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Assessing Local Communities' Perception on Domestic Waste Management in Gasabo District, Rwanda

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Abstract

With accelerated urbanization in developing countries like Rwanda, waste generation has become a significant challenge, leading to health hazards and environmental pollution. In Gasabo District, (Rwanda), there is a pressing need to address inadequate waste management practices and foster community participation for sustainable solutions. However, there is a lack of comprehensive understanding regarding local communities' perception on domestic waste management, highlighting the necessity for this research. Thus, this study aimed at examining the perception of local communities on domestic waste management in Gasabo District. This research employed a descriptive research design with a mixed method of quantitative and qualitative approach. A number of 399 respondents were sampled using stratified and proportionate sample from 249,420 households and given questionnaires during data collection while 5 local leaders and 15 waste collectors were interviewed and purposively sampled from Gasabo District. Data analysis was conducted using the Statistical Package for the Social Sciences (SPSS) software version 23.0 and Microsoft Excel, aiming to uncover patterns, correlations, and statistical significance in the collected data. The local community perception in Gasabo District demonstrated a moderate agreement (mean = 3.580 to 4.190, SD = 0.745 to 0.986) with waste management initiatives, alongside a recognition of challenges in resource access and the need for improvement. Meanwhile, domestic waste management practices revealed varied perceptions, with a notable gap in waste sorting and segregation but moderate agreement on increasing recycling practices (mean = 2.950 to 4.260, SD = 0.693 to 1.256). Correlation analysis indicates significant positive correlations ($r = 0.100$ to 0.183, $p < 0.001$) between community perceptions and waste management aspects, emphasizing factors like education, government policies, and community engagement. Regression analysis further underscores the impact of these factors on waste segregation, recycling adoption, and infrastructure development, with community engagement emerging

as a significant positive predictor. In conclusion, the study underscores the importance of community engagement, education, and government support in enhancing waste management practices in Gasabo District, Rwanda. Collaboration among stakeholders, active participation of residents, and effective policies are crucial for achieving sustainable waste management. Prioritizing these recommendations can lead to a cleaner and more sustainable environment.

Keywords: *Community Perception, Domestic Waste, Gasabo district, Waste management.*

1. Introduction

In Rwanda, there exists a pressing need to evaluate the perceptions of local communities regarding domestic waste management, recognizing the importance of tailoring strategies to the region's unique cultural and socio-economic context (Eshete et al., 2023). Currently, there is a notable lack of comprehensive understanding of the prevailing situation, which hampers the effectiveness of waste management initiatives reliant on community involvement and informed decision-making. Despite Rwanda's progressive policies in waste management, a significant gap persists in understanding how these policies are perceived and adopted at the grassroots level, leading to challenges in achieving optimal waste management outcomes (Victoire et al., 2020).

The situation in Gasabo District exemplifies varying levels of perceptions toward domestic waste management among its diverse communities. While certain areas may exhibit positive practices and perceptions, others encounter obstacles related to awareness and cultural influences affecting waste disposal behaviours (Guo et al., 2016). The absence of a comprehensive assessment hinders the formulation of effective strategies tailored to address the unique challenges and opportunities specific to waste management in this particular region.

Prior studies on waste management in Rwanda have predominantly offered a national outlook, overlooking the distinctive characteristics of Gasabo District. Works by Iraguha et al. (2022) and Victoire et al. (2020) have underscored the success of community-based initiatives in Rwanda but have not delved into the specific dynamics within Gasabo District. To bridge this gap, a thorough examination of the perceptions of local communities in Gasabo District is imperative to inform targeted interventions.

In Gasabo District, managing domestic waste presents multifaceted challenges, including inadequate infrastructure, limited public awareness, and varied perceptions toward waste disposal and recycling (Mpayimana, 2013). Without a holistic understanding of local communities' perceptions regarding domestic waste management, the development and implementation of focused interventions and policies to address these challenges remain hindered. Hence, there is a critical imperative to assess and comprehend the prevailing factors influencing local communities' behaviours and decision-making processes concerning waste management in Gasabo District.

This research endeavours to fill the existing perceptions gap by conducting a comprehensive assessment of local communities' perceptions toward domestic waste management in Gasabo District, Rwanda. By acknowledging and addressing the unique socio-cultural and economic factors that influence waste management practices, the study aims to provide actionable insights for policymakers, environmentalists, and community leaders to design targeted interventions. Ultimately, the goal is to enhance awareness, foster positive perceptions, and improve waste management outcomes in Gasabo District.

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1.1 Research Objectives

1.1.1 General objective

This study generally aims at assessing local community perception on domestic waste management in Gasabo district, Rwanda.

1.1.2 Specific objectives

This study seeks to address the following specific objectives:

(i) To evaluate the local communities' perception on proper domestic waste management in Gasabo District, Rwanda.

(ii) To assess the domestic waste management practices and initiatives implemented in Gasabo District, Rwanda.

(iii) To examine the relationship between local community perception and domestic waste management in Gasabo District, Rwanda.

