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Examining Challenges of Sustainable Waste Management and Community Engagement in Hamar Jajab District, Mogadishu, Somalia

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Abstract

This study examines the barriers to community engagement in sustainable waste management in Hamar Jajab District, Mogadishu, where rapid urban growth and inadequate infrastructure have exacerbated environmental challenges. Community participation is widely acknowledged as a critical element of effective waste management, yet in fragile urban contexts such as Mogadishu, engagement often remains limited despite increasing awareness. To address this gap, a mixed-methods approach was adopted, combining questionnaires and semi-structured interviews to capture both quantitative and qualitative insights, with data analyzed through descriptive statistics, reliability testing, and correlation analysis using SPSS. The findings demonstrate that while residents showed a moderate level of awareness of waste management practices, participation was seriously limited. Over 60% of respondents strongly agreed that the inadequacy of waste infrastructure was the key barrier, 55% cited the lack of government support, and 48% emphasized the involvement of women, youth, and underprivileged communities, with weak institution-based support further entrenching such barriers and widening the knowledge-to-action gap. It concludes that resolving such challenges requires a multi-sectoral approach, encompassing infrastructure development, financial support, and

inclusive awareness campaigns. Improving participation not only strengthens local environmental sustainability and public health but also furthers the attainment of universal goals such as SDG 11 and SDG 12.

Keywords

Community, Barriers, Sustainable, Waste, Management, Perception

1. Introduction

Municipal solid waste (MSW) contributes significantly to pollution, endangering ecological balance, human health, and sustainable development (Zhang et al, 2024), while improper solid-waste disposal is linked to health risks and degraded scenic beauty, underscoring the need for sustainable waste management (Ahmed, 2023). Globally, waste is any material that is discarded after primary use or is considered worthless, defective, and of no further use (Wilson et al., 2006). Wastes are substances resulting from any human activity that produces unwanted or unusable material. The generation of waste can be measured in kilograms per person per day and is classified into three types: 1) Solid; 2) Liquid; 3) Gaseous. Waste management or waste disposal includes activities from its initial creation to its final disposal, such as storage, collection, transportation, processing, recycling, or treatment, and disposal of waste, along with monitoring and regulation of the waste management process (Ferronato et al., 2021).

In other words, waste management refers to the organized process of collecting, transporting, treating, recycling, or disposing of waste materials, while also monitoring their impact. It is mainly concerned with waste generated by human activities and is carried out to protect human health, safeguard the environment, and maintain cleanliness. In many cases, it also focuses on recovering useful resources from waste. Depending on the type, waste may be solid, liquid, gas, or even radioactive, and each requires specialized methods for handling. Approaches to waste management vary across regions, with developed and developing countries, as well as urban and rural areas, often using different strategies. Generally, local government authorities manage non-hazardous residential and institutional waste in cities, whereas businesses and industries are responsible for handling the non-hazardous waste they produce (Bacinschi, 2009).

Sustainable waste management is the process of collecting, transporting, processing, and disposing of waste in a way that minimizes negative impacts on the environment and human health while maximizing resource recovery and economic benefits (Ahmad Kamal et al., 2025). The goal of sustainable waste management is to reduce the amount of waste generated, promote the reuse and recycling of materials, and ensure the safe disposal of remaining waste. Sustainable waste management is gaining importance as environmental challenges grow and the demand for conserving resources increases. Recent research points to innovative methods such

as vermicomposting, which not only minimize dependence on chemical fertilizers but also support ecological sustainability (Azmin Shompa et al., 2025).

According to Adebuason (2024), waste material in the African context is commonly referred to as anything that is no longer useful to its owner and so discarded. Waste management, in turn, refers to the procedures and practices used at all phases, from generation and collection to transportation, treatment, and final disposal. However, most metropolitan areas confront substantial issues in solid waste management due to rapid urbanisation, limited technical and financial capacity, and minimal policy emphasis. With urban populations increasing, municipal solid waste is projected to rise from 2.1 billion tonnes in 2023 to 3.8 billion tonnes by 2050, according to the United Nations Environment Programme (2024).

The increase in urbanization and the growth of unplanned settlement programs have brought solid waste management to the top of the municipal agenda. Plastic litter and polythene bags are the most serious of the challenges since they present such grave environmental and health hazards. Polythene bags are the most prevalent of the food covers, although they are used in locations for toilets among the inhabitants. These bags end up in the ditches, streets, dustbins, adjacent houses, and along the water courses. This activity generates periodic epidemics of diseases such as malaria, cholera, and typhoid, further worsening public health conditions in affected communities (Atem, 2025). Solid Waste Management (SWM) represents one of the most critical environmental and public health challenges in rapidly urbanizing regions. Effective solid waste management is essential for sustainable development and public well-being. It involves a comprehensive approach that includes waste reduction, recycling, composting, and disposal. By minimizing waste generation and maximizing resource recovery, we can mitigate the negative impacts of solid waste on the environment and human health (Shibrain et al., 2025).

