The Effect of Sorting Waste Saving Gold on Financial Independence and Sustainable Behavior Mediated by Financial Inclusion

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Submitted: **January 17, 2026**

Revised: **January 20, 2026**

Accepted: **February 13, 2026**

Published Online: **March 31, 2026**

ABSTRACT

Indonesia faces waste management and financial inclusion challenges. Pegadaian's Sorting Waste, Saving Gold program addresses both by converting sorted inorganic waste into digital gold savings that promote sustainability and financial inclusion. This study examines the program's effects on financial independence and sustainable behavior, with financial inclusion as a mediating variable. A quantitative explanatory approach was employed through a survey of 2,173 active participants who had joined the program for at least three months and maintained active gold savings accounts. Data were analyzed using partial least squares structural equation modeling. Findings reveal that the program has a positive and significant effect on financial inclusion, financial independence, and sustainable behavior. Financial inclusion plays a strong mediating role, especially in the relationship with financial independence, where the indirect effect substantially outweighs the direct effect. For sustainable behavior, the program exerts a robust direct influence that is further enhanced through financial inclusion. The program proves that linking waste management to simple financial tools can broaden inclusion, empower people economically, and build lasting eco-friendly routines. Pegadaian should scale waste bank partnerships, upgrade digital features, and add basic financial education for stronger, sustained impact.

Keywords: *Circular Economy, ESG, Financial Inclusion, Financial Independence, Sorting Waste Saving Gold, Sustainable Behavior.*

INTRODUCTION

Indonesia faces a serious waste management problem, especially with plastic waste. According to recent data from the World Bank (2021) and UNEP (2023), Indonesia produces around 7.8 million tons of plastic waste each year. Much of this waste is not properly managed, and about 4.9 million tons end up as mismanaged plastic waste. A large part leaks into rivers and oceans, making Indonesia one of the top contributors to marine plastic pollution in the world. The National Plastic Action Partnership (NPAP, 2021) and OECD (2022) reports show that unmanaged waste harms the environment, health, and local economies. This issue becomes worse in developing countries like Indonesia because of limited infrastructure, low community participation, and high costs for recycling (Kirchherr, 2022). The Geissdoerfer et al. (2020) and Ellen MacArthur Foundation (2021) explain that traditional linear economy models create more waste and use resources inefficiently. A shift to circular economy principles is needed to reduce waste, reuse materials, and create new value from what was once considered trash (Kandpal et al., 2023; Jongsuksomsakul, 2024).

At the same time, many Indonesians still lack access to formal financial services. The Financial Services Authority reports that financial inclusion has improved, but financial literacy remains low. This makes it hard for people to save, invest, or manage money well.

JIMKES

Jurnal Ilmiah Manajemen Kesatuan
Vol. 14 No. 2, 2026
pp. 1659-1670
IBI Kesatuan
ISSN 2337 – 7860
E-ISSN 2721 – 169X
DOI: 10.37641/jimkes.v14i2.4980

Allen et al. (2022) from the World Bank show that limited access to finance increases economic vulnerability, especially for low-income groups. Dhar and Varshney (2021) and Nair and Menon (2022) find that financial inclusion helps households build resilience and plan for the future. In developing countries, programs that combine financial services with community activities work better because they create habits of saving and managing money (Zulfiqar et al., 2020; Rashid & Razak, 2022). Hashmi and Damanhuri (2022) add that digital savings tools can help low-income people feel more secure financially. Teng et al. (2020) and OECD (2021) also say that access to simple financial products supports long-term financial independence.