2. Materials and methods

2.1 Profile of Musanze District

Gasabo District in Kigali, Rwanda, holds historical significance as the original territory of Rwanda, now hosting key neighborhoods and the Gisozi Genocide Memorial Site. With its urbanization, diverse landscape, and alternating climatic seasons, Gasabo experiences significant waste generation from various sources, including households, industries, and tourism. This diversity makes Gasabo an ideal case study for investigating waste management practices, offering insights into challenges and opportunities for promoting sustainable waste management in rapidly developing regions.

Stratford Peer Reviewed Journals and Book Publishing
Journal of Agriculture & Environmental Sciences
Volume 8||Issue 1||Page 20-36 ||May||2024|
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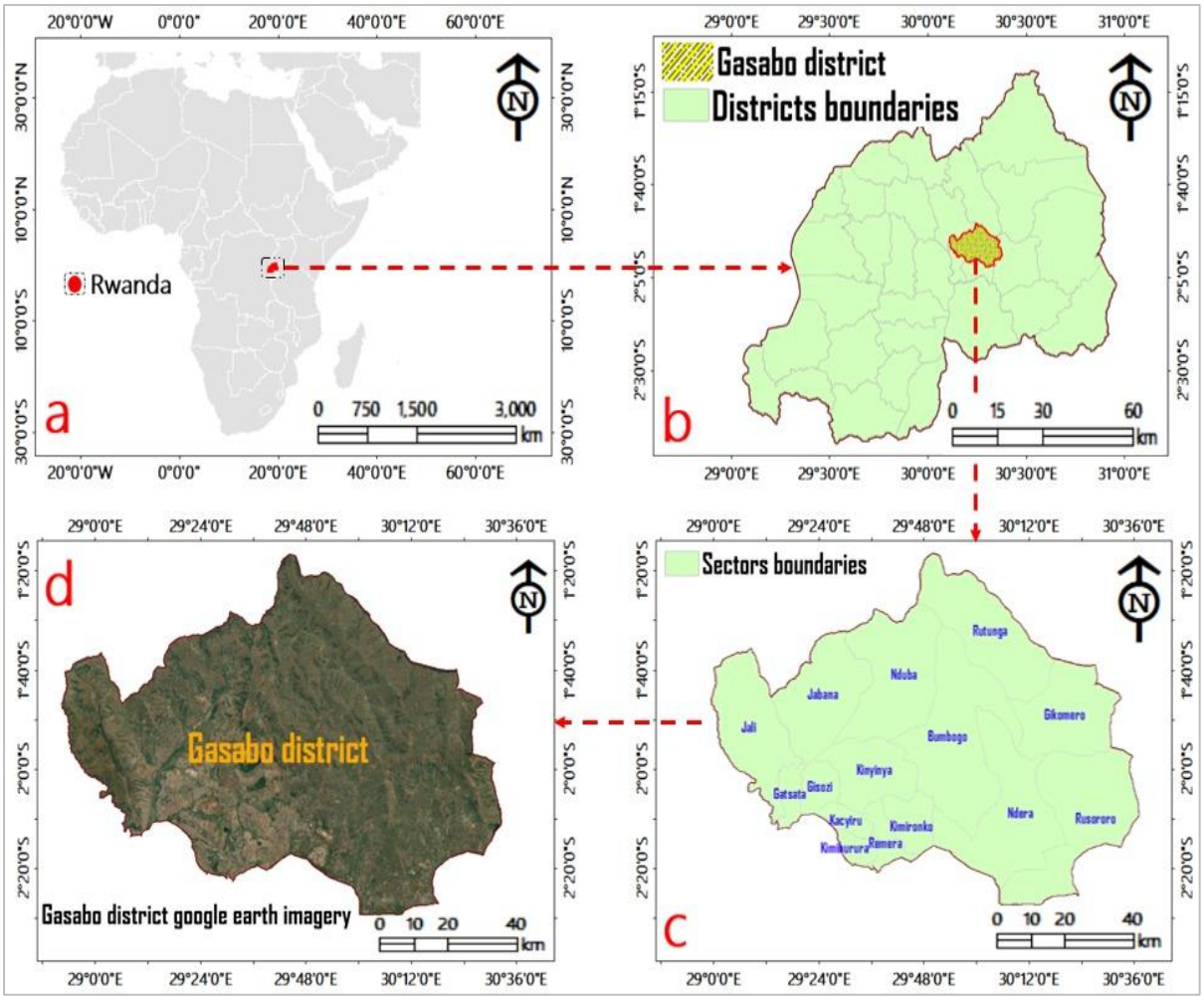

Source: Author's design in ArcGIS 10.8, 2024

Figure 3.1: Geographical location map of the study area; (a) Location of Rwanda at continent level; (b) Location of Gasabo district at national level; (c) the sectors subdivisions in Gasabo district; (d) The google earth map representation of Gasabo district

2.2 Research design and sampling techniques

The research design adopted for this study on domestic waste management in Gasabo District, Rwanda, is a descriptive survey with a mixed method approach, combining quantitative and qualitative methods to gather respondents' perceptions. The population of the study comprises 249,420 households in Gasabo District, chosen due to the focus on domestic waste management. The sample size was determined using Sloven's formula, resulting in 419 participants, including household heads, local leaders, and waste collectors. Inclusion criteria ensure relevance, maturity, and informed consent, while exclusion criteria maintain geographical relevance and address ethical concerns. The study employed simple sampling for selecting 399 household heads using intervals between households, ensuring precision in estimating population parameters. Additionally, purposive sampling was used to select 5 local leaders and 15 waste collectors based on specific criteria, enhancing relevance to research objectives.