In Somalia, the majority of waste currently generated is legally destined for landfills governed by Local Authorities. In some regions, all or a portion of the construction waste stream is illegally dumped on land or in natural drainage systems, including water, in violation of legislation designed to protect people's health, the economy, and the environment (Yusuf, 2022) The Hamar Jajab district in Mogadishu faces serious challenges due to inadequate waste management, leading to environmental degradation, public health risks, and poor living conditions. There is still relatively little community involvement in waste management programs, which reduces the efficacy of existing projects and permits inappropriate garbage disposal to continue. Because of its central location and weaker garbage management infrastructure than other parts of the city, the district was chosen. Our study, which examines the socioeconomic, cultural, and infrastructure barriers that impede effective community engagement in sustainable waste management, is framed by these systemic weaknesses. It emphasizes the pressing need for inclusive, reasonably priced, and well-organized waste management systems. The study's main goal is to investigate and evaluate the barriers preventing community

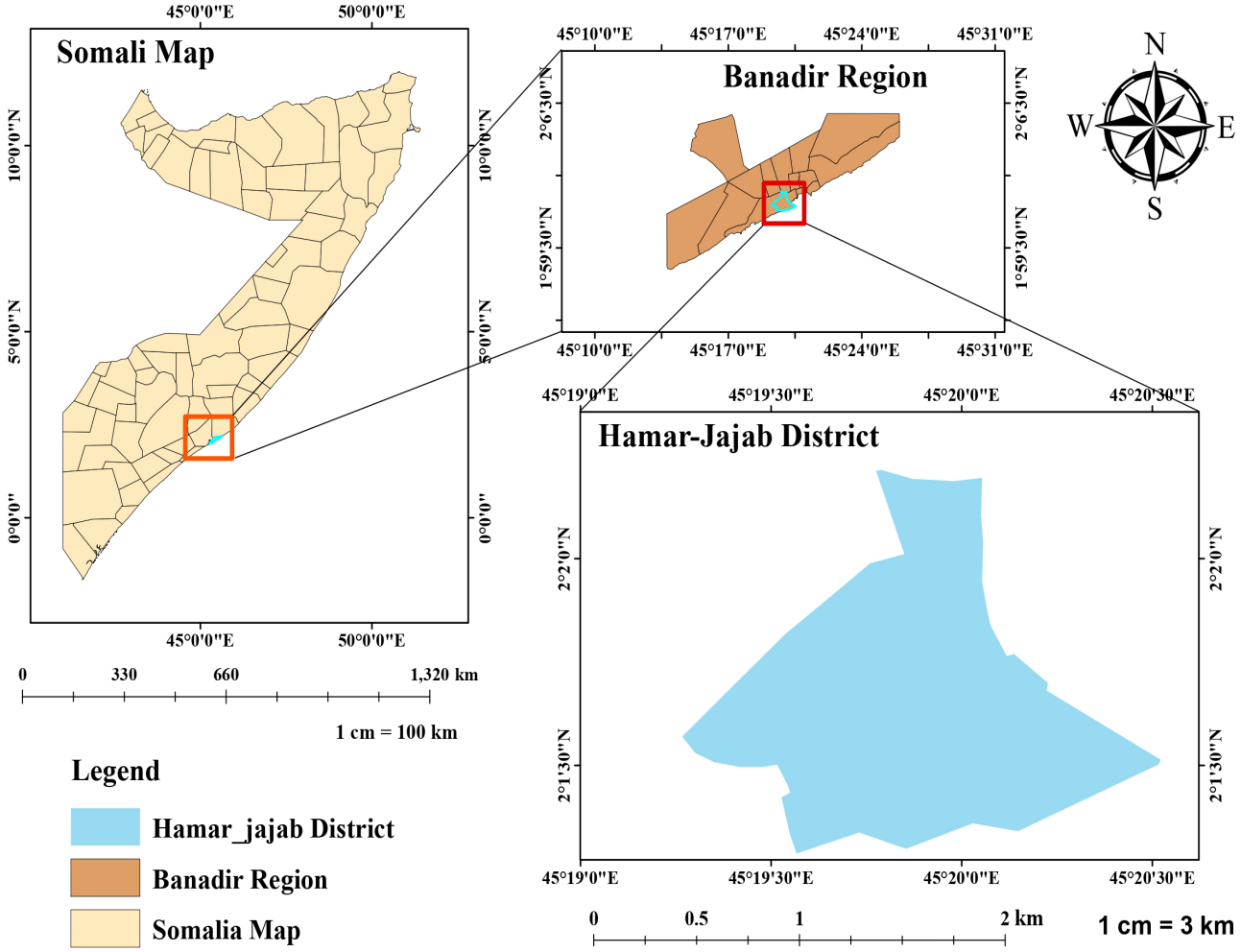
participation in sustainable waste management initiatives. Its specific objectives include identifying these obstacles, evaluating community awareness and participation, and investigating how socioeconomic and cultural factors impact engagement. The concept of the 'knowledge-to-action gap' refers to the discrepancy between awareness of sustainable waste management practices and the actual implementation of such practices within communities. This concept is particularly relevant in fragile urban contexts like Mogadishu, where awareness exists but does not consistently result in community participation. Important concerns about the nature of these obstacles, public awareness, and the influence of socioeconomic and cultural factors on participation are all covered in the study. It includes a six-month timetable from October 2024 to March 2025, a geographical concentration on Hamar Jajab, and a content scope of assessing current projects.

