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Circular Economy and Financial Inclusion: The Role of Waste Banks and Reverse Vending Machines in the Yok Kita GAS Program in Indonesia

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Waste Bank; Financial Inclusion; Circular Economy; Reverse Vending Machine; Creating Shared Value

Abstract

This study aimed to examine how a waste management initiative implemented by a state-owned bank strengthened waste bank capacity and promoted financial inclusion among local communities, focusing on the BRI Care Program, Yok Kita GAS (Waste Management Movement), implemented by PT Bank Rakyat Indonesia (Persero) Tbk. The research employed a qualitative approach using a descriptive single-case study design, with several program components examined as embedded units of analysis. Secondary data were obtained from the program's environmental impact evaluation report covering 2019–2026 and its 2026 post-implementation report. Program achievements were assessed using descriptive statistics, while qualitative information was examined through thematic analysis. The findings were subsequently compared with propositions derived from the relevant literature. The program supported 47 waste management units, comprising 40 waste banks and seven markets, across 46 villages and urban wards in 12 provinces. It also distributed 2,477 facility units and provided management training through 12 modules. The participating network managed 228,887.23 kg of waste and recorded IDR 2.79 billion in customer savings among 12,869 customers. Reverse vending machines (RVMs), deployed at 28 locations and during three large-scale events, connected plastic bottle collection with digital reward points or account balances. The findings demonstrated a documented pathway from waste collection to accumulated savings; however, the subsequent transition from waste-based savings to formal bank account ownership and broader financial service utilization remained unverified. The study was limited by its reliance on secondary data compiled by program implementers and the absence of baseline measurements and comparison groups. Future research should directly assess waste bank customers' ownership and active use of formal financial accounts to establish whether participation contributes to measurable financial inclusion outcomes.

INTRODUCTION

Solid waste management remains one of the most pressing environmental challenges in low- and middle-income countries (Abubakar et al., 2022). The World Bank estimated that global municipal solid waste generation reached 2.01 billion metric tons annually in 2016 and could increase to 3.40 billion metric tons by 2050, with the fastest growth occurring in developing countries (Kaza et al., 2018). In many cities across developing countries, budget constraints, limited institutional capacity, and insufficient public participation have contributed to improper waste disposal practices, including open dumping, uncontrolled burning, and environmental littering (Guerrero et al., 2013). Plastic waste has received particular attention because plastic entering aquatic environments is difficult to recover. Jambeck et al. (2015) identified Indonesia as

one of the largest contributors of mismanaged plastic waste entering the ocean, while Meijer et al. (2021) demonstrated that a substantial proportion of riverine plastic emissions into the ocean originates from small and medium-sized rivers in densely populated regions, including Southeast Asia.

These challenges are closely associated with Indonesia's conventional waste management system, which continues to rely heavily on collection, transportation, and final disposal. Research examining plastic waste flows in Jakarta indicated that recycling rates remained relatively low and that recycling activities depended substantially on the informal sector (Putri et al., 2018). Similarly, Lestari and Trihadiningrum (2019) identified inadequate land-based waste management as a major contributor to plastic pollution in Indonesia's coastal and marine environments. Although informal waste collectors and recyclers play an essential role in recycling systems across developing countries, they frequently operate without adequate social protection or access to formal services (Wilson et al., 2006). Consequently, improving waste management in Indonesia requires not only infrastructure development but also sustained community participation and stronger integration of informal recycling activities into organized waste management systems.

One approach to strengthening community participation involves waste banks, which enable residents to deposit segregated recyclable materials and accumulate monetary value through recorded savings balances. Wijayanti and Suryani (2015) examined waste banks in Surabaya as a form of community-based environmental governance that combined economic incentives with social capital. Similarly, research conducted in Padang demonstrated that community-based waste bank programs could improve municipal waste management, although their contribution to overall waste reduction remained limited (Raharjo et al., 2017). Household participation in waste reduction activities was influenced by environmental knowledge, access to supporting facilities, and perceived benefits (Dhokhikah et al., 2015). Furthermore, Wulandari et al. (2017) reported that the economic benefits of waste banks were particularly relevant to women managing household activities and finances.

From an institutional governance perspective, waste banks can function as decentralized decision-making entities within local waste management systems. Ostrom (2010) demonstrated that collective-action problems could be addressed through polycentric governance arrangements involving multiple interacting institutions rather than relying exclusively on government intervention or market mechanisms. Within this framework, waste banks operate alongside local governments, informal waste collectors, and recycling industries to support coordinated waste management activities (Wijayanti & Suryani, 2015). Their activities also reflect circular economy principles by facilitating waste reduction, reuse, recycling, and material value recovery at the community level, thereby extending the productive use of resources and reducing dependence on virgin materials (Geissdoerfer et al., 2017; Ghisellini et al., 2016; Kirchherr et al., 2017).

Despite their potential contributions, waste banks continue to face institutional and operational sustainability challenges. Their activities often depend on a limited number of volunteer administrators, while fluctuations in recyclable material prices and restricted access to processing facilities and reliable buyers can undermine financial stability. Guerrero et al. (2013)

emphasized that waste management performance in developing countries depends on interactions among stakeholders and the availability of institutional, financial, and technical resources. External support, including corporate social and environmental responsibility initiatives, may strengthen waste bank capacity through infrastructure provision, managerial assistance, and technical training. However, such interventions may also create institutional dependence when external assistance is not accompanied by sustainable organizational development and operational independence.