Stratford Peer Reviewed Journals and Book Publishing
Journal of Agriculture & Environmental Sciences
Volume 8||Issue 1||Page 20-36 ||May||2024|
Email: info@stratfordjournals.org ISSN: 2616-8465

Table 3. 1: Sample Size in each Sector of Gasabo District

Sectors	Target Population	Sample Size	Sampling technique
Bumbogo	30,892	49	Stratified and Proportional Sampling
Gatsata	14,197	23	Stratified and Proportional Sampling
Gikomero	4,792	8	Stratified and Proportional Sampling
Gisozi	22,899	36	Stratified and Proportional Sampling
Jabana	16,621	26	Stratified and Proportional Sampling
Jali	10,832	18	Stratified and Proportional Sampling
Kacyiru	8,918	15	Stratified and Proportional Sampling
Kimihurura	5,352	8	Stratified and Proportional Sampling
Kimironko	17,612	29	Stratified and Proportional Sampling
Kinyinya	36,610	58	Stratified and Proportional Sampling
Ndera	28,286	45	Stratified and Proportional Sampling
Nduba	17,795	28	Stratified and Proportional Sampling
Remera	12,347	20	Stratified and Proportional Sampling
Rusororo	16,650	27	Stratified and Proportional Sampling
Rutunga	5,617	9	Stratified and Proportional Sampling
Total (Gasabo)	249,420	399	

Source: Gasabo District, 2024

The sample sizes for each sector in Gasabo district vary based on its target population as the number of households. The sectors with larger number of households, like Kinyinya and Bumbogo have larger sample sizes of 58 and 49 respondents, while smaller sectors, like Rutunga and Gikomero, have smaller sample sizes of 9 and 8 respondents respectively. Hence, a Stratified and Proportional Sampling technique were used to ensure an equal chance of participation for every individual in all households of Gasabo District, Rwanda.

2.3 Illustration of research methodology

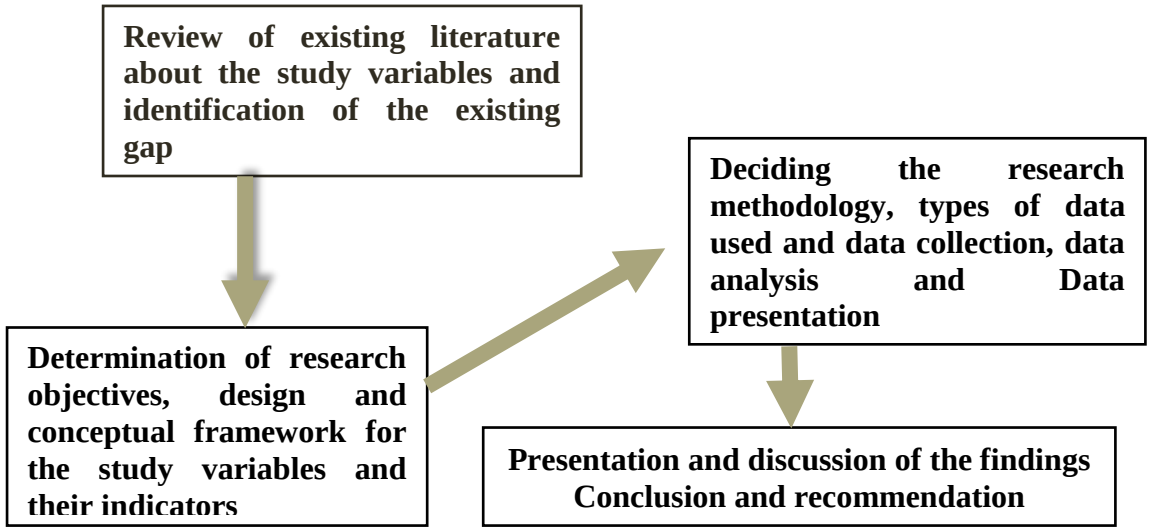

Figure 2.1: Methodology flowchart followed by the researcher

Stratford Peer Reviewed Journals and Book Publishing
Journal of Agriculture & Environmental Sciences
Volume 8||Issue 1||Page 20-36 ||May||2024|
Email: info@stratfordjournals.org ISSN: 2616-8465

3. Results

3.1 Local communities' perceptions on proper domestic waste management in Gasabo District

The local community perceptions regarding proper domestic waste management, demonstrate a mixed viewpoint. While there is growing awareness and support for government policies promoting waste management, challenges persist in accessing resources for disposal. There's acknowledgment of the need for improvement in waste management practices, alongside an emerging sense of social and ecological responsibility among residents in Gasabo District, Rwanda.