By emphasizing the importance of grassroots involvement in achieving efficient and sustainable waste management, the study can offer valuable insights for local governments, legislators, and environmental organizations. Understanding the core issues helps develop community-driven solutions that support Mogadishu's economic growth, environmental sustainability, and public health improvements. The study's structure focuses on key ideas, including community involvement, sustainable waste management, participation barriers, and the unique context of Hamar Jajab.

2. Methods

This study adopted a descriptive and quantitative research design to systematically explore the barriers to community engagement in sustainable waste management in Hamar Jajab District, Mogadishu. Descriptive research helped to objectively portray the existing waste management challenges, while the quantitative approach enabled the collection of measurable data to identify patterns and relationships. The study targeted a population of approximately 24,000 residents. To determine an appropriate sample size, Slovin's formula was applied at a significance level of 0.08. A margin of error of 0.08 was selected instead of the conventional 0.05 to balance statistical rigor with the practical constraints of time, resources, and accessibility during fieldwork in a fragile urban context. The formula is as follows: $n = \frac{N}{1 + Ne^2}$ Where: n is the required sample size, N is the population size, and e is the margin of error (significance level). Substituting the values: n = 24,000/[1 + 24,000 × $(0.08)^2$] ≈ 155. Thus, a sample size of 155 respondents was determined to be appropriate for this study. Convenience sampling (non-probability) was employed, focusing on accessible individuals willing to participate, ensuring representation across different age groups, genders, and socio-economic backgrounds. Data were collected using structured questionnaires and semi-structured interviews. The questionnaires were initially prepared in English and translated into Somali for broader accessibility, while interviews allowed for deeper exploration of participant experiences and perspectives regarding waste management practices.

Data collection took place in homes, public areas, community centers, and waste management sites within the district. For data analysis, initial observations and general summaries guided early insights, followed by a detailed statistical analysis using SPSS version 27. To maintain the quality and reliability of the data and to ensure the internal consistency of the scale used in this study, Cronbach's Alpha (α) was calculated. Data analysis included non-parametric tests: the Kruskal-Wallis H test was used to examine differences in Likert-scale responses across educational levels, while Spearman's rho correlation assessed relationships between demographic variables and community engagement in sustainable waste management. Overall, this study was carefully structured to ensure methodological rigor, ethical compliance, and the generation of reliable and valid results. It offers significant insights into the waste management challenges of Hamar Jajab and provides a foundation for designing targeted interventions to enhance community engagement in sustainable environmental practices. The geographical context of the study is illustrated in Figure 1, which presents the map of Hamar Jajab District and highlights its central location within Mogadishu.



Source: Primary data.

Figure 1. Map of the study area, Hamar Jajab District.

3. Results

3.1 Demographic Data

As shown in Table 1 below, the demographic makeup of the respondents reveals a predominantly young and diverse group. The largest age group was 18–24 years, comprising 55.5% of all respondents, indicating that younger individuals make up the majority of the surveyed population. This is followed by respondents aged 36 - 45 years at 19.3%, while the 25 - 35 years and 46 years and above categories accounted for 12.9% and 12.3%, respectively. This age distribution suggests a generally young respondent pool, with over two-thirds being under 35. Regarding gender, the sample was nearly evenly split, with 51.6% female and 48.4% male respondents. This balanced gender representation enhances the reliability of insights gathered from both genders. Marital status showed that more than half of the participants were single (53.5%), followed by married individuals (34.9%), and a smaller portion were divorced (11.6%). The prevalence of single respondents correlates with the youthful age profile, which may influence attitudes toward community participation and waste management. Concerning education, most respondents had either secondary education (30.3%) or informal education (25.8%), with primary education holders also constituting a significant portion (24.5%). Only 16.8% held a Bachelor's degree, and 2.6% had postgraduate qualifications. This educational background indicates that most respondents possess basic to moderate levels of formal education, potentially affecting their awareness, understanding, and participation in community efforts like sustainable waste management.

