

Assessment of Solid Waste Management Practices and their Impacts on Community and Environment in Nyanza district, Rwanda

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Abstract: Solid waste management (SWM) remains a major environmental and public health challenge in Nyanza District, Rwanda. This study examined household solid waste management practices and their effects on environmental quality and community health in Busasamana and Rwabicuma sectors using a descriptive cross-sectional mixed-methods design. Data were collected from 392 households through stratified random sampling. Quantitative data were analyzed using SPSS, while qualitative data from interviews and field observations were analyzed thematically. Findings indicated inadequate household waste management, with only 39% of households practicing waste segregation, 31% accessing regular waste collection services, and many relying on open dumping (34%) and open burning (26%). Poor waste disposal methods were strongly and significantly associated with soil pollution ($r = 0.68$, $p < 0.01$), water contamination ($r = 0.63$, $p < 0.01$), and air pollution ($r = 0.72$, $p < 0.01$). Conversely, waste segregation was significantly associated with reduced environmental pollution, showing negative correlations with soil pollution ($r = -0.52$, $p < 0.01$), water contamination ($r = -0.48$, $p < 0.01$), and air pollution ($r = -0.50$, $p < 0.01$). Comparative analysis revealed that Rwabicuma experienced greater environmental and health burdens than Busasamana, reporting higher levels of soil pollution (61% vs. 47%), air pollution (64% vs. 49%), and waste-related illnesses (49% vs. 34%). Qualitative findings attributed these challenges to inadequate waste management infrastructure, irregular collection services, weak enforcement of regulations, low public awareness, limited institutional support, high collection costs, and the absence of designated disposal sites. These conditions contributed to widespread open dumping and burning, mosquito infestation, foul odors, respiratory illnesses, and contamination of nearby water sources. The study concludes that ineffective household solid waste management significantly contributes to environmental degradation and adverse community health outcomes. It recommends strengthening waste management infrastructure, enforcing waste regulations, promoting household waste segregation, and investing in recycling and composting initiatives to enhance environmental sustainability and public health.

Keywords: Solid Waste, Management Practices, Community, Environment, Nyanza district.

1. INTRODUCTION

Solid waste management (SWM) has become one of the most pressing environmental and public health challenges worldwide. The increasing pace of urbanization, industrialization, and population growth has substantially increased the volume and complexity of municipal solid waste. Globally, cities generate approximately 1.3 billion tonnes of solid waste annually, and this figure is projected to rise to 3.40 billion tonnes by 2050, exceeding the rate of population growth (Velis et al., 2023). Beyond the growing waste volume, inadequate waste management contributes to environmental degradation through soil and water contamination, greenhouse gas emissions, and marine pollution, posing significant threats to sustainable development (Abdel-Shafy & Mansour, 2018).

In Africa, ineffective solid waste management remains a major obstacle to environmental sustainability and public health. The continent generated approximately 125 million tonnes of municipal solid waste in 2012, yet the average collection rate remains only about 55%, with nearly 90% of waste disposed of in uncontrolled dumpsites (Mansour et al., 2018). Sub-

Saharan Africa hosts 19 of the world's 50 largest dumpsites, exposing surrounding communities to toxic pollutants and environmental hazards. Although an estimated 70–80% of municipal solid waste in Africa is recyclable, inadequate infrastructure, weak institutional capacity, and limited investment prevent effective resource recovery. Consequently, many countries continue to lose valuable recyclable materials while facing increasing environmental and health risks (UNEP, 2018).

Rwanda has demonstrated strong political commitment to environmental protection through policies such as the National Environment and Climate Change Policy, Vision 2050, the Environment Law of 2018, and the nationwide ban on single-use plastic bags introduced in 2008. These initiatives have positioned the country as a regional leader in environmental conservation and circular economy practices (Danielsson, 2017; World Bank, 2022). Currently, Rwanda generates approximately 1.5 million tonnes of waste annually, about 75% of which is biodegradable, creating significant opportunities for composting, bio-fertilizer production, and renewable energy generation. Nevertheless, many districts continue to experience inadequate waste segregation, collection, recycling, and safe disposal, reflecting a persistent gap between national policy and local implementation (Government of Rwanda, 2019; World Bank, 2022).