Alongside environmental challenges, Indonesia continues to face barriers to financial inclusion. The Global Findex Database 2021 identified Indonesia among seven countries collectively accounting for approximately half of the world's adults without accounts at financial institutions or mobile money providers (Demirgüç-Kunt et al., 2022). Sarma and Pais (2011) conceptualized financial inclusion in terms of access to, availability of, and use of formal financial services, indicating that account ownership alone does not adequately capture meaningful financial participation (Ozili, 2021). Low-income households frequently engage in savings activities through informal financial arrangements that offer familiarity and social accessibility but may involve financial risks and transaction costs (D. Collins et al., 2009; Karlan et al., 2014). Experimental evidence further demonstrated that reducing barriers to savings services could increase savings accumulation and productive investment among low-income households (Dupas & Robinson, 2013).

Empirical research has associated financial inclusion with improved household risk management, investment opportunities, and economic resilience, although outcomes vary across financial products and institutional settings (Demirgüç-Kunt et al., 2017). Barriers to formal savings participation commonly include transaction costs, geographic distance from financial institutions, minimum balance requirements, and difficulties maintaining savings discipline (Karlan et al., 2014). Ashraf et al. (2006) demonstrated that commitment savings products could encourage greater savings accumulation by helping individuals allocate funds toward specific objectives. These findings are consistent with mental accounting theory, which explains how individuals categorize and manage financial resources according to their sources and intended purposes (Thaler, 1999). Waste bank savings exhibit comparable characteristics because their monetary value originates from recyclable material deposits, is recorded separately from everyday household expenditures, and may be accumulated for withdrawal at designated intervals.

The expansion of digital financial services has created additional opportunities to connect small-value transactions with formal financial systems. Evidence from Kenya demonstrated that mobile money services reduced transaction barriers and contributed to poverty reduction among participating households (Suri & Jack, 2016). Ozili (2018) argued that digital finance could expand financial inclusion, although its effectiveness depended on financial literacy, institutional trust, and accessibility. Conversely, Gabor and Brooks (2017) cautioned that digital financial inclusion initiatives may also advance the commercial interests of financial service providers, requiring careful assessment of their actual benefits for users. Financial literacy has been consistently associated with savings behavior and financial planning (Lusardi & Mitchell, 2014), while

financial education interventions have demonstrated improvements in financial knowledge and behavior, although their effects vary across contexts and intervention designs (Kaiser et al., 2022).

Waste banks occupy a potentially important position at the intersection of community-based waste management and financial inclusion. Their operational mechanisms resemble certain banking practices, including accepting deposits, recording monetary balances, and facilitating withdrawals. However, waste bank savings generally constitute community-managed value accumulation arrangements rather than regulated deposit products offered by formal financial institutions. Research on village savings groups demonstrated that community-based financial arrangements could improve consumption stability and household economic resilience (Ksoll et al., 2016), although participation did not necessarily lead to integration into formal financial systems. Existing waste bank research has predominantly examined environmental performance, community participation, and contributions to household income (Dhokhikah et al., 2015; Wijayanti & Suryani, 2015; Wulandari et al., 2017). Comparatively limited attention has been devoted to examining whether waste bank participation facilitates formal account ownership, active financial service use, or sustained financial inclusion. This gap is particularly relevant to bank-supported waste management initiatives, which may connect community savings activities with existing banking infrastructure and digital financial services.

Beyond conventional waste banks, reverse vending machines (RVMs) have emerged as technology-enabled collection systems for used beverage containers. Internationally, RVMs are frequently incorporated into deposit-return systems (DRSs), which provide financial incentives for returning eligible beverage packaging and have been associated with increased container return rates (Zhou et al., 2020). Indonesia has not established a comprehensive nationwide deposit-return system for beverage packaging, and existing RVM initiatives generally operate through voluntary collection arrangements supported by incentive mechanisms. Their effectiveness therefore depends partly on accessibility, user participation, and the attractiveness of the rewards provided. Deploying RVMs at large-scale events, including festivals and sporting competitions, may offer opportunities to collect substantial quantities of recyclable packaging within relatively short periods (A. Collins et al., 2009). For financial institutions, integrating RVMs with digital reward systems may also create opportunities to introduce participants to digital transactions and financial service platforms.

However, the effectiveness of financial incentives in encouraging sustained environmental behavior cannot be determined solely by the monetary value of the rewards. Motivation crowding theory suggests that external incentives may either reinforce or weaken intrinsic motivation, depending on how individuals interpret them (Frey & Jegen, 2001). Gneezy et al. (2011) observed that incentives could influence short-term behavior, although their effects might diminish after rewards were withdrawn, particularly when behavioral habits had not been established. Bowles and Polanía-Reyes (2012) further demonstrated that economic incentives and social preferences could function as substitutes or complements. From a behavioral perspective, intentions are influenced by attitudes, subjective norms, and perceived behavioral control (Ajzen, 1991), while habitual behaviors develop through repeated actions in relatively stable contexts (Verplanken &

Wood, 2006). In large-scale event settings, operational indicators, including waste generation or collection volumes per visitor, can support the assessment of waste management performance (Cierjacks et al., 2012).

The relationship between corporate interests and community benefits can also be examined through the concept of creating shared value (CSV). Porter and Kramer (2011) proposed that companies could generate economic value while addressing societal needs, including by strengthening local business ecosystems and supporting community development. Nevertheless, this perspective has attracted criticism. Crane et al. (2014) argued that the CSV framework insufficiently addresses potential conflicts between corporate profitability and social objectives, while Dembek et al. (2016) identified conceptual inconsistencies and limitations in measuring shared value outcomes. These critiques are particularly relevant to corporate social responsibility programs implemented by financial institutions, where environmental achievements may be presented alongside claims of expanded financial inclusion without sufficient evidence demonstrating actual changes in financial behavior or service utilization.