Table 3.1: Local community perceptions in Gasabo District

Local community Perceptions related statements	Mean	SD
Local communities are becoming more aware of proper waste management	3.580	0.855
Residents support government policies that promote waste segregation and recycling	3.850	0.756
Some communities face challenges in accessing resources for waste disposal	4.190	0.823
Many residents are willing to participate in community-led waste management initiatives	3.810	0.804
Current waste management practices need improvement	4.070	0.745
Residents want to minimize their ecological footprint through responsible waste handling.	3.610	0.986
There is a growing sense of social responsibility among residents	3.750	0.858

Source: Field Data, 2024

The Table 3.1 presents the mean ratings and standard deviations (SD) of local community perceptions on proper domestic waste management. On average, respondents somewhat agree that local communities are becoming more aware of waste management (Mean = 3.580, SD = 0.855) and support government policies promoting waste segregation and recycling (Mean = 3.850, SD = 0.756). However, they perceive challenges in accessing resources for waste disposal (Mean = 4.190, SD = 0.823), indicating a significant issue. Additionally, there's a recognition that current waste management practices need improvement (Mean = 4.070, SD = 0.745). The willingness to participate in community-led waste management initiatives is moderate (Mean = 3.810, SD = 0.804). Furthermore, there's a shared desire to minimize ecological footprints (Mean = 3.610, SD = 0.986) and a growing sense of social responsibility (Mean = 3.750, SD = 0.858) among residents in Gasabo District, Rwanda.

3.2 Domestic waste management practices and initiatives implemented in Gasabo District

The domestic waste management landscape presents a clear picture. While there are positive initiatives like the use of designated containers and collection points, and increasing awareness campaigns, challenges persist. Households struggle with segregating recyclable waste properly, despite efforts to improve infrastructure and engage in recycling practices. Community-driven clean-up drives and composting efforts contribute to waste management endeavours in Gasabo District, Rwanda.

Stratford Peer Reviewed Journals and Book Publishing
Journal of Agriculture & Environmental Sciences
Volume 8||Issue 1||Page 20-36 ||May||2024|
Email: info@stratfordjournals.org ISSN: 2616-8465

Table 3.2: Domestic waste management practices and initiatives in Gasabo District

Domestic waste management practices and initiatives	Mean	SD
Many households segregate recyclable and non-recyclable waste for proper disposal	2.950	1.256
Recycling practices are increasing among residents	3.490	0.983
Residents are using designated bins and collection points for waste disposal	4.070	0.922
Efforts are underway to improve waste management infrastructure	3.740	0.831
Communities organize regular clean-up drives to remove litter and waste.	3.730	0.838
Some households engage in composting organic waste for gardening and agriculture.	3.630	0.950
Awareness campaigns educate residents on waste management and conservation.	4.260	0.693
Local government implements programs to improve waste collection and recycling.	3.860	0.810

Source: Field Data, 2024

The Table 3.2 presents the mean ratings and standard deviations (SD) regarding domestic waste management practices and initiatives. On average, respondents somewhat disagree that many households segregate recyclable and non-recyclable waste as explained by the high Mean = 2.950 and low SD = 1.256), indicating a gap in proper waste sorting. However, there's moderate agreement that recycling practices are increasing (Mean = 3.490, SD = 0.983). Moreover, residents largely agree that they use designated bins and collection points for waste disposal (Mean = 4.070, SD = 0.922) and that efforts are underway to improve waste management infrastructure (Mean = 3.740, SD = 0.831). Communities also engage in regular clean-up drives (Mean = 3.730, SD = 0.838) and compost organic waste (Mean = 3.630, SD = 0.950). Furthermore, awareness campaigns (Mean = 4.260, SD = 0.693) and government programs (Mean = 3.860, SD = 0.810) contribute to improving waste collection and recycling, reflecting positive initiatives despite existing challenges in Gasabo District.

3.3 Relationship between local community perceptions and domestic waste management

The relationship between local community perceptions and domestic waste management practices reveals strong agreement among respondents. The results recognize the pivotal role of community engagement, awareness and education, government policies, infrastructure access, social responsibility, environmental awareness, and community-led initiatives in shaping effective waste management practices. This underscores the significance of community involvement and awareness in addressing waste management challenges in Gasabo District.

Stratford Peer Reviewed Journals and Book Publishing
Journal of Agriculture & Environmental Sciences
Volume 8||Issue 1||Page 20-36 ||May||2024|
Email: info@stratfordjournals.org ISSN: 2616-8465

Table 3.3: Local community perceptions and domestic waste management in Gasabo District

Statements	Mean	SD
Community engagement improves waste segregation and recycling	4.120	0.656
Awareness and education lead to responsible waste handling	4.230	0.625
Government policies shape waste management practices	4.170	0.636
Access to infrastructure facilitates proper waste disposal	4.270	0.608
Social responsibility encourages positive waste management practices	4.140	0.650
Environmental awareness drives sustainable waste management	4.240	0.653
Community-led initiatives foster collaboration for effective waste management	4.110	0.630
Local perceptions influence waste management policy development	4.040	0.693