PT Pegadaian, as a major financial institution in Indonesia, has launched the "The Gade Clean and Gold" program (also known as Sorting Waste, Saving Gold) to address both waste and financial issues. This program is part of Pegadaian's ESG and CSR efforts. It lets people sort inorganic waste and exchange it for digital gold savings (Fianto et al., 2020; Karnawijaya et al., 2021; Laksmono, 2023; Tiyarna et al., 2024). The program follows circular economy ideas by turning waste into economic value (Jain & Mittal, 2024; Sangaji & Adawiyan, 2025; Perez, 2025). It also promotes sustainable behavior by giving rewards for eco-friendly actions (Khan et al., 2022; Gao & Zhang, 2023; Li & Wu, 2023). Gifford (2020) and Wang et al. (2020) explain that incentives make people more likely to keep pro-environmental habits. Xiao and Li (2021) note that hands-on programs help build awareness and change behavior over time.

Despite these efforts, few studies have looked at how such programs affect financial inclusion, independence, and sustainable behavior together. Most research focuses on financial literacy alone or environmental incentives without linking to financial outcomes (Gao & Zhang, 2023; Li & Wu, 2023). According to Fianto et al. (2020) and Karnawijaya et al. (2021), the Gade Clean and Gold helps with financial inclusion and green economy, but they do not fully examine the mediation role of financial inclusion. Laksmono (2023) and Tiyarna et al. (2024) describe the program as CSR innovation, but they do not test its impact on sustainable behavior through financial channels. Ojeda-Cortés and Camarena (2025) and Hoang Tien et al. (2025) discuss the circular economy in other contexts, but not in Indonesia's pawnshop programs. This creates a research gap, there is little evidence on how waste-to-gold programs can bridge environmental actions with financial independence via financial inclusion in one model.

This study aims to fill this gap by analyzing the effect of the Sorting Waste, Saving Gold program on financial independence and sustainable behavior among Pegadaian participants. It also examines financial inclusion as a mediating variable. The research uses PLS-SEM to test direct and indirect relationships. The findings will show how circular economy-based programs can support SDGs, especially SDG 8 (decent work and economic growth), SDG 11 (sustainable cities), and SDG 12 (responsible consumption). This will give practical ideas for Pegadaian and similar institutions to improve ESG programs.

LITERATURE REVIEW & HYPOTHESIS DEVELOPMENT

The Effect of Sorting Waste, Saving Gold Program

The "Sorting Waste, Saving Gold" program, also known as The Gade Clean and Gold, is a key ESG initiative by PT Pegadaian. This program lets participants sort inorganic waste and exchange it for digital gold savings through waste banks and Pegadaian branches (Fianto et al., 2020; Karnawijaya et al., 2021). It follows circular economy principles by turning waste into valuable resources, reducing landfill use, and creating economic benefits (Geissdoerfer et al., 2020; Ellen MacArthur Foundation, 2021). Kirchherr (2022) points out that in developing countries like Indonesia, community-based circular programs face barriers such as low participation and infrastructure limits, but incentives help overcome them. The program provides direct rewards, so people see waste sorting as useful for both the environment and personal finance (Jongsuksomsakul, 2024; Perez, 2025).

This approach connects waste management to financial services. Participants open gold savings accounts easily, often for the first time, which boosts access to formal finance (Laksmono, 2023; Tiyarna et al., 2024). Khan et al. (2022) and Gao and Zhang (2023) explain that waste-to-wealth programs increase pro-environmental actions when linked to economic gains. Li and Wu (2023) add that household incentives strengthen consistent, sustainable habits. The program builds financial habits through regular small savings from waste, leading to better money management (Hashmi & Damanhuri, 2022). It also encourages independence by giving people control over assets without relying on others (Teng et al., 2020; OECD, 2021). The program acts as a bridge between environmental actions and financial outcomes.

H1: The sorting waste, saving gold program has a positive and significant effect on financial inclusion.
H2: The sorting waste, saving gold program has a positive and significant effect on financial independence.
H3: The sorting waste, saving gold program has a positive and significant effect on sustainable behavior.

