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THE IMPACT OF COMMUNITY PARTICIPATION ON SOLID WASTE MANAGEMENT PRACTICES IN RWANDA: A CASE OF AGRUNI COMPANY IN RWAMAGANA DISTRICT (2023-2025)

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ABSTRACT

The purpose of the study is to evaluate the impact of community participation on solid waste management in Rwanda, a case of AGRUNI Company in Rwamagana District (2021-2025)". Research design to be used was descriptive and explanatory research design. The study used the population of 12,008 people and the sample size of 388 clients of AGRUNI Company. Questionnaire, interview were used to collect primary data and documentary review was used to collect secondary data. Descriptive statistics and inferential statistics were used to analyse data with a help of SPSS version 26. The study found that community participation significantly influences solid waste management practices in Rwamagana District, with decision-making and monitoring being the strongest predictor ($B = 0.659$, $p = 0.000$), followed by clean-up activities ($B = 0.100$, $p = 0.000$) and communication ($B = 0.081$, $p = 0.000$), while awareness and environmental education was not significant ($B = 0.020$, $p = 0.203$). Secondary data show high waste generation of 36 MT per month, only one dumping site, 324 waste bins, and low collection coverage of 40%. Transportation challenges and poor rural recycling systems further reduce efficiency, despite 80% biodegradable waste and 20% recycled materials. Regression results clearly indicate a significant positive relationship between community participation and waste management performance. Community participation significantly improves solid waste management in Rwamagana District, but its impact is uneven due to weak awareness and infrastructural limitations. The study recommended that Rwamagana District, AGRUNI, and REMA should prioritize strengthening decision-making participation, improving waste infrastructure, and enhancing practical environmental education programs.

Keywords: Community participation, Decision making, Waste generation, Community communication, Solid waste management

1 INTRODUCTION

Solid waste management has become a major environmental and public health concern worldwide due to population growth, urbanization, and changing consumption patterns. Kaza et al. (2021) noted that increasing waste generation places significant pressure on existing waste management systems. Effective management requires not only infrastructure and policies but also active community participation in waste reduction, collection, segregation, recycling, and disposal. In Africa, inadequate resources, weak institutional capacity, and limited community involvement continue to affect effective waste management (Sinha & Enayetullah, 2023).

In East Africa, community participation has increasingly been recognized as important for improving sustainable waste management practices. Mpuya (2025) found that household involvement in decision-making and monitoring can strengthen environmental cleanliness and compliance with waste management practices. Similarly, communication, environmental education, and community clean-up activities can encourage responsible waste handling and collective environmental responsibility. In Rwanda, initiatives such as Umuganda support community involvement, although challenges remain in waste collection, transportation, recycling, and disposal.

In Rwamagana District, AGRUNI provides solid waste management services, while increasing urbanization and economic activities contribute to growing waste management demands. Irabaruta and Ndokoye (2024) observed that awareness of waste management does not always translate into active community participation. Limited evidence is available on how community awareness and environmental education, clean-up activities, communication, and decision-making and monitoring contribute to waste management under AGRUNI operations. Therefore, this study examines the impact of community participation on solid waste management practices in Rwamagana District.

1.1 Research objectives

i. To assess the relationship between community participation and solid waste management practices in Rwamagana District.

1.2 Theoretical review

The present study is based on Stakeholder Theory, Theory of Planned Behavior, Social Capital Theory and Community Participation Theory:

1.2.1 Stakeholder Theory

The Theory of Planned Behavior, developed by Ajzen (1991), explains that behaviour is influenced by attitudes, subjective norms, and perceived behavioural control. It assumes that individuals are more likely to engage in desired behaviours when they perceive them as beneficial, socially supported, and within their ability to perform, although behaviour may also be affected by external factors beyond individual control. The theory is relevant because awareness, environmental education, and community training can influence residents' attitudes and norms toward proper waste handling and participation. In this study, it explains how improved awareness and perceived control can encourage household waste segregation, recycling, clean-up participation, and responsible waste disposal in Rwamagana District.

1.2.2 Theory of Planned Behavior

The Theory of Planned Behavior, developed by Ajzen (1991), explains that individual behaviour is influenced by attitudes toward the behaviour, subjective norms, and perceived behavioural control. The theory assumes that people make rational decisions based on their beliefs about outcomes and social expectations. In the context of environmental management, residents are more likely to participate in waste management practices when they believe such behaviours are beneficial and socially supported. The Theory of Planned Behavior is highly relevant to studies on community participation in solid waste management. In relation to this study on the impact of community participation on solid waste management in Rwamagana District, the theory explains how community awareness campaigns, environmental education, and training programs can shape positive attitudes and social norms toward proper waste handling. Consequently, improving community knowledge and perceived control over waste management practices can enhance participation in clean-up activities, recycling, and waste segregation at the household level.