Source: Field Data, 2024

The Table 3.3 shows mean ratings and standard deviations (SD) regarding the relationship between local community perceptions and domestic waste management practices. Overall, respondents strongly agree that community engagement enhances waste segregation and recycling (Mean = 4.120, SD = 0.656), indicating the crucial role of community involvement. Similarly, they agree that awareness and education lead to responsible waste handling (Mean = 4.230, SD = 0.625) and that government policies shape waste management practices (Mean = 4.170, SD = 0.636). Access to infrastructure is perceived as facilitating proper waste disposal (Mean = 4.270, SD = 0.608), and social responsibility encourages positive waste management practices (Mean = 4.140, SD = 0.650). Moreover, environmental awareness drives sustainable waste management (Mean = 4.240, SD = 0.653), and community-led initiatives foster collaboration for effective waste management (Mean = 4.110, SD = 0.630). The data suggests a strong correlation between local perceptions and initiatives, emphasizing the importance of community involvement and awareness in waste management efforts in Gasabo District, Rwanda.

3.3.1 Correlation analysis

The correlation analysis between local community perceptions and domestic waste management reveals significant associations. Education and awareness positively correlate with waste segregation, proper waste disposal, and infrastructure. Government policies positively correlate with waste disposal. Access to resources shows mixed correlations, while community engagement positively associates with waste segregation, recycling practices adoption, and infrastructure. These findings underscore the interconnectedness of community perceptions and effective waste management strategies in Gasabo District.

Stratford Peer Reviewed Journals and Book Publishing
Journal of Agriculture & Environmental Sciences
Volume 8||Issue 1||Page 20-36 ||May||2024|
Email: info@stratfordjournals.org ISSN: 2616-8465

Table 3.4: Correlation analysis between local community perceptions and domestic waste management

		Waste Segregation	Recycling practices adoption	Proper domestic waste disposal	Waste management infrastructure
Education and awareness	Pearson Correlation	.104*	.095	.111*	.183**
	Sig. (2-tailed)	.039	.058	.027	.000
	N	399	398	399	399
Gov't policies and regulations	Pearson Correlation	.058	.065	.089	.115*
	Sig. (2-tailed)	.247	.194	.075	.021
	N	399	398	399	399
Access to resources	Pearson Correlation	-.216**	-.041	.100*	.014
	Sig. (2-tailed)	.000	.416	.047	.780
	N	399	398	399	399
Community engagement and participation	Pearson Correlation	.142**	.142**	.057	.170**
	Sig. (2-tailed)	.005	.005	.252	.001
	N	399	398	399	399

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).
Source: Field Data, 2024

The Table 3.4 presents Pearson correlation coefficients and significance levels between local community perceptions and various aspects of domestic waste management. Education and awareness show significant positive correlations with waste segregation ($r = 0.104$, $p = 0.039$), proper waste disposal ($r = 0.111$, $p = 0.027$), and waste management infrastructure ($r = 0.183$, $p < 0.001$). Government policies demonstrate a significant positive correlation with waste disposal ($r = 0.115$, $p = 0.021$). Access to resources negatively correlates with waste segregation ($r = -0.216$, $p < 0.001$) but positively correlates with proper waste disposal ($r = 0.100$, $p = 0.047$). Community engagement shows significant positive correlations with waste segregation ($r = 0.142$, $p = 0.005$), recycling practices adoption ($r = 0.142$, $p = 0.005$), and waste management infrastructure ($r = 0.170$, $p = 0.001$). These correlations highlight the interconnectedness of community perceptions and waste management practices, emphasizing the importance of education, government involvement, resource accessibility, and community engagement in fostering effective waste management strategies in Gasabo District.

3.3.2 Regression analysis

The regression analysis explores the relationship between local community perceptions and various aspects of waste management. Findings indicate weak positive relationships between community perceptions and waste segregation, recycling practices adoption, proper waste disposal, and waste management infrastructure. Factors such as community engagement, access to resources, government policies, and education contribute to explaining variations in waste management practices in Gasabo District.

Stratford Peer Reviewed Journals and Book Publishing
Journal of Agriculture & Environmental Sciences
Volume 8||Issue 1||Page 20-36 ||May||2024|
Email: info@stratfordjournals.org ISSN: 2616-8465

Table 3.5: Model summary of local community perception and waste segregation in Gasabo District

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.287[a]	.082	.073	1.209

a. Predictors: (Constant), Community engagement and participation, Access to resources, Government policies and regulation, Education and awareness

Source: Field Data, 2024

The Table 3.5 of model summary indicates a weak positive relationship between local community perceptions and waste segregation ($R = 0.287$, $R^2 = 0.082$). This suggests that factors such as community engagement, access to resources, government policies, and education slightly contribute to explaining variations of 7.3% in waste segregation practices in Gasabo District.