The BRI Peduli Yok Kita GAS (Waste Management Movement) program, implemented by PT Bank Rakyat Indonesia (Persero) Tbk since 2019, provided a relevant case for examining these relationships. The program supported waste banks through infrastructure provision, technical assistance, financial management training, and the deployment of RVMs that converted deposited plastic bottles into digital reward points or balances. It also incorporated waste management activities into large-scale events. Against this background, the study aimed to examine how corporate support strengthened waste bank operational capacity and whether program activities created pathways toward formal financial inclusion. Specifically, the study addressed three research questions: (1) How did infrastructure support and training contribute to waste bank operational capacity? (2) How did waste banks and RVMs connect community-based waste collection activities with financial services? And (3) To what extent did the available evidence substantiate each stage of the proposed pathway from waste collection to financial inclusion?

The study's primary contribution was analytical rather than an assessment of causal program effectiveness. It developed a stage-based analytical framework distinguishing documented program outputs from reported or anticipated outcomes, particularly regarding the transition from waste-based savings to formal financial service participation. By identifying which relationships were supported by available evidence and which required additional verification, the framework provided a basis for future evaluations of corporate-supported waste management initiatives. Its practical relevance extended to program administrators, financial institutions, and policymakers seeking to establish appropriate monitoring indicators and data collection procedures before attributing measurable financial inclusion outcomes to community-based environmental programs.

METHOD

This study employed a qualitative approach using a descriptive single-case study design to examine the implementation and reported outcomes of a community empowerment program

within its social and institutional context (Neuman, 2014). The design was selected to facilitate an in-depth examination of a single program and its components. The case focused on the BRI Care Program, Yok Kita GAS, implemented by PT Bank Rakyat Indonesia (Persero) Tbk since 2019 across 46 villages and urban wards in 12 Indonesian provinces. The program primarily targeted waste management units, including waste banks and markets, and incorporated reverse vending machines (RVMs) deployed at permanent locations and large-scale events.

The study relied on secondary data obtained from the company's internal documents, including program impact evaluation reports covering 2019–2026 and post-activity reports from 2026 (PT Bank Rakyat Indonesia (Persero) Tbk., 2026a, 2026b, 2026c, 2026d). These documents contained information on program achievements, beneficiary satisfaction surveys, participant testimonials, recommendations, and activity documentation. Document analysis was employed to systematically examine program implementation and reported outcomes (Bowen, 2009). A literature review was also conducted to establish the theoretical framework concerning waste banks, financial inclusion, incentive mechanisms, and shared value creation.

Quantitative program data were analyzed using descriptive statistics, including frequencies, averages, and proportions, and were presented in tables and figures. Qualitative information from testimonials, recommendations, and activity records was analyzed thematically by identifying and organizing recurring patterns relevant to the research questions (Braun & Clarke, 2006). The findings were subsequently compared with theoretical propositions derived from the literature (Yin, 2018). Data credibility was assessed through cross-document triangulation by comparing reported figures and information across available program reports to identify consistencies and discrepancies.

RESULST AND DISCUSSION

Overview and Reach of the Yok Kita GAS Program

The Yok Kita GAS program is designed to encourage responsible and participatory waste management. This program has four objectives, namely increasing public awareness about waste problems, optimizing waste bank governance through the provision of facilities and improving competence, reducing plastic waste through technological innovation and river waste barriers, and combining waste management with financial literacy to create economic added value for the community. This fourth goal is what distinguishes this program from the waste bank program in general.

The goal is carried out through four groups of activities. The first group is the provision of infrastructure and waste bank optimization. The second group is the use of digital technology through RVM that allows residents to exchange plastic bottles for digital balances. The third group is water conservation through the Jaga Sungai Jaga Kehidup activity, which includes cleaning a 2,200-meter river and installing 18 units of waste barriers. The fourth group is community empowerment and financial literacy for waste bank administrators and customers.

How these activities work can be seen in one program framework (Figure 1). BRI's support in the form of facilities, training, and RVM is channeled through two channels. The first channel

is a network of waste banks managed by the community. The second channel is RVM, both at fixed points and in large-scale activities, which convert plastic bottles into points or digital balances.