1.2.3 Social Capital Theory

Social Capital Theory, advanced by Putnam (2000), emphasizes social networks, trust, shared norms, and cooperation as foundations for collective community action. It assumes that strong relationships and mutual trust encourage individuals to cooperate in addressing common problems, although unequal access to networks may limit participation among some community members. The theory is relevant to solid waste management because social cohesion can facilitate collective clean-up activities, information sharing, waste monitoring, and community-based environmental initiatives. In this study, it explains how cooperation among residents, local leaders, AGRUNI, and community committees can strengthen collective responsibility and improve sustainable solid waste management.

1.3 Empirical review

Irabaruta and Ndokoye (2024) conducted a study titled "Knowledge Assessment of Local People on Solid Waste Management in Rwanda: A Case Study of Nyamata City in Bugesera District" to assess the level of knowledge and practices of residents regarding solid waste management. The study employed a survey design using questionnaires administered to local residents. The findings revealed that community members possessed a high level of awareness regarding solid waste management and recognized the importance of proper waste handling practices. However, the study established that despite this high level of knowledge, the actual practice of waste segregation and proper waste

management remained relatively low. The results further demonstrated a positive relationship between residents' knowledge and their waste management practices, indicating that increased awareness contributes to improved waste management behaviour. The study concluded that although awareness and knowledge of solid waste management are relatively high, practical implementation of waste segregation and proper waste handling remains inadequate.

Temeh (2025) conducted a study titled "The Impact of Solid Waste Management on Community Livelihoods in Gasabo District, Rwanda: A Case Study of Nduba Landfill (2019–2023)" to examine how solid waste management practices influence community livelihoods. The study adopted a mixed-methods descriptive survey design and incorporated environmental sample testing to assess the environmental impacts of waste management activities. The findings revealed that community members generally held positive perceptions regarding waste management and waste handling practices. However, environmental assessments indicated significant levels of environmental pollution associated with landfill operations, particularly in water quality indicators. The study further established that efficient waste collection systems and effective emission control measures significantly contribute to improving community livelihoods and environmental conditions. The study concluded that integrated solid waste management practices have the potential to improve both environmental quality and community well-being. However, the study emphasized the need for stronger stakeholder coordination, improved environmental monitoring, and more inclusive governance systems to enhance the sustainability and effectiveness of waste management programs.

Robert (2024) conducted a study titled "Assessing Challenges to Solid Waste Management in Urban Local Authorities in Uganda: A Case of Arua Municipality" to examine institutional, financial, demographic, and behavioural factors affecting solid waste management performance. The study employed a case study design involving households, business operators, and waste collectors, and data were analyzed using descriptive statistics and regression analysis. The findings revealed that rapid urban population growth negatively affected solid waste management performance, while the availability of financial resources positively influenced waste management effectiveness. The study further established that improper waste disposal practices, inadequate waste management facilities, and weak enforcement of environmental regulations were major challenges hindering effective waste management. These challenges contributed to increased waste accumulation and reduced efficiency in service delivery. The study concluded that sustainable solid waste management requires stronger policy enforcement, increased financial investment, improved waste management infrastructure, and enhanced community capacity-building programs.

Adefris, Damene, and Satyal (2023) conducted a study titled "Household Practices and Determinants of Solid Waste Segregation in Addis Ababa City, Ethiopia" to assess household waste segregation practices and identify factors influencing segregation behaviour. The study adopted a mixed-methods approach, utilizing household surveys, focus group discussions, key informant interviews, and observations. The findings revealed that waste segregation at source was not widely practiced among households. The major factors contributing to poor waste segregation included limited environmental awareness, weak social norms supporting waste separation, and inadequate institutional support. The study further established that households that had received environmental awareness training were more likely to practice waste segregation than those without such training. This indicates that environmental education plays a significant role in promoting responsible waste management behaviour. The study concluded that strengthening public awareness programs, enforcing supportive waste management policies, and improving institutional frameworks are essential for enhancing household waste segregation and overall solid waste management effectiveness.

1.3.1 Research Gap

Previous studies mainly focused on waste management knowledge, livelihoods, institutional challenges, and household waste segregation in different locations (Irabaruta & Ndokoye, 2024; Temeh, 2025; Robert, 2024; Adefris *et al.*, 2023). However, limited attention has been given to community participation in solid waste management within Rwamagana District and specifically under AGRUNI Company operations. A conceptual gap exists because previous studies did not jointly examine community awareness and environmental education, clean-up activities, communication, and decision-making and monitoring. Therefore, this study addresses the contextual and conceptual gaps by examining the impact of these four community participation dimensions on solid waste management practices in Rwamagana District.