Table 3.6: Analysis of variance (ANOVA) of local community perception and waste segregation in Gasabo District

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	51.750	4	12.938	8.847	.000[b]
	Residual	576.144	394	1.462		
	Total	627.895	398			

a. Dependent Variable: Waste segregation

b. Predictors: (Constant), Community engagement and participation, Access to resources, Gov't policies and regulation, Education and awareness

Source: Field Data, 2024

The Table 3.6 of analysis of variance (ANOVA) results indicate that the regression model, including predictors such as community engagement, access to resources, government policies, and education, significantly explains variance in waste segregation practices ($F = 8.847$, $p < 0.001$). This suggests that these predictors collectively contribute to understanding waste segregation behaviors in Gasabo District, signifying their importance in shaping waste management practices within the community.

Table 3.7: Regression coefficients of local community perception and waste segregation in Gasabo District

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	2.959	.477		6.207	.000
Education and awareness	.047	.080	.032	.591	.555
Gov't policies and regulation	.150	.090	.090	1.662	.097
Access to resources	-.380	.077	-.249	-4.969	.000
Community engagement and participation	.219	.079	.141	2.792	.006

a. Dependent Variable: Waste segregation

Source: Field Data, 2024

The Table 3.7 regression coefficients reveal the impact of predictors on waste segregation in Gasabo District, Rwanda. The community engagement and participation exhibit a significant positive effect ($\beta = 0.141$, $p = 0.006$), indicating that increased community involvement is associated with higher levels of waste segregation. Conversely, access to resources (β = -

0.249, $p < 0.001$) demonstrates a significant negative effect, suggesting that limited access impedes waste segregation efforts. While government policies and regulation ($\beta = 0.090$, $p = 0.097$) show a positive effect, it is statistically insignificant, implying a weak influence on waste segregation practices. However, education and awareness ($\beta = 0.032$, $p = 0.555$) exhibit a statistically insignificant effect, suggesting minimal impact on waste segregation behaviours.

Table 3.8: Model summary of local community perception and recycle practices adoption in Gasabo District

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.167[a]	.028	.018	.974

a. Predictors: (Constant), Community engagement and participation, Access to resources, Gov't policies and regulation, Education and awareness

Source: Field Data, 2024

The Table 4.8 of model summary suggest a weak positive relationship between local community perceptions and recycling practices adoption ($R = 0.167$, $R^2 = 0.028$). This implies that factors such as community engagement, access to resources, government policies, and education contribute slightly to explaining around 1.8% of the variations observed in recycling practices in Gasabo District.

Table 3.9: Analysis of variance (ANOVA) of local community perception and recycle practices adoption in Gasabo District

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	10.754	4	2.689	2.835	.024[b]
Residual	372.735	393	.948		
Total	383.490	397			

a. Dependent Variable: Recycling practices adoption

b. Predictors: (Constant), Community engagement and participation, Access to resources, Gov't policies and regulation, Education and awareness

Source: Field Data, 2024

The Table 3.9 of analysis of variance (ANOVA) results indicate that the regression model, incorporating predictors like community engagement, access to resources, government policies, and education, significantly explains variance in recycling practices adoption ($F = 2.835$, $p = 0.024$). This suggests that these predictors collectively contribute to understanding the adoption of recycling practices in Gasabo District. The model's significance implies that these factors play a role in shaping recycling behaviours within the community.

Stratford Peer Reviewed Journals and Book Publishing
Journal of Agriculture & Environmental Sciences
Volume 8||Issue 1||Page 20-36 ||May||2024|
Email: info@stratfordjournals.org ISSN: 2616-8465

Table 3.10: Regression of coefficients of local community perception and recycle practices adoption in Gasabo District

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	2.790	.385		7.248	.000
Education and awareness	.047	.065	.041	.729	.466
Gov't policies and regulation	.064	.073	.049	.884	.377
Access to resources	-.075	.062	-.063	-1.212	.226
Community engagement and participation	.158	.063	.129	2.496	.013

a. Dependent Variable: Recycling practices adoption
Source: Field Data, 2024

The coefficients represent the impact of predictors on recycling practices adoption in Gasabo District, Rwanda, community engagement and participation emerge as the most influential factor, with a statistically significant positive effect ($\beta = 0.129$, $p = 0.013$). This indicates that increased community involvement leads to higher adoption rates of recycling practices. However, access to resources shows a statistically insignificant negative effect ($\beta = -0.063$, $p = 0.226$), suggesting that limited access may hinder recycling efforts, although this relationship is not strong enough to be considered significant at the conventional threshold of 0.05.

Table 3.11: Model summary of local community perception and proper domestic waste disposal in Gasabo District

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.152[a]	.023	.013	.916

a. Predictors: (Constant), Community engagement and participation, Access to resources, Gov't policies and regulation, Education and awareness
Source: Field Data, 2024

The Table 4.11 of model summary indicates a weak positive relationship between local community perceptions and waste management practices ($R = 0.152$, $R^2 = 0.023$). This suggests that factors like community engagement, access to resources, government policies, and education marginally contribute to explaining approximately 2.3% of the variations observed in waste management practices in Gasabo District.