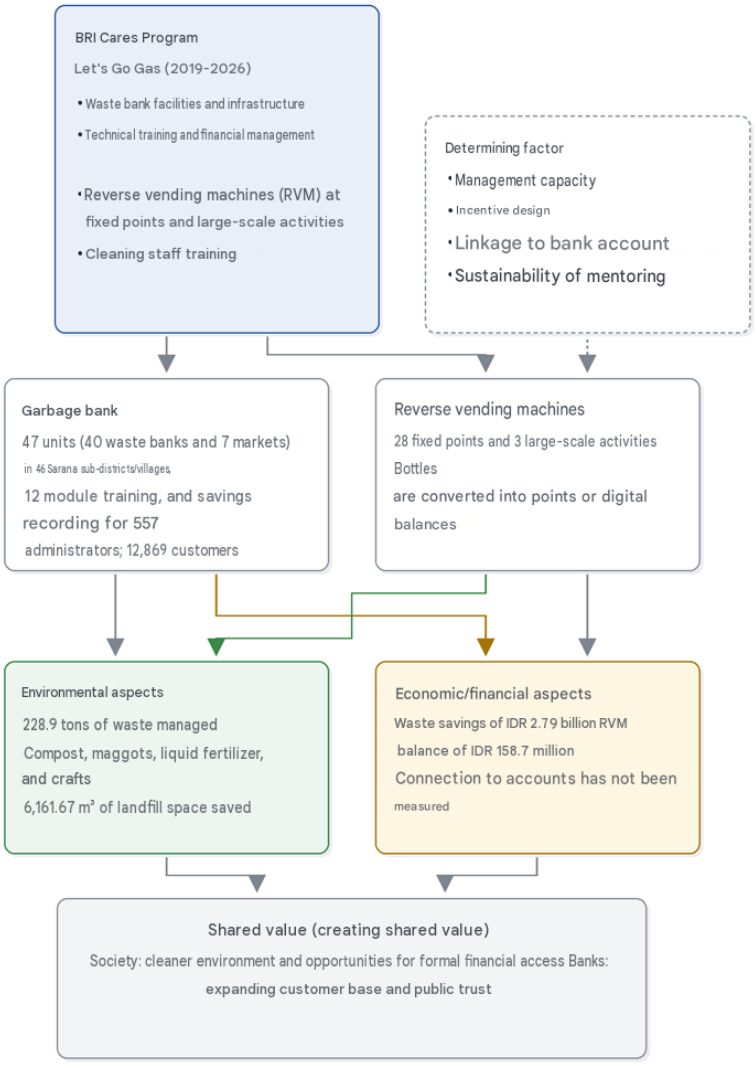

Figure 1. Yok Kita GAS Program Scheme
Source: Processed from PT Bank Rakyat Indonesia (Persero) Tbk. (2026d).

Based on the scheme in Figure 1, BRI Peduli support is carried out through two main activities, namely the waste bank and RVM. The fostered waste management unit totals 47 units, consisting of 40 waste banks and 7 markets, spread across 46 sub-districts/villages, with 557 administrators and 12,869 customers. In the waste bank, facilities and training materials from 12 modules are used by administrators to sort, process, and record residents' waste deposits as savings. Meanwhile, RVM is placed at 28 fixed points and in three large-scale activities. Unlike waste banks that involve administrators as intermediaries, RVM receives plastic bottles directly from users and converts them into points or digital balances.

The activities of waste banks and RVM have an impact on two aspects. In the environmental aspect, the program produces 228.9 tons of managed waste, processed products in the form of compost, *maggot*, liquid fertilizers, and handicrafts, as well as a saving of space for the final processing site of 6,161.67 m^3. In the economic or financial aspect, the program generates waste savings worth IDR 2.79 billion and RVM balances worth IDR 158.7 million. These two aspects are interrelated. Each deposit to the waste bank increases the volume of managed waste while increasing customer savings, while each bottle that enters RVM adds recycled materials while generating a balance for its users. In the financial aspect, the data recorded only reaches savings and balances, while the connection to bank accounts has not been measured.

The impact on both aspects boils down to *creating shared value*. The program document places Yok Kita GAS at the level of local cluster development, namely strengthening waste banks through the cooperation of various stakeholders. For the community, the value generated is in the form of a cleaner environment, income from processed products, savings from waste, and opportunities for formal financial access. For BRI, the program is expected to expand the customer base among waste bank administrators and members and increase public trust in the company. With this flow, social benefits and business benefits are designed to grow simultaneously from the same activities.

This framework also contains four determining factors, namely management capacity, incentive design, connection with bank accounts, and sustainability of mentoring. These factors affect how optimally program activities produce impact, and become a reference in describing the results in the next subsection. The program scope during 2019–2026 is summarized in Table 1.

Table 1. Yok Kita GAS Program Reach, 2019–2026

Indicator	Reach	Remarks
Construction waste management unit	47 units	40 waste banks and 7 markets
Region	46 sub-districts/villages	Spread across 12 provinces, from North Sumatra to North Sulawesi
RVM Point	28 points	Fixed plastic bottle collection point
River Guard Point Guard Life	44 points	Includes 18 units of garbage barriers
School	91 schools	69 elementary and 22 junior high schools
Waste bank manager	557 people	Direct beneficiaries
Waste bank customers	12,869 people	Direct beneficiaries
General public	3,865 people	Direct beneficiaries, participants in socialization and waste collection
Students	24,542 people	Indirect beneficiaries, 17,321 elementary school students and 7,221 junior high school students
Volunteers	1,405 people	Direct beneficiaries, Jaga Sungai Jaga Vida activities
Total beneficiaries	43,238 people	The accumulated 2019–2026 is 18,696 direct beneficiaries and 24,542 indirect beneficiaries

Source: Processed from PT Bank Rakyat Indonesia (Persero) Tbk. (2026d).

Based on Table 1, the beneficiaries of the program are divided into two groups, namely direct and indirect beneficiaries. The direct beneficiaries consist of 557 administrators and 12,869 waste bank customers, 3,865 members of the general public involved in waste collection, and 1,405 volunteers of the Jaga Sungai Jaga Kebuhay activities. The indirect beneficiaries are 24,542 students from 91 schools who benefit through education and training activities. Thus, a total of 43,238 beneficiaries is a sum of 18,696 direct beneficiaries and 24,542 indirect beneficiaries. The program is spread across 12 provinces and is not centralized in one city. The network of waste banks that have been formed is also diverse, ranging from RW-level waste banks in Jakarta, parent waste banks in West Java, integrated waste treatment sites in Central Java, to village-based waste processing sites in Bali. Documentation of Jaga Sungai Jaga Vida activities involving volunteers is presented in Figure 2.