3.2. Identifying Barriers to Community Engagement

The findings from objective 1, as shown in Table 2 below, highlight key barriers and drivers of community engagement in sustainable waste management within the Hamar Jajab district. Firstly, financial constraints and logistical challenges emerged as dominant barriers, with over 41% of respondents strongly agreeing that these factors prevent their active participation. The mean scores for financial and logistical barriers (3.03 and 2.97, respectively) suggest that economic hardship, lack of transportation, and limited time significantly hinder involvement. Additionally, cultural and social perceptions, including inadequate communication with waste management authorities, scored moderate agreement, indicating that while some community members recognize these factors, they are not universally viewed as decisive barriers.

Table 1. Demographic data

Age of respondents			
	Respondent	Frequency	Percent
Valid	18 - 24	86	55.5
	25 - 35	20	12.9
	36 - 45	30	19.3

Continued

Valid	46 years and above	19	12.3
	Total	155	100.0
Gender of respondents			
	Respondents	Frequency	Percent
Valid	Female	80	51.6
	Male	75	48.4
	Total	155	100.0
Marital status of respondents			
	Respondent	Frequency	Percent
Valid	Divorced	18	11.6
	Married	54	34.9
	Single	83	53.5
	Total	155	100.0
The education level of respondents			
	Respondent	Frequency	Percent
Valid	Bachelor' Degree	26	16.8
	Informal Education	40	25.8
	Post-graduate	4	2.6
	Primary	38	24.5
	Secondary	47	30.3
	Total	155	100.0

Table 2. Identifying barriers to community engagement.

Descriptive statistics			
Identifying Barriers to Community Engagement	N	Mean	Std. Deviation
Financial challenges prevent me from participating in sustainable waste management initiatives.	155	3.03	1.314
Logistical challenges (e.g., lack of transportation or time) are significant barriers to waste management participation.	155	2.97	1.291
My neighborhood has inadequate waste bins or collection points for effective waste management.	155	3.18	1.379
I feel that cultural or social factors in my community discourage participation in waste management activities.	155	2.92	1.477
There is insufficient communication and coordination between the community and waste management authorities.	155	3.08	1.353
Valid N (listwise)	155		

As presented in Figure 2, the majority of respondents consistently strongly

agreed that key barriers hinder community engagement in sustainable waste management. Specifically, 41.3% strongly agreed that financial challenges were a barrier, while logistical challenges also received 41.3% strong agreement, indicating that these factors are critical impediments. Similarly, 35.5% strongly agreed that the lack of adequate waste bins contributes to poor waste management practices. Cultural or social discouragement factors were acknowledged, with 36.8% strongly agreeing that such factors exist in their community. Additionally, 34.8% strongly agreed that there is insufficient communication and coordination between communities and waste management authorities. These findings suggest that economic, infrastructural, cultural, and communication-related barriers are widely recognized by the respondents.

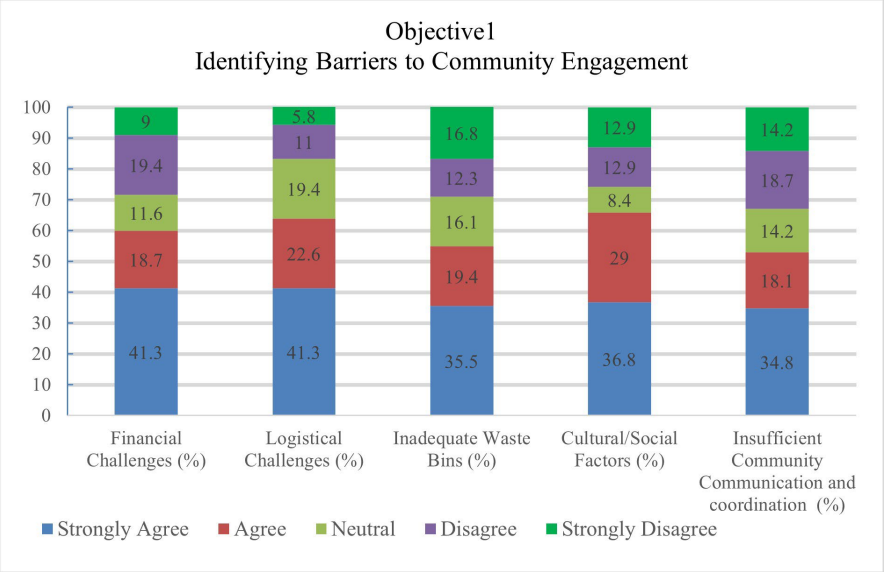


Figure 2. Identifying barriers to community engagement.