Table 3.12: Analysis of variance (ANOVA) of local community perception and proper domestic waste disposal in Gasabo District

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	7.807	4	1.952	2.327	.056[b]
	Residual	330.499	394	.839		
	Total	338.306	398			

a. Dependent Variable: Proper domestic waste disposal

b. Predictors: (Constant), Community engagement and participation, Access to resources, Gov't policies and regulation, Education and awareness
Source: Field Data, 2024

Stratford Peer Reviewed Journals and Book Publishing
Journal of Agriculture & Environmental Sciences
Volume 8||Issue 1||Page 20-36 ||May||2024|
Email: info@stratfordjournals.org ISSN: 2616-8465

The Table 3.12 of analysis of variance (ANOVA) results show that the regression model, incorporating predictors such as community engagement, access to resources, government policies, and education, somewhat explains variance in proper domestic waste disposal ($F = 2.327$, $p = 0.056$). While the model's overall significance is close to the significance threshold commonly set at 0.05, there's a trend indicating that these predictors may collectively influence proper waste disposal practices in Gasabo District, although to a lesser extent.

Table 3.13: Regression coefficients of local community perception and proper domestic waste disposal in Gasabo District

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	3.054	.361		8.459	.000
Education and awareness	.100	.061	.093	1.659	.098
Gov't policies and regulation	.035	.068	.028	.506	.613
Access to resources	.101	.058	.090	1.740	.083
Community engagement and participation	.025	.060	.022	.418	.676

a. Dependent Variable: Proper domestic waste disposal
Source: Field Data, 2024

The Table 3.13 of coefficients show the impact of predictors on proper domestic waste disposal in Gasabo District, Rwanda. The access to resources demonstrates a marginally significant positive effect ($\beta = 0.090$, $p = 0.083$), suggesting that increased access may slightly enhance proper waste disposal practices. Education and awareness also exhibit a positive effect ($\beta = 0.093$, $p = 0.098$), although not statistically significant. Conversely, government policies ($\beta = 0.028$, $p = 0.613$) and community engagement and participation ($\beta = 0.022$, $p = 0.676$) show statistically insignificant effects, implying limited impact on proper waste disposal practices at the conventional significance threshold of 0.05.

Table 3.14: Model summary of local community perception and waste management infrastructure in Gasabo District

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.226[a]	.051	.042	.814

a. Predictors: (Constant), Community engagement and participation, Access to resources, Gov't policies and regulation, Education and awareness
Source: Field Data, 2024

The Table 3.14 model summary indicates a weak positive relationship between local community perceptions and waste management practices ($R = 0.226$, $R^2 = 0.051$). This suggests that factors like community engagement, access to resources, government policies, and education contribute modestly to explaining about 4.2% of the variations observed in waste management practices in Gasabo District.

Stratford Peer Reviewed Journals and Book Publishing
Journal of Agriculture & Environmental Sciences
Volume 8||Issue 1||Page 20-36 ||May||2024|
Email: info@stratfordjournals.org ISSN: 2616-8465

Table 3.15: Analysis of variance (ANOVA) of local community perception and waste management infrastructure in Gasabo District

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	14.063	4	3.516	5.311	.000[b]
	Residual	260.829	394	.662		
	Total	274.892	398			

a. Dependent Variable: Waste management infrastructure
b. Predictors: (Constant), Community engagement and participation, Access to resources, Gov't policies and regulation, Education and awareness
Source: Field Data, 2024

The Table 3.15 of the analysis of variance (ANOVA) results indicate that the regression model, incorporating predictors such as community engagement, access to resources, government policies, and education, significantly explains variance in waste management infrastructure ($F = 5.311$, $p < 0.001$). This suggests that these predictors collectively contribute to the model's predictive power, indicating their importance in influencing waste management infrastructure in Gasabo District.

Table 3.16: Regression coefficients of local community perception and waste management infrastructure in Gasabo District

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	2.605	.321		8.122	.000
Education and awareness	.123	.054	.127	2.290	.023
Gov't policies and regulation	.059	.061	.053	.965	.335
Access to resources	-.010	.052	-.010	-.194	.847
Community engagement and participation	.134	.053	.129	2.526	.012

a. Dependent Variable: Waste management infrastructure
Source: Field Data, 2024

The Table 3.16 of regression coefficients illustrate the impact of predictors on waste management infrastructure in Gasabo District, Rwanda. The community engagement and participation demonstrate a significant positive effect ($\beta = 0.129$, $p = 0.012$), indicating that increased community involvement is associated with improved infrastructure. Conversely, access to resources ($\beta = -0.010$, $p = 0.847$) and government policies and regulation ($\beta = 0.053$, $p = 0.335$) show statistically insignificant effects, suggesting limited influence on infrastructure development. However, education and awareness ($\beta = 0.127$, $p = 0.023$) exhibit a significant positive effect, implying that higher levels of education contribute to enhanced waste management infrastructure in Gasabo District, Rwanda.

3.5 Qualitative results

The qualitative results from this study support the quantitative findings that the local community perception significantly influences domestic waste management in Gasabo District. The responses highlighted varying levels of awareness among local communities, with some being more informed about proper waste management practices than others. This

aligns with the quantitative data, which showed moderate agreement among respondents regarding awareness and support for waste management initiatives.