Figure 2. Activities to Protect the River Protect Life

Source: Internal Documentation of PT Bank Rakyat Indonesia (Persero) Tbk. (2026).

Supporting Facilities and Strengthening the Capacity of Waste Banks

The main support program for waste banks is in the form of distributing facilities and infrastructure. During 2019–2026, the program distributed 2,477 units of main facilities consisting of waste processing machines, transport vehicles, *maggot* cultivation houses, garbage cans, sorting bags, and composter bins, plus 43 types of supporting equipment such as boots, uniforms, and gloves (Table 2). The machines distributed include pressing machines, organic and inorganic waste shredders, dryers, plastic heaters and melters, organic and inorganic waste sorters, and a series of *maggot* processing equipment. The variety of machines shows that the program support is not limited to the collection stage, but also includes the processing stage that adds material value.

Table 2. Facility Support and Capacity Building of Waste Banks, 2019–2026

Support Type	Quantity	Functions in the Management Chain
Sorting bags	1,818 units	Sorting at source
Trash can	490 units	Storage
Composter Tongue	67 units	Organic waste treatment
Waste treatment machine	48 units	Shredding, pressing, drying, *maggot processing*
Supporting vehicles	45 units	Transportation
Maggot house	9 units	Maggot cultivation from organic waste
Supporting equipment	43 types	Manager's job safety (recorded per item type, such as boots, uniforms/vests, and gloves)
Training modules	12 modules	Technical processing, financial management, bookkeeping, crafts

Source: Processed from PT Bank Rakyat Indonesia (Persero) Tbk. (2026d).

In addition to facilities, the program provides training to administrators, customers, and the general public through 12 modules. The technical module includes waste management, waste sorting, liquid fertilizer management, *maggot cultivation*, paper recycling, and paper management. The creative module includes handicrafts making, *eco print*, *eco brick,* and waste utilization. The managerial module includes financial management and bookkeeping administration. This managerial module is important because recording customer savings and sales transactions is the core function of a waste bank that determines the trust of citizens.

The training resulted in five innovations in processed waste products, namely *eco enzyme* creations and compost pillows, bags from used plastic bags, the use of damaged umbrella waste, *eco brick* creations, and cellophane plastic creations. The satisfaction survey of 91 beneficiaries resulted in an index score of 85.67 out of a scale of 100, which is included in category B (good). The element with the highest score was the quality of facilities and infrastructure (88.58), followed by the fairness of costs (87.83) and the benefits of activities (86.63). The lowest scores were found in handling complaints, inputs, and suggestions (81.54) and timeliness of activities (84.29). This pattern shows that beneficiaries value physical support the most, while feedback and mentoring mechanisms still need to be improved. Figure 3 shows training activities and some of the facilities received by waste banks.



Figure 3. Training Activities and Facilities of the Yok Kita GAS Waste Bank
Source: Internal Documentation of PT Bank Rakyat Indonesia (Persero) Tbk. (2026).

1. Waste Management Performance and Circular Economy Output

The fostered waste bank network managed 228,887.23 kg of waste during the program period, consisting of 123,871.58 kg of organic waste (54.1%) and 105,015.65 kg of inorganic waste (45.9%). On average, each unit manages about 4.9 tons of waste. Organic waste is processed into compost, liquid organic fertilizer, *maggot*, and *eco enzyme*, while inorganic waste is sold to collectors or processed into crafts. The diversion of waste from the final processing site is estimated to save 6,161.67 m^3 of landfill space. Details of the output are presented in Table 3.

Table 3. Environmental and Economic Output of Waste Bank Network, 2019–2026

Dimensions	Indicator	Reach
Environment	Managed organic waste	123,871.58 kg
	Managed inorganic waste	105.015.65 kg
	Plastic bottles through RVM	6,111.73 kg
	Saving space in the final processing area	6,161.67 m^3
Processed products	Compost fertilizer	24,163.5 liters
	Liquid organic fertilizer	1,003 liters

Dimensions	Indicator	Reach
Economy	*Maggot*	6,921.5 kg
	Eco enzyme	777 liters
	Savings of waste bank customers	IDR 2,792,500,850
	Sale of waste processing products	IDR 522,000,000
	Grants received by waste banks	IDR 8,784,750
	RVM transaction value	IDR 158,684,282

Source: Analysis results from PT Bank Rakyat Indonesia (Persero) Tbk. (2026d).

The largest economic value recorded in the waste bank network is customer savings, which is IDR 2.79 billion. This amount is more than five times the waste bank's revenue from the sale of processed products (IDR 522 million). The comparison shows that from the household economic side, the waste bank plays a role as a place to store customer value rather than as a business unit that generates profits for its managers. However, income from the sale of processed products is still important because it is a source of operational costs and incentives for management.

Mechanism from Waste Savings to Financial Services

The financial mechanism in the Yok Kita GAS Program runs through two activities, namely the waste bank and RVM. In the waste bank, the mechanism consists of four stages. The first stage is the deposit of segregated waste by the customer. The second stage is the recording of the value of waste as savings at the waste bank. The third stage is the connection of savings with BRI accounts or service channels. The fourth stage is the use of other financial services, such as formal savings, payment services, and credit. The flow of the mechanism is presented in Figure 4.