The Effect of Financial Inclusion on Financial Independence and Sustainable Behavior

Financial inclusion means easy access to and use of formal financial services, including for low-income groups. It covers access, usage, quality of services, and financial literacy (Ozili, 2020; Allen et al., 2022). Financial Services Authority (2022) reports that while access has grown in Indonesia, many people still lack the understanding to use services well. Dhar and Varshney (2021) find that inclusion builds household resilience by helping people save and plan. Nair and Menon (2022) show that community-based programs make inclusion more effective because they create real habits. Digital tools like gold savings lower barriers for those without bank accounts (Hashmi & Damanhuri, 2022).

Financial inclusion directly supports financial independence. Independence is the ability to manage income, make decisions, and handle risks without depending on others (Teng et al., 2020). When people use formal services regularly, they develop skills in budgeting and saving (Zulfiqar et al., 2020). Rashid and Razak (2022) and Rahmiyati (2025) note that ESG-linked inclusion programs encourage long-term financial habits. This leads to greater control and stability. Inclusion also promotes sustainable behavior. Financially secure people have more space to think about long-term environmental impacts (Wang et al., 2020; Li & Wu, 2023). Gifford (2020) explains that motivation for green actions grows when basic needs are met. Xiao and Li (2021) add that awareness programs work better with economic support. In programs like Pegadaian's, inclusion ties waste sorting to personal benefits, making sustainable habits stronger (Kandpal et al., 2023).

H4: Financial inclusion has a positive and significant effect on financial independence.
H5: Financial inclusion has a positive and significant effect on sustainable behavior.

The Mediating Effect of Financial Inclusion

Financial inclusion can act as a mediator between the Sorting Waste, Saving Gold program and its outcomes. It bridges environmental activities to financial results by turning waste exchanges into structured savings (Ozili, 2020). Nair and Menon (2022) argue that community interventions work best when combined with financial access. Dhar and Varshney (2021) show that simple mechanisms build long-term habits. In Pegadaian's case, waste-to-gold creates ongoing use of accounts, which strengthens independence (Teng et al., 2020; Hashmi & Damanhuri, 2022).

The mediation also applies to sustainable behavior. Access to finance gives security, so people stick to green habits longer (Wang et al., 2020; Li & Wu, 2023). Gao and Zhang (2023) find that economic incentives via inclusion deepen motivation. Xiao and Li (2021) and Rashid and Razak (2022) note that financial knowledge raises awareness of long-term

impacts. Ojeda-Cortés and Camarena (2025) discuss similar mediation in social circular economy models. Hoang Tien et al. (2025) highlight how financial institutions support circular transitions.

H6: Financial inclusion mediates the effect of the sorting waste, saving gold program on financial independence.
H7: Financial inclusion mediates the effect of the sorting waste, saving gold program on sustainable behavior.

This study builds an integrated model linking the sorting of waste, the saving gold program (independent variable), to financial independence and sustainable behavior (dependent variables), with financial inclusion as the mediator. The framework draws from circular economy theories (Geissdoerfer et al., 2020; Ellen, 2021) and financial inclusion models (Ozili, 2020; Allen et al., 2022). Program participation leads to inclusion through easy access and usage (Fianto et al., 2020; Karnawijaya et al., 2021). Inclusion then drives independence (Teng et al., 2020) and sustainable actions (Gifford, 2020; Li & Wu, 2023). Direct paths from the program to outcomes are also tested (Khan et al., 2022; Gao & Zhang, 2023).

