **the theory of diffusion of innovation** (Turner, 2007) which explains that the adoption of new technologies in society occurs through the stages of awareness, persuasion, decision, implementation, and confirmation.

Thus, this discussion underscores that the digitization of the waste bank in RW 01 Pleburan is not merely a technical solution for record-keeping, but also a community empowerment process that strengthens social, economic, and environmental capacities. This program demonstrates the relevance between theory and practice, and supports the achievement of Indonesia's national "Waste-Free Indonesia 2025" target.

Conclusion

The community service program through the digitization of the waste bank in RW 01, Pleburan Villager, South Semarang, has made a tangible contribution to improving efficiency, transparency, and resident participation in waste management. A theoretical reflection of the activity's results indicates that a community-based approach combined with technological innovation can strengthen the community's capacity to address environmental issues. This aligns with **community-based development theory**, which emphasizes the importance of active resident involvement as the primary agents of change, as well as **circular economy theory**, which views waste as a valuable resource.

The digitization of the waste bank has proven to be not only a technical solution for record-keeping but also a tool for social empowerment. Residents gained new knowledge regarding waste sorting, digital literacy, and basic financial literacy. The mentoring process—from the awareness-raising stage, through technical training, to the implementation of the digital application—revealed a gradual transformation in community behavior, consistent with **the diffusion of** innovation framework (Turner, 2007) where the technology adoption occurs through the stages awareness, persuasion, decision, implementation, and confirmation.

Based on the results and theoretical reflections, several recommendations can be proposed:

1. **Program sustainability** : there is a need for routine mentoring and capacity building for residents, particularly the elderly, so they can adapt to the digital system.
2. **Integration of local policies**: village and city governments need to support the digital waste bank program as part of urban waste management strategies.
3. **Application development**: the features of the waste bank application can be expanded to make it more user-friendly, for example with automatic notifications, periodic reports, and integration with microfinance services.
4. **Model replication**: The success in RW 01 Pleburan can serve as a model to be implemented in other areas with similar conditions, thereby expanding the positive impact.
5. **Multi-stakeholder collaboration**: It is necessary to involve universities, the government and the private sector in supporting the development of digital waste banks, both in terms of technology and funding.

Thus, this community service initiative not only resolves technical issues related to waste recording but also strengthens residents' socioeconomic capacity, supports environmental sustainability, and contributes to achieving the national target of "*Indonesia Free of Waste 2025*".

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