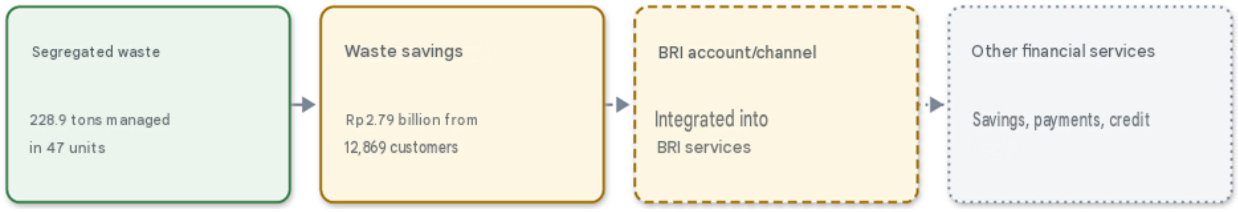

Figure 4. Financial Mechanism through Waste Banks

Source: Processed from PT Bank Rakyat Indonesia (Persero) Tbk. (2026d).

Figure 4 shows that in the first and second stages, as many as 12,869 customers have accumulated savings worth IDR 2,792,500,850, or an average of around IDR 217 thousand per customer during the program period. This savings become a new asset for customers because the waste that was previously disposed of now has a recorded value in their name. One of the beneficiaries said, "*The biggest change I feel is not about how many rupiah I get, but about a change in behavior. Now, every time I see waste, the intention is no longer to immediately dispose of it, but to manage*". In the third stage, the shared value analysis in the program document states that waste bank activities have been integrated into BRI's banking service ecosystem and expanded the active customer base among waste bank administrators and members. However, the document does not present data on the number of waste bank customers who open or use BRI accounts, so

this statement is still in the form of unmeasured claims. Therefore, the third and fourth stages in Figure 4 are depicted with dotted lines as connections that are still in the form of potential.

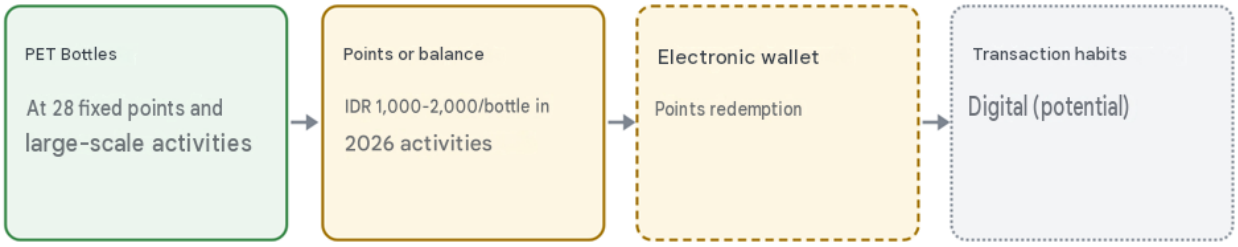

Figure 5. Financial Mechanism through RVM

Source: Processed from PT Bank Rakyat Indonesia (Persero) Tbk. (2026a, 2026c).

The second mechanism runs through RVM, which connects the deposit of plastic bottles directly with points or digital balances without the intermediary of the management (Figure 5). This mechanism starts from depositing PET bottles at 28 fixed points and at large-scale activity locations. Each incoming bottle is automatically converted into points or balances, with a value of IDR 1,000–2,000 per bottle in 2026 activities. The points can then be disbursed to the user's electronic wallet. In this way, every bottle deposit has the opportunity to become a digital financial transaction, and repeated use can form a digital transaction habit. Compared to a waste bank, the RVM mechanism is more concise because the value of the bottle is converted directly without manual recording by the administrator.

Both mechanisms are supported by several program activities, including financial literacy training and financial management and bookkeeping administration modules for administrators and customers. The program also recommends a scheme to convert used cooking oil into savings balances that can be exchanged for basic necessities or electricity tokens. This recommendation shows that the concept of waste savings has begun to be developed for other types of waste, although the balance is still directed to consumption needs and has not been linked to formal financial products.

Implementation of RVM Machines in Large-Scale Activities

In addition to being part of the financial mechanism, RVM functions as a means of collecting plastic bottles. The program operates 28 RVM points which cumulatively collected 6,111.73 kg of plastic bottles with a transaction value of IDR 158,684,282, or an average of around IDR 26 thousand per kilogram of bottles. In contrast to waste bank savings that are recorded manually, RVM directly converts bottles into points or digital balances. In 2026, RVM will also be placed in three large-scale activities with different participant characteristics and incentive schemes, as presented in Table 4.

Table 4. Comparison of RVM Use in Large-Scale Activities, 2026

Indicator	Environment Day 2026	Pestapora 2026	MotoGP Mandalika 2026
Types of activities	Employee activities at the head office	Public music festivals	International racing championships
Participants	920 employees	70 visitors, 10 employees, 10 influencers	Around 120 thousand spectators for three days
Unit RVM	2 units	2 units	2 units
Bottle Collection	6,780 bottles (126.79 kg)	6,318 bottles (118.15 kg)	65.56 kg
Transactions	1,400 transactions	260 transactions	–
Incentives	IDR 2,000 per bottle, minimum 5 bottles, spinning wheel prize	IDR 1,000 per bottle and content competition	–
Transaction value	IDR 13,235,352	IDR 6,318,000 (in points)	–
Bottles per transaction	4,8	24,3	–
Value per kg bottle	IDR104,000	IDR 53,000	–

Source: Processed from PT Bank Rakyat Indonesia (Persero) Tbk. (2026a, 2026b, 2026c).