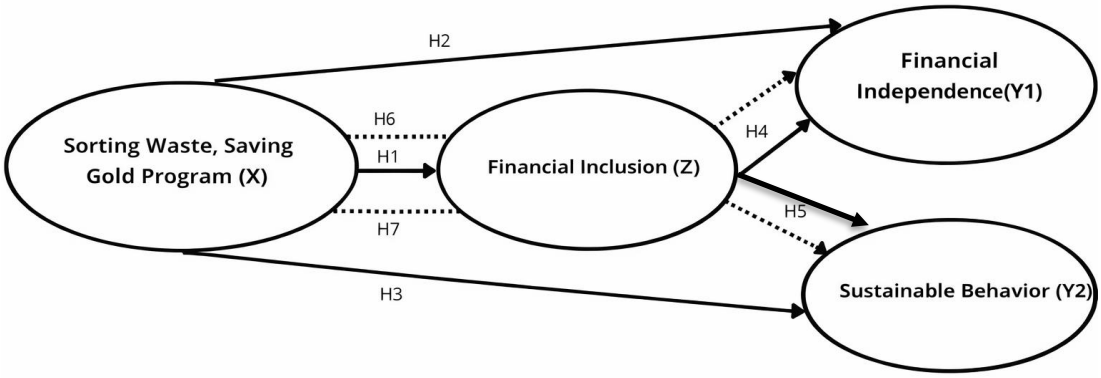

Figure 1. Research Framework

The model applies Partial Least Squares–Structural Equation Modeling (PLS-SEM) to examine both direct and indirect relationships among variables and to test the mediating role of financial inclusion in strengthening program outcomes (Hair et al., 2021). As illustrated in Figure 1, the conceptual framework explains how the waste sorting and gold saving program affects financial independence and sustainable behavior through financial inclusion, while also accounting for direct influences on both outcomes. This framework provides a structured understanding of how environmental, social, and governance-oriented programs generate integrated environmental and financial benefits in the Indonesian context (Kandpal et al., 2023; Jain & Mittal, 2024; Perez, 2025).

RESEARCH METHODS

This study adopts a quantitative explanatory approach using a survey design to examine the relationships among the Sorting Waste, Saving Gold program, financial inclusion, financial independence, and sustainable behavior. The target population consists of active Indonesian Waste Care Friends Forum participants (*Forum Sahabat Peduli Sampah Indonesia*/FORSEPSI), totaling 16,722 individuals who have been involved in the waste-to-gold savings conversion program and maintain active gold savings accounts at Pegadaian. A purposive sampling technique was applied to select respondents who had participated in the program for at least three months, possessed an active gold savings account, and were at least 17 years old. These criteria ensured that only experienced participants who could provide meaningful responses were included in the study.

The data collection process resulted in 2,173 valid respondents across various Pegadaian regional offices in Indonesia. Questionnaires were distributed online and through field assistance at waste bank locations and Pegadaian branches. The instrument used a five-point Likert scale (1 = strongly disagree to 5 = strongly agree) to measure the key variables. Items for the Sorting Waste, Saving Gold program focused on participation, environmental education, literacy, and the perceived fairness of the waste-to-gold exchange system. Financial inclusion items assessed access to services, usage frequency, and financial literacy gained through the program. Financial independence covered personal financial management skills, economic resilience, and decision-making ability. Sustainable behavior items evaluated pro-environmental habits, social awareness, and adoption of a sustainable lifestyle. All indicators were adapted from established studies and refined through expert judgment to ensure content relevance and clarity in the Indonesian context.

Before full distribution, a pilot test was conducted with a small group of participants to check item clarity, wording, and initial reliability. Minor adjustments were made based on feedback to improve understanding and reduce ambiguity. Data analysis employed Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS software. This method was selected because it effectively handles complex models with direct effects, indirect effects through mediation, and formative or reflective constructs. The analysis process included evaluation of the measurement model (convergent validity via outer loadings and AVE, discriminant validity via cross-loadings, and reliability via Cronbach's alpha and composite reliability), followed by assessment of the structural model (R^2, Q^2, f^2, path coefficients, and mediation testing using bootstrapping). This step-by-step procedure allowed for a robust examination of how financial inclusion mediates the program's impact on financial independence and sustainable behavior among low- to middle-income participants.