3.3. Assessing Awareness and Participation

Secondly, as presented in Table 3, when assessing community awareness and participation, the results indicate a moderately positive perception of local initiatives. A substantial portion of respondents—around 38.7%—strongly agreed they are aware of ongoing programs, and 36.8% felt public campaigns were effective. However, participation in waste collection or recycling remained relatively modest, with a mean of 3.30, suggesting awareness does not always translate into active involvement. This study highlights a clear knowledge-to-action gap: although respondents demonstrated moderate awareness of sustainable waste management programs, this awareness did not consistently translate into active participation. This gap reflects structural and economic constraints but also limited institutional support. Addressing it requires targeted interventions that convert knowledge into practice through improved infrastructure, economic incentives, and community-driven initiatives. Community hubs like schools and mosques were seen as influential, though this influence varied across respondents.

Table 3. Assessing awareness and participation.

Descriptive statistics			
Assessing Awareness and Participation	N	Mean	Std. Deviation
I am aware of ongoing sustainable waste management programs or initiatives in my community.	155	2.92	1.279
Public awareness campaigns or workshops about waste management are effective in my area.	155	2.85	1.265
My community has sufficient knowledge about the benefits of sustainable waste management.	155	3.05	1.298
Schools, mosques, or community hubs play a significant role in promoting sustainable waste practices.	155	2.92	1.314
My family and I regularly participate in community waste collection and recycling activities.	155	3.30	1.401
Valid N (listwise)	155		

As shown in Figure 3, when evaluating awareness and participation, responses showed a mixed but generally positive trend. A significant proportion (38.7% strongly agreed) reported being aware of ongoing sustainable waste management initiatives, while 36.8% strongly agreed on the effectiveness of awareness campaigns and workshops. However, perceptions of community knowledge about sustainable waste management were slightly lower, with 32.3% strongly agreeing that their community has sufficient knowledge. Schools, mosques, and community hubs were recognized as influential in promoting sustainable waste practices, with 30.3% strongly agreeing. Despite this, active participation in community waste collection or recycling activities was less prominent, with 27.7% strongly agreeing and a notable 24.5% strongly disagreeing, indicating that awareness does not always translate into active engagement.

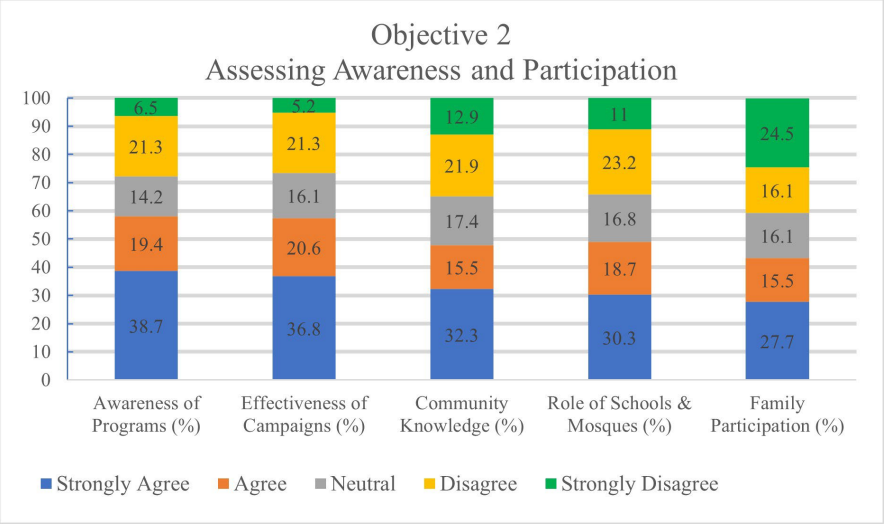


Figure 3. Assessing awareness and participation.

3.4. Examining Socio-Economic and Cultural Influences

Finally, as presented in Table 4, socio-economic and cultural factors played a mixed role. While 43.2% strongly agreed that economic challenges affect participation, and over half (53.5%) believed incentives like financial rewards could im-

prove involvement, community engagement is also influenced by perceptions of responsibility. Many respondents felt waste management is mainly a household duty, while the involvement of women, youth, and marginalized groups received moderate support. The overall interpretation suggests that although financial and infrastructural barriers are significant, social dynamics, community structures, and perceived personal responsibility also greatly impact engagement. Addressing these interconnected factors through targeted incentives, awareness campaigns, and better community coordination could promote more sustainable waste management practices in the district.