Table 4 shows three different patterns. At the Environment Day activity, around 920 employees were asked to bring a minimum of five clean bottles, and each transaction on average contained 4.8 bottles. This pattern reflects the habit of carrying pre-sorted bottles. Participants rated this activity as a fun way to sort waste from home because bottles can be exchanged for Rp2,000 per bottle. However, the activity report noted that participants tended to focus on acquiring souvenirs and plant seeds. The report then recommended a more structured reward mechanism and collection targets associated with environmental achievements.

At the Pestapora Festival, the number of bottles collected was almost the same as the Environment Day activities, but it came from a much smaller number of participants and transactions, with an average of 24.3 bottles per transaction. Participant testimonials shed light on this pattern, namely that plastic bottles have been provided and points can be disbursed to electronic wallets. The number of bottles in this activity therefore reflects more of the design of the activity than the behavior of sorting waste. In the same testimonial, participants hoped that similar machines could be used in everyday life, not just during large events. The activity report recommended that information about the existence of RVMs be reinforced and that machines be placed at points with a high concentration of visitors.

In the 2026 Mandalika MotoGP, 300 cleaning personnel collected 22,560 kg of waste, consisting of 6,715 kg of organic waste and 15,845 kg of inorganic waste, from around 120 thousand spectators. The two RVM units only collected 65.56 kg of bottles, or about 0.3% of the total waste collected. In activities with this large number of visitors, waste management is more determined by cleaning personnel than by RVM. Departing from this experience, the program organized cleaning personnel training for the 2026 Mandalika MotoGP. The material includes

standard operating procedures, the use of personal protective equipment and equipment, the separation of organic and inorganic waste at the source, the flow of waste transfer in the activity area, and service to visitors. The use of RVM in these three activities is documented in Figure 6.



Figure 6. The Use of RVM in Large-Scale Activities
Source: Internal Documentation of PT Bank Rakyat Indonesia (Persero) Tbk. (2026).

The satisfaction survey in the two activities in 2026 showed good acceptance, with an index value of 88.78 in the Environment Day activity (32 respondents) and 86.75 in Pestapora (30 respondents). The value per kilogram of bottles in the two activities, which is around IDR 104 thousand and IDR 53 thousand, is much higher than the average RVM transaction value at fixed points which is around IDR 26 thousand per kilogram. This difference indicates that large-scale activities function more as a means of campaigning and technology introduction than as the main channel for waste collection.

The results of the study show that the support of facilities and training from the program strengthens the operational capacity of the waste bank. The assistance of processing machines, vehicles, and sorting equipment allows the waste bank to develop from just a collection point to a processing unit that produces compost, *Maggot*, and various crafts. These findings are in line with Wijayanti and Suryani (2015) who view waste banks as a form of community-based environmental governance, as well as with Raharjo et al. (2017) which shows that waste banks can improve municipal waste management if supported by adequate facilities and institutions. Within the framework of Ostrom (2010), the company's support in this case strengthens one of the nodes in the polycentric governance system, while the community's role as a manager is maintained.

The next step is to ensure that physical capacity strengthening is followed by institutional strengthening. Dhokhikah et al. (2015) found that residents' participation in waste reduction is influenced by knowledge, facilities, and perceived benefits, so that customer activity needs to be maintained through continuous assistance. The results of the satisfaction survey show a high appreciation for the quality of facilities, while the handling of input and suggestions is an aspect that can continue to be developed. The proposal to establish a forum between waste bank managers is the right step in this direction. According to Ostrom (2010), horizontal networks between governance nodes are important for sharing knowledge and maintaining compliance with common rules, so that this kind of forum can help all waste bank units stay active.

From a circular economy perspective, the waste bank network has implemented the principle of recycling and value recovery on a micro scale, namely by returning materials to the production chain and processing organic waste into compost and *Maggot* (Ghisellini et al., 2016; Kirchherr et

al., 2017). The principle of reducing waste at source can be the focus of further development, for example by adding an indicator of the amount of waste generated by customers' households. In terms of scale, the main contribution of the program lies in the formation of a community-based waste management model that is spread across 12 provinces and can be replicated in other regions. This model is important because urban waste management in developing countries requires community involvement in addition to government services (Kaza et al., 2018; Raharjo et al., 2017).

In the financial aspect, waste savings worth IDR 2.79 billion from 12,869 customers showed that waste banks were able to carry out the savings function for households, most of whom came from low-income groups. This is in line with the findings that poor households actively save when instruments are available that are easily accessible and in accordance with their income patterns (D. Collins et al., 2009; Karlan et al., 2014). Waste savings also have characteristics that facilitate accumulation, since their value comes from a special source, is recorded separately from spending money, and is usually withdrawn at a specific moment. In the framework of mental accounting (Thaler, 1999), this feature makes waste savings easier to maintain than cash, similar to how committed savings products work (Ashraf et al., 2006).

Waste savings can be seen as the first door to financial inclusion. Sarma and Pais (2011) emphasizing that financial inclusion includes access to and use of the formal financial system. Because waste bank balances are recorded outside the formal financial system, saving activities at waste banks cannot be equated with financial inclusion. In this case, savings in waste banks play a role like community savings groups that have proven to be beneficial for household economic resilience (Ksoll et al., 2016). These savings build savings habits and citizens' trust in the record-keeping system, which is an important provision before customers switch to formal financial services. The waste bank thus prepares the behavioral foundation needed for formal financial access to be utilized optimally.