RESULTS

This section presents the findings from the data analysis of 2,173 respondents who actively participated in Pegadaian's sorting waste, saving gold program. The results start with the demographic profile of the respondents, followed by descriptive statistics of the main variables, evaluation of the measurement model, assessment of the structural model, and hypothesis testing. All analyses were performed using Partial Least Squares Structural Equation Modeling (PLS-SEM) in SmartPLS software. Thus, the findings provide strong empirical support for the proposed relationships, highlighting the important mediating role of financial inclusion.

Table 1. Demographic Profile

Category	Subcategory	Percentage
Regional Office	Semarang Regional Office	30.2%
	Pekanbaru Regional Office	18.5%
	Jakarta Regional Office	8.3%
	Balikpapan Regional Office	7.6%
	Surabaya Regional Office	7.5%
	Palembang Regional Office	7.0%
	Bandung Regional Office	6.2%
	Jakarta Regional Office 2	6.0%
	Makassar Regional Office	5.9%
	Medan Regional Office	2.2%
	Denpasar Regional Office	0.5%
Work	Housewife	56.7%
	Other	16.5%
	Self-employed	11.0%
	ASN	8.3%
	Private/State-Owned Enterprise Employees	4.0%
	Student	2.4%
	Community/NGO/NGO	0.7%
	Academic/Lecturer/Researcher	0.5%

Category	Subcategory	Percentage
Income	< IDR1,000,000	49.2%
	IDR1,000,000 – IDR3,000,000	28.9%
	IDR3,000,001 – IDR5,000,000	15.3%
	IDR5,000,001 – IDR10,000,000	5.5%
	IDR10,000,001 – IDR20,000,000	0.8%
	> IDR20,000,000	0.4%
Education Levels	High School/Vocational School/Equivalent	48.0%
	Bachelor's Degree (S1)	24.6%
	Junior High School/Equivalent	12.7%
	Diploma (D1–D3)	7.7%
	Elementary School/Equivalent	4.9%
	Master's (S2)	2.0%
	Doctoral (S3)	0.1%
Number of Family Members	4 people	34.2%
	5 people	22.2%
	3 people	22.0%
	2 persons	11.1%
	> 5 people	7.5%
	1 person	2.9%
Length of Time Joining	2024	30.7%
	2023	24.2%
	2025	16.8%
	2022	8.5%
	2018	6.3%
	2019	6.2%
	2020	3.6%
	2021	3.6%

The respondents came from various Pegadaian regional offices across Indonesia. Table 1 summarizes their demographic characteristics. The largest proportion was from the Semarang Regional Office (30.2%), followed by Pekanbaru (18.5%) and Jakarta (8.3%). Most participants were housewives (56.7%), while others included self-employed individuals (11.0%), civil servants (8.3%), private or state-owned enterprise employees (4.0%), students (2.4%), and smaller groups from NGOs or academia. Income distribution showed that 49.2% earned less than IDR 1,000,000 per month and 28.9% earned between IDR 1,000,000 and IDR 3,000,000. Education levels were mainly high school/vocational (48.0%) or bachelor's degree (24.6%). Family size was most commonly four members (34.2%). In terms of program participation, 30.7% joined in 2024, 24.2% in 2023, and the rest in earlier years. These demographics reflect the typical profile of Pegadaian's community-based ESG program participants, who are predominantly from lower- to middle-income households and actively involved in waste sorting activities.

Descriptive statistics revealed high positive perceptions toward all variables. The sorting waste, saving gold program had an overall mean of 4.54 on a 5-point Likert scale. Only 0.1% of respondents strongly disagreed, and 0.2% disagreed, while 55.5% strongly agreed and 41.7% agreed. The highest-rated indicator was "I understand the environmental benefits from the habit of sorting rubbish" (mean = 4.63), and the lowest was the perceived fairness and transparency of the waste-to-gold exchange rate (mean = 4.43). Financial inclusion scored an overall mean of 4.44, with 47.5% strongly agreeing and 46.6% agreeing. The strongest item was easy access to financial information through the program (mean = 4.47), while ownership of a gold savings account from the program was slightly lower (mean = 4.39). Financial independence had a mean of 4.40, with the highest score for more regular financial planning after joining (mean = 4.42) and the lowest for having emergency funds (mean = 4.38). Sustainable behavior achieved the highest overall mean of 4.46, led by greater discipline in sorting and collecting inorganic waste (mean = 4.53), though active participation in environmental social activities was a bit lower (mean = 4.42). These results indicate that participants generally viewed the program as effective in delivering environmental, financial, and behavioral benefits.