As displayed in Figure 4, responses to socio-economic and cultural factors reflected strong agreement with the role these factors play in influencing community engagement. The majority of respondents (43.2% strongly agreed) believed that income levels and economic challenges significantly affect participation. Cultural practices also garnered recognition, with 31.6% strongly agreeing that they support sustainable waste management efforts, though 20.6% disagreed, reflecting some division in views. The involvement of women, youth, and marginalized groups was positively acknowledged by 37.4% who strongly agreed, and responsibility for waste management was seen primarily as a household duty by 40.0% who strongly agreed. Notably, the prospect of incentives as a motivator received the strongest support, with 53.5% strongly agreeing that rewards or recognition would encourage participation. This highlights the importance of addressing economic realities and leveraging incentives to enhance community involvement.

3.5. Reliability Test

The reliability test of this research was conducted (see the table below). This test measures the internal consistency of a set of scale items; this research employed Cronbach's coefficient alpha to indicate the reliability of the data. The Cronbach's coefficient alpha can take a value between 0 and 1, with values closer to 1 indicating greater reliability of the scale for our variable. As shown in Table 5, the Cronbach's alpha was 0.864.

Table 4. Examining socio-economic and cultural influences.

Descriptive statistics			
Examining Socio-Economic and Cultural Influences.	N	Mean	Std. Deviation
Income levels and economic challenges in the community significantly affect participation in waste management programs.	155	3.01	1.304
Cultural practices in my community support sustainable waste management efforts.	155	3.10	1.376
Women, youth, and marginalized groups are actively involved in waste management initiatives in my community.	155	2.90	1.454
Responsibility for waste management is primarily perceived as belonging to individual households rather than local authorities or organizations.	155	2.86	1.316

Continued

Incentives, such as financial rewards or recognition, would encourage community members to participate in waste management initiatives.	155	3.35	1.262
Valid N (listwise)	155		

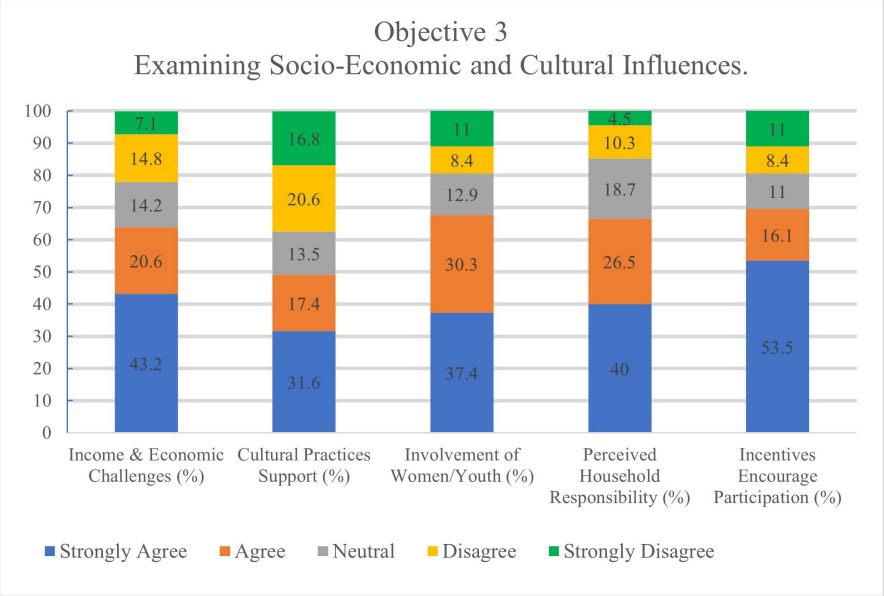


Figure 4. Examining socio-economic and cultural influences.

Table 5. Reliability of the data.

Reliability of the data		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.864	0.864	15

3.6. Inferential Statistics

The Kruskal-Wallis H test was conducted (as shown in Table 6) to examine whether respondents' educational levels influenced their perceptions and experiences regarding barriers to sustainable waste management. Out of the 15 survey items, six showed statistically significant differences across education groups. These included logistical challenges ($\chi^2(4) = 23.855$, $p = .000$), cultural or social discouragement ($\chi^2(4) = 10.301$, $p = .036$), the role of schools and community hubs ($\chi^2(4) = 13.158$, $p = .011$), community knowledge about waste management benefits ($\chi^2(4) = 12.758$, $p = .013$), the inclusion of marginalized groups ($\chi^2(4) = 13.543$, $p = .009$), and the role of incentives ($\chi^2(4) = 18.316$, $p = .001$). These results suggest that respondents with varying educational backgrounds perceive and experience these barriers differently. Notably, higher-educated participants were more likely to recognize systemic and policy-related challenges, such as the role of educational institutions and the effectiveness of incentives. Conversely, no significant differences were found regarding more direct or practical barriers, such as financial difficulties, the availability of waste bins, or participation levels, indi-

cating that some issues affect all education levels uniformly.

Table 6. Kruskal-wallis test by education level.