2 MATERIAL AND METHODS

2.1 Description of AGRUNI Company

Agruni Company Limited is a solid waste management company operating in Rwanda. It was founded in 2006, at a time when waste collection was not carried out systematically in Kigali. Instead, waste was mostly dumped in the street or in informal dumping areas. The founder of Agruni, Jean-Paul Shiraniro, saw a need for the systematic organization of waste collection in Kigali, and started to collect and transport waste from households with two ordinary trucks and 14 employees. Solid waste collection and management is one of major aspect which has to be considered in terms of making urban area environment healthier. The common dustbins placed by our company are leading health, environmental and

social issues. Thus presented solution achieves smart solid waste management satisfying goal of making Rwanda cities clean, healthy and hygienic. AGRUNI company is the largest waste collection and sorting company in East Africa. leading integrated recycling, waste collection and management company, was established in 2002 and specializes in the collection of waste. AGRUNI company has since started collecting other materials including plastic, aluminum and steel and is the first company in Rwanda to manage plastic and metal waste. (AGRUNI report, 2025).

2.2 Research design and target population

Research design is the conceptual framework that guides data collection, measurement, and analysis in a study (Kothari, 2021). This study adopted both descriptive and explanatory research designs. study adopted descriptive and explanatory research designs to examine community participation and solid waste management practices in Rwamagana District. The descriptive design was used to describe the levels of community awareness and environmental education, decision-making and monitoring, community clean-up activities, and community communication, as well as solid waste management practices. The explanatory design was used to assess the effect of the community participation variables on solid waste management practices using multiple linear regression analysis.. The target population for this study comprised 12,008 of beneficiaries of AGRUNI.

2.3 Sample size and sampling techniques

A sample refers to a group of individuals chosen from a larger population, typically to represent that population in a research study (Newing, 2011). The primary aim of research is to examine the sample and extend the findings to the broader population. The ability to generalize the results from a sample to the population depends on how representative the sample is. The sample size was determined using Slovin's formula from a population of 12008 households at a 5% level of precision, giving approximately 388 households. However, the study collected data from 331 clients of AGRUNI in Rwamagana District. Stratified sampling was used to select clients from Kigabiro, Muhazi, Muyumbu, Mwurire, and Fumbwe sectors. Universal sampling was used to select the AGRUNI Manager, who provided key information relevant to the study.

2.4 Data collection instruments and data analysis

Data were collected using structured questionnaires, semi-structured interviews, and documentary review, with 330 completed questionnaires obtained from 388 distributed. A five-point Likert scale was used, while interviews with the AGRUNI Manager and District Environment Officer supplemented questionnaire data. Data were edited, coded, entered, and analyzed using SPSS through descriptive statistics, including frequencies, percentages, means, and standard deviations. Multiple linear regression was used to assess the effect of community awareness and environmental education, clean-up activities, community communication, and decision-making and monitoring on solid waste management. The regression model was expressed as $Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + e$, with significance assessed using R^2 , ANOVA, regression coefficients, t-statistics, and p-values at the 5% level ($p \leq 0.05$).

3 FINDINGS

3.1 Regression results

The model summary in Table 4.10 shows a very strong relationship between community participation and solid waste management practices in Rwamagana District, with $R = 0.958$, indicating a strong positive correlation. The coefficient of determination ($R^2 = 0.918$) means that 91.8% of the variation in solid waste management practices is explained by community awareness, clean-up activities, communication, and decision-making and monitoring. The adjusted R^2 of 0.917 confirms the high reliability and stability of the model after adjusting for predictors. The small standard error of the estimate (0.14650) indicates high accuracy in predicting waste management outcomes.

Table 1: Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.958 ^a	0.918	0.917	0.14650
a. Predictors: (Constant), X4=Community Communication, X1=Community awareness and environmental education, X2=Decision-making and monitoring, X3=Involvement in community clean-up activities				

Table 2: ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	78.291	4	19.573	911.936	0.000 ^b
	Residual	6.975	325	0.021		
	Total	85.267	329			
a. Dependent Variable: Y=Solid Waste Management						
b. Predictors: (Constant), X4=Community Communication, X1=Community awareness and environmental education, X2=Decision-making and monitoring, X3=Involvement in community clean-up activities						

The ANOVA results confirm that the regression model is highly significant in explaining the relationship between community participation and solid waste management practices in Rwamagana District. The model produced an F-value of 911.936 with a significance level of 0.000, indicating that the independent variables jointly have a significant effect on solid waste management. Furthermore, the calculated F-value (911.936) is far greater than the critical F-value (2.39), confirming a strong positive linear relationship between community participation and waste management practices. Therefore, the model is valid and demonstrates that community awareness, communication, clean-up activities, and decision-making and monitoring collectively influence solid waste management outcomes in Rwamagana District.