Table 2. Summary of Measurement Model

Construct	Outer Loadings Range	AVE	Composite Reliability (CR)	Cronbach's Alpha
Sorting Waste, Saving Gold Program	0.730 – 0.871	0.673	0.933	0.930
Financial Inclusion	0.730 – 0.871	0.696	0.941	0.937
Financial Independence	0.730 – 0.871	0.711	0.950	0.942
Sustainable Behavior	0.730 – 0.871	0.733	0.957	0.948

Table 2 summarizes the key measurement model results. The measurement model was assessed for validity and reliability. All outer loadings exceeded 0.70, confirming convergent validity. The Average Variance Extracted (AVE) values were above 0.50 for all constructs: sorting waste, saving gold program (0.673), financial inclusion (0.696), financial independence (0.711), and sustainable behavior (0.733). This shows that more than 67% of the variance in each construct was explained by its indicators. Composite Reliability (CR) ranged from 0.933 to 0.957, and Cronbach's Alpha values were all above 0.90 (from 0.930 to 0.948), demonstrating excellent internal consistency.

Table 3. Structural Model Evaluation (R^2, Q^2, f^2, and SRMR)

Endogenous Construct	R^2	Q^2 (Construct Level)	Key f^2 Values	SRMR (Saturated / Estimated)
Financial Inclusion	0.646	0.415	Program → Inclusion: 1.822 (very large)	0.053 / 0.061
Financial Independence	0.639	0.306	Inclusion → Independence: 0.507 (large)	-
Sustainable Behavior	0.628	0.394	Program → Behavior: 0.273 (medium)	-

Table 3 presents the key structural model evaluation metrics. The structural model demonstrated strong explanatory and predictive power. The R^2 values were 0.646 for financial inclusion (64.6%), 0.639 for financial independence (63.9%), and 0.628 for sustainable behavior (62.8%). These values indicate substantial explanatory power. Predictive relevance was confirmed with Q^2 values of 0.415 for financial inclusion, 0.306 for financial independence, and 0.394 for sustainable behavior (all positive and well above 0). The overall model predictive relevance reached $Q^2 = 0.953$, indicating very strong out-of-sample predictive ability. Model fit was acceptable, with SRMR values of 0.053 (saturated model) and 0.061 (estimated model), both below the recommended 0.08 threshold. Effect sizes (f^2) were very large for the program on financial inclusion ($f^2 = 1.822$), large for inclusion on independence ($f^2 = 0.507$), and medium for the program on sustainable behavior ($f^2 = 0.273$).

Table 4. Hypothesis Testing Results

Relationship between Constructs	Original Sample (β)	t-statistics	p-value	Conclusion
Sorting Waste, Saving Gold Program → Financial Inclusion	0.803	89.003	0.000	Positive & Significant
Sorting Waste, Saving Gold Program → Financial Independence	0.099	3.646	0.000	Positive & Significant
Sorting Waste, Saving Gold Program→ Sustainable Behavior	0.535	19.413	0.000	Positive & Significant
Financial Inclusion → Financial Independence	0.718	28.267	0.000	Positive & Significant
Financial Inclusion → Sustainable Behavior	0.296	10.250	0.000	Positive & Significant
Sorting Waste, Saving Gold Program→ Financial Inclusion → Financial Independence	0.577	25.464	0.000	Positive & Significant (Mediation)

Relationship between Constructs	Original Sample (β)	t-statistics	p-value	Conclusion
Waste Sorting Program → Financial Inclusion → Sustainable Behavior	0.237	10.172	0.000	Positive & Significant (Mediation)