Question No.	Survey Statement (Shortened)	Chi-Square	df	p-value
Q1	Financial challenges	1.899	4	.754
Q2	Logistical challenges	23.855	4	.000
Q3	Inadequacy of waste bins	4.345	4	.361
Q4	Cultural/social discouragement	10.301	4	.036
Q5	Insufficient Community Communication and Coordination with Authorities	3.803	4	.433
Q6	Awareness of programs	8.844	4	.065
Q7	Public awareness campaigns	8.301	4	.081
Q8	Role of schools, mosques, etc.	13.158	4	.011
Q9	Family participation	0.744	4	.946
Q10	Community knowledge about waste management	12.758	4	.013
Q11	Perceived responsibility	1.583	4	.812
Q12	Gender and group involvement	6.077	4	.193
Q13	Inclusion of marginalized groups	13.543	4	.009
Q14	Incentives encourage participation	18.316	4	.001
Q15	Cultural practices support SWM	4.860	4	.302

3.7. Associations between Demographic Factors and Community Waste Engagement Perceptions

The Spearman's correlation analysis showed several significant links between demographic traits and perceptions of sustainable waste management (see Table 7). There is a strong positive correlation ($\rho = .312$, $p < .01$) between income-level challenges and financial barriers, indicating that greater economic hardship is linked to reduced participation in sustainable waste management. Educational level showed a moderate positive correlation with the perception of inadequate waste bins or collection points ($\rho = .257^{**}$, $p = .001$) and with the active involvement of women, youth, and marginalized groups ($\rho = .226^{**}$, $p = .005$). This implies that more educated respondents were more aware of infrastructure shortcomings and more engaged in inclusive waste management efforts.

Gender had a significant negative correlation with the perception that cultural practices support sustainable waste management ($\rho = -.317^{**}$, $p = .000$) and with the perceived involvement of marginalized groups ($\rho = -.204^{*}$, $p = .011$). This indicates that men and women view cultural support and inclusivity differently, possibly suggesting that women face more cultural or social barriers to active participation. Age showed weak but notable positive correlations with perceived responsibility for waste management within households ($\rho = .158$, $p = .050$), and with the belief that schools, mosques, and hubs promote sustainable practices ($\rho = -.010$, $p = .906$, not significant). Although not all age-related associations were

statistically significant, older respondents tended to feel slightly more personally responsible and more engaged with public institutions. These findings underscore the importance of designing targeted awareness and participation strategies based on educational background, gender, and age differences, particularly in addressing inadequate infrastructure and insufficient inclusion in community waste management initiatives.

Table 7. Interpretation table—Key Correlations Between Demographics and SWM Perceptions.

Variable Pair	Spearman's Rho (ρ)	Significance (p)	Interpretation
Financial challenges → Income-level challenges	.312**	.000	Strong positive correlation. As economic constraints increase, financial barriers to engagement rise.
Education Level → Inadequate waste bins or collection points	.257**	.001	Moderate positive correlation. More educated respondents notice infrastructure gaps.
Education Level ↔ Involvement of marginalized groups	.226**	.005	Higher education is linked to greater awareness of inclusive waste management.
Gender ↔ Cultural practices support SWM	−.317**	.000	Strong negative correlation. Gender differences influence cultural perceptions.
Gender ↔ Involvement of marginalized groups	−.204*	.011	Negative link. Women may perceive less inclusivity in waste management efforts.
Age ↔ Household responsibility for waste management	−.105	.195	Weak negative correlation. Older respondents more often view it as a household duty.
Age → School/mosque/community role in SWM promotion	−.010	.906	No meaningful correlation. Age does not affect this perception.
Marital Status → Participation in community waste activities	−.083	.304	Not statistically significant. Marital status does not influence engagement.

Note: **ρ** = Spearman's Rho correlation coefficient. **p** = Significance level. ***Correlation is significant at the 0.05 level (2-tailed). ****Correlation is significant at the 0.01 level (2-tailed).

4. Discussion

Our results are consistent with the findings of Shibrain et al. (2025), who reported that the solid waste management system in Khartoum Locality is constrained by weak infrastructure, limited public awareness, and inadequate government support. Similarly, our survey reveals that most respondents strongly agreed that logistical barriers, particularly the lack of adequate transportation, pose significant obstacles. In addition, budgetary constraints were frequently highlighted as a major factor limiting active participation in sustainable waste management. Furthermore, the participants mentioned that there is a failure in providing appropriate waste bins and collection points in their neighborhoods, hindering effective engagement. These intersecting challenges, financial, logistical, and infrastructural, echo the systemic vulnerabilities found in Shibrain and reveal that without focused investments in infrastructure, increased awareness-raising among the public, and consistent government support, environmental sustainability and the well-being of society continue to be vulnerable. In one instance, Sanneh et al. (2011) noted that such constraints weaken municipal waste disposal services in

The Gambia. The country's National Action Plan to End Plastic Pollution, which seeks an ambitious 86% reduction in plastic waste, continues to face serious hurdles. Limited financial resources and difficulties in carrying out planned measures remain the biggest obstacles. As a result, budget pressures not only limit public participation but also put the overall sustainability of the initiative at risk.