The challenges identified in the qualitative responses, such as limited access to education, inadequate infrastructure, and cultural practices prioritizing convenience over environmental concerns, mirror the factors highlighted in the quantitative analysis. These challenges contribute to disparities in support for government policies promoting waste segregation and recycling, echoing the findings of the quantitative data that emphasized the influence of factors like education and accessibility of recycling facilities on residents' level of support or opposition.

The observations on waste management practices in Gasabo District households, as mentioned in the qualitative responses, also correspond with the quantitative results, which revealed a mix of alignment and divergence from government policies and community perceptions. Socio-economic factors, access to resources, and awareness levels were identified as influencing factors in both the qualitative and quantitative analyses.

In addition, the qualitative findings emphasized the importance of community-led waste management initiatives, echoing the quantitative data that highlighted the significance of community involvement and grassroots campaigns in shaping effective waste management practices. Moreover, the qualitative responses underscored the need for improvements in waste management infrastructure, reflecting the quantitative data's call for expanding waste collection services and establishing recycling facilities. Therefore, the qualitative results provide qualitative support for the quantitative findings, reinforcing the interconnectedness of community perception and domestic waste management practices in Gasabo District.

3.5 Discussion of the results

The results of the study indicate a moderate agreement among residents of Gasabo District, regarding their awareness and support for waste management initiatives (Velis et al., 2023). This is evident from the mean ratings ranging from 3.580 to 4.190 and standard deviations (SD) from 0.745 to 0.986. Despite this awareness, respondents acknowledged challenges in resource access and the need for improvement in current waste management practices, reflecting findings from dos Santos et al. (2022) and Hidayat et al. (2019), who emphasized the importance of addressing systemic failures associated with lower socio-economic levels to enhance waste management outcomes. The findings of Velis et al. (2023) indicated significant correlations between socio-economic development and solid waste management (SWM) performance, reflecting observations in the current study. Cities in higher income brackets show better SWM performance, reflected in controlled recovery and disposal rates. This correlation emphasizes the importance of addressing socio-economic disparities highlighted in Gasabo District, Rwanda. Gasabo residents' desire to minimize ecological footprints (mean = 3.610 to 3.750, SD = 0.858 to 0.986) aligns with fostering social responsibility to enhance waste management outcomes.

The empirical research of Fadhullah et al. (2022) conducted on household waste practices and perceptions about waste management in Panji, Malaysia exhibited the findings of varied perceptions regarding waste sorting and segregation, alongside a moderate agreement on increasing recycling practices. These are consistent with the results of the current study. Efforts such as using designated bins and clean-up drives, as acknowledged positively in their study, align with the contributions of awareness campaigns and government programs to improving waste collection and recycling in Gasabo District. The previous study of

Turyahabwe et al. (2022) investigated the environmental and socio-economic impact of solid waste management practices in Mbale City, Uganda. Their findings of significant positive correlations between community perceptions and various aspects of waste management, particularly emphasizing the role of community engagement, resonate with the results of the Gasabo District study. Additionally, the impact of socio-economic factors such as education and access to resources on waste management practices, as highlighted in their research, supports the observations in Gasabo District regarding the influence of these factors on waste segregation, recycling practices adoption, and waste management infrastructure development.

4. Conclusion

In conclusion, the effective domestic waste management is crucial for promoting environmental sustainability, public health, and quality of life within communities. This comprehensive study evaluated the local community's perception, assessed existing waste management practices and initiatives, and examined the relationship between perception and waste management efforts in Gasabo District, Rwanda. The findings revealed a diverse range of perceptions, awareness levels, and socio-economic factors influencing community perceptions and behaviors towards waste management. While some residents demonstrated a good understanding of the importance of proper waste disposal, others lacked sufficient perceptions or faced practical barriers hindering sustainable practices.

Therefore, addressing these gaps through tailored educational campaigns, infrastructure development, and policy interventions is essential. The assessment of current waste management initiatives highlighted areas for improvement and the need for continuous evaluation and enhancement. Increasing resource allocation, improving accessibility, and fostering community engagement can significantly strengthen these efforts. The study identified a clear correlation between community perception and waste management practices. Positive perceptions and awareness often translated into more responsible waste disposal behaviors, underscoring the importance of cultivating a supportive community culture through inclusive decision-making processes, incentives, and targeted engagement strategies. Moving forward, a collaborative, multi-stakeholder approach involving local authorities, waste management service providers, and community members is crucial for co-creating sustainable solutions.

Furthermore, capacity building, infrastructure development, policy interventions, and community engagement initiatives tailored to the local context should be prioritized. In addition, exploring economic opportunities associated with proper waste management, such as recycling and waste-to-energy initiatives, can contribute to local economic development while promoting environmental sustainability. This study serves as a foundation for further research, policy development, and practical interventions aimed at improving waste management practices in Gasabo District and beyond. Achieving sustainable domestic waste management requires a long-term commitment from all stakeholders and a holistic approach that considers environmental, social, economic, and cultural factors. By addressing the identified gaps, leveraging community participation, and fostering a supportive waste management culture, Gasabo District can pave the way toward a cleaner, healthier, and more sustainable future for its residents.

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