Hypothesis testing results are shown in Table 4. Hypothesis testing is carried out by assessing the path coefficients, t-statistics, and the level of significance (p-values). The results of the analysis using bootstrapping show that most of the relationships between variables in the model are proven to be significant, which confirms that the relationship structure built is in accordance with the theoretical direction of the research. The test results show that inclusion finance has a positive and significant influence on independent financial with a coefficient value of 0.718 and a t-statistic of 28.267 ($p < 0.001$). This finding confirms that increased financial access, use, and literacy contribute directly to strengthening respondents' ability to manage personal finances. Furthermore, financial inclusion also proved to have a significant effect on sustainable behavior, with a coefficient of 0.296 and a t-statistic of 10.250 ($p < 0.001$), indicating that involvement in financial services encourages more environmentally and socially responsible behavior.

Furthermore, the sorting waste, saving gold program has a positive and significant influence on financial inclusion, with a coefficient of 0.803 and a t-statistic as big as 89,003 ($p < 0.001$). Matter, this shows that the program is effective in encouraging people to access and use financial services through mechanisms, such as savings gold. On connection next, the waste sorting program is also significantly influential to behavior sustainability, with a coefficient of 0.535 and a t-statistic of 19.413 ($p < 0.001$). These findings indicate that participation in the program directly encourages pro-environmental behavior.

In contrast to other relationships, the direct influence of the sorting waste, saving gold program on financial independence shows a relatively small coefficient, namely 0.099, with a t-statistic of 3.646 ($p < 0.001$). Although statistically significant, the direct contribution is far lower than the indirect effect through financial inclusion. This pattern indicates that the increase in participants' financial independence is more due to the ease of access to financial services resulting from the program, rather than from the sorting activity. waste directly. The results of the hypothesis testing indicate that most of the relationships between variables are in the direction consistent with the theoretical basis of the model. Financial inclusion has been shown to play a significant role as a connecting variable in strengthening the impact of the waste sorting program on financial independence and sustainable behavior. Thus confirming the mediation role that has been formulated in the conceptual framework.

DISCUSSION

The results show that the sorting waste, saving gold program has a strong positive and significant effect on financial inclusion, with a path coefficient of 0.803. This finding aligns with previous studies indicating that community-based programs can effectively bring unbanked or underbanked individuals into the formal financial system when services are linked to everyday activities (Ozili, 2020; Nair & Menon, 2022). In the context of Pegadaian, the simple mechanism of exchanging sorted waste for digital gold savings lowers entry barriers and creates a practical entry point for financial engagement. Participants who were previously unfamiliar with formal savings products now regularly interact with their gold accounts, monitor balances, and experience direct benefits. Fianto et al. (2020) and Karnawijaya et al. (2021) reported similar patterns in early descriptions of the *gade* clean and gold, where waste-to-value conversion encouraged account opening and usage among low-income households. The high coefficient suggests that the program design is particularly effective in Indonesia's context, where trust in financial institutions often grows through tangible, community-linked incentives (Allen et al., 2022).

The direct effect of the program on financial independence is positive but relatively small (β = 0.099), while the indirect effect through financial inclusion is much larger (β = 0.577). This pattern indicates partial mediation and confirms that the program's impact on independence mainly operates via increased access, usage, and literacy in financial services (Dhar & Varshney, 2021; Hashmi & Damanhuri, 2022). Many participants reported more regular financial planning and a growing sense of control after joining, yet the direct link remains modest because the program focuses more on habit formation than on advanced financial education. Teng et al. (2020) emphasized that true independence requires not only access but also ongoing skill-building, which suggests Pegadaian could strengthen outcomes by adding targeted modules on budgeting and emergency planning. The mediation result supports the idea that formal financial tools act as a bridge, turning small, consistent savings from waste into meaningful economic resilience (OECD, 2021).