The study revealed that cultural and social factors are among the significant barriers to community engagement in waste management. Cultural or social dynamics in the community directly or indirectly discourage participation in waste management activities. This finding is consistent with Zhang et al. (2024), who identified that barriers to effective waste management extend beyond infrastructure and economic resources, encompassing socio-economic factors such as awareness, education, and the availability of facilities, alongside cultural influences like waste composition and entrenched disposal habits. In the context of Hamar Jajab, these cultural and social factors may include traditional waste disposal practices, gender roles affecting participation, and limited community dialogue about environmental responsibility. Such influences can undermine otherwise well-designed waste management programs, particularly when infrastructure is lacking or financial barriers exist. Addressing these cultural constraints will require tailored community engagement strategies that respect local traditions while fostering positive behavioral change.

Our findings show that income levels greatly affect participation in waste management, aligning with Adanweli Ahmed (2023), who reported that in the Hamarweyne district, a neighboring district, more than half of households (53.8%) relied on private collection services that cost $3-6 per month, although many were unable to afford the fees and resorted to direct disposal into the environment. These behaviors not only lead to contamination but also increase risks for health, such as measles and respiratory disorders, with 55% of respondents being concerned with the impact on the environment. Kalina et al. (2023) also observed that higher-income households are less concerned about disposal costs and more willing to pay for services, even in areas with underdeveloped systems. In contrast, low-income households encounter greater financial barriers, as noted by Fereja & Chemeda (2022), who found that free garbage collection can ease these concerns, and door-to-door services can promote wider engagement. The World Bank (2018) further reports that waste collection is widely available in middle- and high-income countries in Asia and Africa, but in low-income countries, coverage is limited to 48% in urban areas and 26% in rural areas, with recycling rates as low as 4%. These patterns echo our findings, emphasizing how financial limitations and gaps in service accessibility restrict participation in sustainable waste management, and that without addressing affordability and access, financial barriers will continue to undermine effective sustainable waste management in Mogadishu. One limitation of this study is the reliance on convenience sampling, which restricts the generalizability of findings to the broader population. Future research could employ random or stratified sampling to enhance representativeness.

Based on these findings, the following recommendations are made to remove the identified impediments and improve sustainable waste management in the district. The district's sustainable waste management can be strengthened through targeted youth and gender-inclusive engagement, the integration of environmental education in schools, the modernization of collection infrastructure, the establishment of centralized waste hubs, the promotion of multi-stakeholder partnerships, and the adoption of a 50% government-community cost-sharing scheme to address financial, logistical, and awareness barriers. Based on these findings, municipal authorities and NGOs should prioritize three interventions: 1) Investment in localized waste collection infrastructure, particularly accessible bins and transport; 2) Financial support mechanisms such as subsidies or cost-sharing schemes to alleviate economic barriers; 3) Gender- and youth-inclusive engagement programs that harness community hubs (schools, mosques, and centers) as platforms for awareness and participation. Such policies would directly address the barriers identified and strengthen community-driven sustainable waste management.

5. Conclusion

This study revealed that community involvement in sustainable waste management in Hamar Jajab District faces limitations due to structural, economic, and social barriers. While residents have some awareness, actual participation remains low, with over 60% citing inadequate facilities, 55% mentioning the lack of government subsidies, and 48% highlighting the exclusion of women and youth as major challenges. Weak institutional support further hinders translating knowledge into action. To overcome these obstacles, a comprehensive approach is required, combining infrastructure expansion, financial incentives, and inclusive awareness programs aimed at vulnerable groups, particularly women and youth. Increasing participation in waste management will not only improve local environmental and health conditions but also advance broader sustainability goals, such as SDG 11 (sustainable cities) and SDG 12 (responsible consumption and production). Future research should assess the long-term impacts of interventions and compare results across districts, helping Hamar Jajab become a model for sustainable waste management in fragile urban settings.

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Authors' Contributions

Ibrahim Jamal Ahmed: Writing—original draft, Methodology, Investigation, Conceptualization. Abdifatah Ahmed Ali Afyare: Writing—review & editing, Validation. Mohamud Abdi Ahmed: Resources, Investigation, Data curation. Dahir

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Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Conflicts of Interest

The authors declare that they have no known competing financial interests or personal relationships that could appear to influence the work reported in this paper. We also assert that this article is original, has not been published before, and is not under consideration for publication elsewhere.

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