Table 3: Regression coefficient

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.642	0.080		8.065	0.000
	X1=Community awareness and environmental education	0.020	0.015	0.022	1.277	0.203
	X2=Decision-making and monitoring	0.659	0.021	0.800	32.097	0.000
	X3=Involvement in community clean-up activities	0.100	0.023	0.115	4.432	0.000
	X4=Community Communication	0.081	0.016	0.107	5.228	0.000
a. Dependent Variable: Y=Solid Waste Management						

The regression results show that community awareness and environmental education have a positive but statistically insignificant effect on solid waste management ($B = 0.020$, $\beta = 0.022$, $p = 0.203$). This indicates that although awareness initiatives exist within AGRUNI operations in Rwamagana District, they do not significantly explain variations in waste management outcomes when other variables are considered. The result suggests that knowledge alone is insufficient to trigger consistent behavioural change in waste practices. Decision-making and monitoring show a strong, positive, and highly significant effect on solid waste management ($B = 0.659$, $\beta = 0.800$, $p = 0.000$), making it the most influential factor in the model. This means that involving community members in decision-making and monitoring processes significantly improves waste management outcomes such as collection efficiency, accountability, and environmental cleanliness.

Involvement in community clean-up activities has a positive and statistically significant effect on solid waste management ($B = 0.100$, $\beta = 0.115$, $p = 0.000$), indicating that regular participation in clean-up exercises contributes to improved environmental sanitation and reduced waste accumulation. This shows that community action directly translates into visible improvements in environmental cleanliness.

Community communication has a positive and statistically significant effect on solid waste management ($B = 0.081$, $\beta = 0.107$, $p = 0.000$), indicating that effective communication between AGRUNI and residents enhances coordination, timely waste collection, and compliance with waste disposal practices. This suggests that communication acts as a coordination mechanism that links service providers with community behaviour. Overall, the regression analysis demonstrates that community participation significantly influences solid waste management practices in Rwamagana District under AGRUNI.

4 DISCUSSION

The findings reveal that community participation in solid waste management under AGRUNI is generally high, particularly in decision-making and monitoring, community communication, environmental education, and community clean-up activities. Respondents agreed that awareness campaigns, training sessions, communication channels, and community involvement have improved waste management practices and environmental cleanliness. Interview findings further confirmed that sensitization meetings, local committees, and clean-up campaigns contribute positively to waste management outcomes. However, variations in responses indicate that participation is not uniform across all communities, especially between urban and rural areas. These findings support Irabaruta and Ndokoye (2024), Makinde et al. (2023), Nyirandamira and Niyomugabo (2026), and Chisanga et al. (2024), who emphasize that effective participation, communication, and monitoring enhance environmental service delivery and community ownership. Therefore, community participation remains a critical factor in improving solid waste management practices in Rwamagana District.

The findings further indicate that solid waste management practices are moderately to highly implemented in Rwamagana District, although several operational challenges remain. Waste generation continues to increase due to urbanization and commercial activities, while waste storage and collection are constrained by limited coverage and infrastructure. Transportation systems are generally adequate but affected by poor road conditions, especially during rainy seasons. Waste disposal and recovery practices contribute to environmental sustainability through composting and recycling, although these activities are concentrated mainly in urban areas. Regression results confirmed that decision-making and monitoring, community clean-up activities, and community communication significantly influence solid waste management, whereas awareness alone does not have a significant independent effect. Therefore, the study concludes that practical participation mechanisms are more effective than awareness alone in improving sustainable solid waste management outcomes.

5 CONCLUSION

The study concludes that community participation significantly influences solid waste management practices in Rwamagana District, particularly through decision-making and monitoring, community communication, and clean-up activities. While awareness and environmental education improve knowledge, they do not independently translate into better waste management outcomes without active involvement. The findings also revealed challenges such as increasing waste generation, low collection coverage, inadequate infrastructure, and limited access to recycling services. Nevertheless, community engagement, together with AGRUNI's waste collection, composting, and recycling initiatives, has contributed to improved environmental cleanliness and waste management performance. Therefore, strengthening participatory approaches and collaboration among communities, AGRUNI, and local authorities is essential for achieving sustainable environmental management and public health protection.

STATEMENTS ON COMPLIANCE WITH ETHICAL STANDARDS

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Disclosure of conflict of interest

The authors declare no conflicts of interest regarding this manuscript.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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