The program also directly influences sustainable behavior (β = 0.535), and financial inclusion further strengthens this relationship through partial mediation (β = 0.237). Participants became more disciplined in sorting waste and collecting inorganic materials because they saw clear economic returns in their gold balances. This finding is consistent with research showing that economic incentives combined with environmental education lead to more persistent pro-environmental habits (Khan et al., 2022; Li & Wu, 2023; Gao & Zhang, 2023). Gifford (2020) explained that direct experiences of benefit reinforce motivation, while Wang et al. (2020) and Xiao and Li (2021) noted that linking personal gains to environmental actions increases long-term commitment. In this case, the gold savings mechanism provides a visible reward loop that makes sustainable behavior feel both socially responsible and financially smart. The total effect on sustainable behavior (direct + indirect = 0.772) highlights the program's dual success in environmental and behavioral change.

Financial inclusion itself emerges as a powerful predictor of both financial independence (β = 0.718) and sustainable behavior (β = 0.296). The strong link to independence reflects how regular use of Pegadaian's services builds confidence in managing finances and reduces reliance on informal sources (Rashid & Razak, 2022). The smaller but significant effect on sustainable behavior suggests that financial security creates mental space for long-term thinking about the environment (Jain & Mittal, 2024; Perez, 2025). Tong et al. (2024) and Hoang Tien et al. (2025) discussed similar dynamics in green finance contexts, where inclusion supports broader sustainability transitions without greenwashing risks.

These findings carry several practical implications for Pegadaian and similar institutions. First, the program should continue expanding waste bank networks and digital tools to maintain high inclusion levels. Second, managers need to integrate simple financial education sessions, such as short app tutorials or community workshops, into waste collection events to amplify effects on independence. Third, transparent communication about exchange rates and balance growth can further boost trust and participation (Kirchherr, 2022; Ojeda-Cortés & Camarena, 2025). Pegadaian can position this initiative as a model for ESG-driven financial services in emerging markets, contributing to SDGs 8, 11, and 12 while building customer loyalty and brand reputation as a sustainable institution.

CONCLUSION

This study demonstrates that Pegadaian's sorting waste, saving gold program effectively promotes financial inclusion, financial independence, and sustainable behavior among its participants. The program successfully transforms everyday waste sorting into a gateway for accessing formal financial services, building consistent saving habits, and encouraging long-term, environmentally friendly actions. Financial inclusion plays a central mediating role, particularly in strengthening financial independence, where the indirect effect through inclusion far outweighs the direct impact of the program itself. For sustainable behavior, the program has a strong direct influence that is further reinforced by financial inclusion. These results highlight how integrating circular economy principles

with accessible financial tools can create meaningful dual benefits, economic empowerment for individuals and positive environmental change for communities.

The findings offer several practical implications for Pegadaian and similar institutions. Managers should prioritize expanding waste bank networks, improving digital gold savings features, and incorporating basic financial education into program activities to maximize long-term impacts. However, the study has limitations, including its cross-sectional design, reliance on self-reported data, and focus on active participants only, which may limit generalizability and causal claims. Future research could adopt longitudinal approaches, include control variables such as age or prior financial knowledge, compare this program with similar initiatives in other countries, or explore additional mediators like environmental awareness to deepen understanding of these dynamics.

FUNDING STATEMENT: This research did not receive any specific grant from funding agencies in the public, commercial, or not - for - profit sectors.

CONFLICTS OF INTEREST: The author declares no conflict of interest.

DECLARATION OF GENERATIVE AI STATEMENT: During the preparation of this work, the author(s) used ChatGPT, Grammarly, and Turnitin in order to support academic writing clarity, improve linguistic accuracy, and ensure compliance with plagiarism standards. After using this tool/service, the author(s) reviewed and edited the content as needed and take full responsibility for the content of the publication.

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The Effect of Sorting
Waste Saving Gold on
Financial Independence

1670