At this stage, the role of banks as the driving force of the program provides its own advantages. Banks have services that can directly connect waste savings with formal accounts, for example through collective accounts for waste banks, individual accounts for customers, or disbursement of balances to digital wallets. Digital financial studies show that reducing transaction costs through digital services can expand the use of financial services and provide real benefits to low-income households (Ozili, 2018; Suri & Jack, 2016). The financial management and bookkeeping training provided by the program is also relevant, as financial literacy is closely related to saving behavior and financial planning (Lusardi & Mitchell, 2014), and financial education has been shown to improve financial behavior (Kaiser et al., 2022).

To strengthen evidence of shared value creation, the integration of waste banks with BRI services can be complemented by more detailed measurements. Crane et al. (2014) and Dembek et al. (2016) emphasizes that CSV requires a clear measure of success, while Gabor and Brooks (2017) reminding the importance of ensuring that financial services are truly beneficial to their users. Indicators that can be used include the number of waste bank customers who open accounts, the frequency of account usage, the proportion of waste bank balances stored in the bank, and

customer access to other services such as business credit. This measurement will help the program show its benefits credibly, both for the community and for the company (Delmas & Burbano, 2011).

In the RVM mechanism, incentives per bottle were proven to be able to encourage high participation, as seen from 1,400 transactions in one day of Environment Day activities. These findings are consistent with the study of the system *Deposit Refund* which indicates that the amount of reward and ease of access determines the return rate of the packaging (Zhou et al., 2020). In order for such enthusiasm to continue to be environmental concern, incentive design needs to pay attention to the balance between rewards and educational messages. Theory *Motivation crowding* explains that rewards can strengthen or weaken intrinsic motivation, depending on how they are perceived (Bowles & Polanía-Reyes, 2012; Frey & Jegen, 2001). Gneezy et al. (2011) It also notes that the effect of incentives may weaken after the incentives are discontinued, so incentives should be combined with habit-building efforts. Program recommendations to link collection targets to environmental achievements and strengthen recycling education are in line with these findings.

The experience at the Pestapora Festival and the Mandalika MotoGP provides valuable input for the development of RVM in large-scale activities. In activities where bottles are provided by the organizers, the success of RVM can be measured by additional indicators, such as the number of unique users, the proportion of bottles brought by themselves, and reuse after the activity. At the Mandalika MotoGP, the collection of large amounts of waste is more supported by cleaning personnel, so the program step of organizing cleaning personnel training for the 2026 implementation is the right response. This is in line with A. Collins et al. (2009) dan Cierjacks et al. (2012) which emphasizes the importance of operational management and number of visitor-based performance indicators in managing the environmental impact of major activities.

Habits are formed through repetition in a stable context (Verplanken & Wood, 2006), while the intention to behave is influenced by the perception of convenience and social norms (Ajzen, 1991). Therefore, RVM in large-scale activities plays an important role as a means of introduction, while RVM at fixed points plays a role in building daily habits. Participants' expectations for RVM to be available in daily life show an opportunity to expand fixed points in easy-to-reach locations. In terms of financial inclusion, RVM has an advantage because it directly generates digital balances. If point disbursement is directed to the user's account or digital wallet, each bottle deposit can become a recurring digital financial transaction.

Thus, the Yok Kita GAS Program can be seen as an effort to create shared value at the level of local cluster development (Porter & Kramer, 2011). For the community, the program results in a cleaner environment, income from processed products, and savings accumulation. For banks, the program strengthens the company's publication and reputation while opening up opportunities to expand the customer base among waste bank administrators and members. This study proposes that the benefits of these businesses be monitored through the indicators of financial inclusion of waste bank customers. In this way, the bank's business interests and the social interests of customers can be assessed with the same indicators, in line with the basic idea of CSV (Crane et al., 2014; Porter & Kramer, 2011).

This study uses secondary data from the company's internal documents, so that the changes that occurred have not been compared with the conditions before the program or with the comparison group. RVM data on large-scale activities also reflect activities in a short period of time. Further research can complement these findings with primary data from customers and banking service data, especially to measure the connection between waste savings and accounts and the use of formal financial services.

CONCLUSION

This study demonstrated that bank-supported waste management initiatives strengthened community-level waste management infrastructure and established potential pathways toward financial inclusion. The Yok Kita GAS program supported 47 waste management units, comprising 40 waste banks and seven markets, across 12 Indonesian provinces. It distributed 2,477 units of essential equipment, facilitated the management of approximately 228.9 metric tons of waste, and recorded customer savings totaling IDR 2.79 billion. Reverse vending machines (RVMs), deployed at permanent locations and large-scale events, provided additional digital interaction points by converting deposited plastic bottles into reward points or digital balances.

However, the pathway toward formal financial inclusion remained only partially substantiated. Although the conversion of recyclable waste into recorded savings was documented, the subsequent transition from waste-based savings to formal financial accounts and services had not been empirically verified. Conceptually, the findings positioned waste bank savings as a potential preliminary stage of financial inclusion that could encourage savings behavior but required institutional and technological mechanisms to facilitate integration into the formal financial system. From a practical perspective, bank-supported programs should establish stronger connections between waste bank savings and formal bank accounts or digital wallets, incorporate account ownership and active financial service utilization into performance indicators, and design RVM incentive mechanisms that prioritize unique user participation and repeated engagement. Additional institutional support should also be directed toward underperforming waste management units. Future research should incorporate primary data from waste bank customers and verified banking records to examine actual financial inclusion outcomes, including comparative assessments of waste banks with and without formal financial service linkages.

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