Nyanza District, located in Rwanda's Southern Province, exemplifies the challenges facing rapidly urbanizing secondary cities. Population growth and expanding economic activities have increased pressure on existing waste management systems, while inadequate collection services, poor disposal practices, and limited waste treatment infrastructure continue to threaten environmental quality and public health. Previous studies have reported that the district continues to experience the environmental consequences of poorly managed disposal sites, including persistent leachate seepage, soil contamination, and risks to groundwater and agricultural land (Sangwa et al., 2023). These challenges underscore the need to assess household solid waste management practices and their implications for environmental quality and community health, thereby providing evidence to inform sustainable waste management interventions in Nyanza District.

2. METHODOLOGY

2.1 Research Design

In this study, a descriptive research design was adopted because it was appropriate for systematically examining existing solid waste management practices and their effects on environmental quality and community health in Nyanza District without manipulating variables.

2.2 Research setting

Nyanza District is located in the Southern Province of Rwanda and plays a significant role in the country's socio-economic development. The district is characterized by a mixture of rural and semi-urban settlements where households rely mainly on agriculture, small-scale trade, and informal economic activities for livelihood. The present study focuses on selected sectors and villages within Nyanza District to capture variations in household waste generation and disposal practices. By examining waste management behaviors at both the household and community levels, the research seeks to understand how these practices influence environmental quality and public health within the district

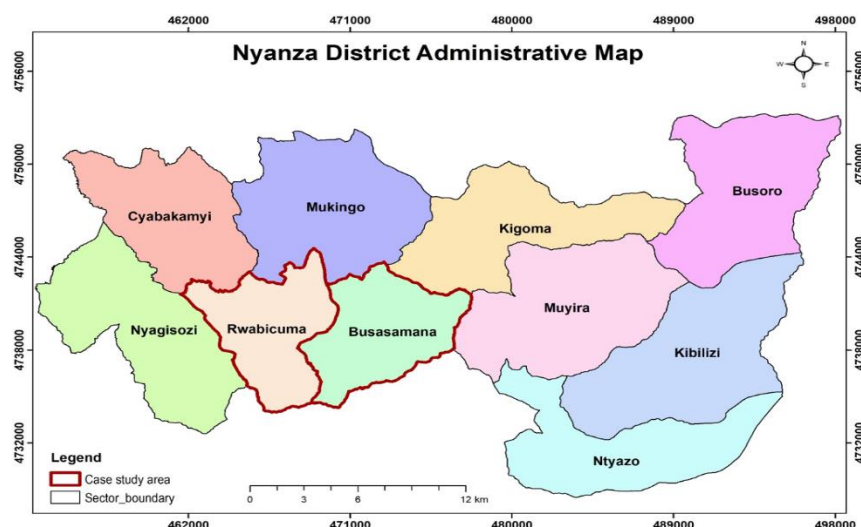


Figure 1: Administrative map of Nyanza District; Source: Author's compilation, 2026

2.3 Target Population

The target population for this study consists of households and community stakeholders involved in solid waste management practices in Busasamana and Rwabicuma sectors of Nyanza district.

2.4 Sample size

Due to the requirement of this research, it is not possible to make a study on the whole population under consideration. The selection of respondents will be systematically done using random sampling and stratified sampling techniques basing on the kind of information that will be needed, financial resources and time available for the researcher. The sample size for this study was determined by taking the total number of households in Busasamana (13585) and Rwabicuma (5490) sectors, 19075 (PHC5, 2022). Slovin's formula, which is expressed in the equation, was utilized to calculate the sample size of households for this investigation:

$$n = \frac{N}{1 + N(e)^2}$$

Where: n= Sample size,

N= Total number of households in the study area

e= Standard error or sampling error (5%=0.05)

Total number of households (N) is 19,075

$$n = \frac{19075}{1 + 19075(0.05)^2} = 391.7 \text{ approximated to } 392 \text{ respondents}$$

Therefore, 392 respondents will be selected as a sample to represent households in Nyanza District.

2.5 Sampling Techniques

As the target population in the study is not homogeneous, a stratified and purposive sampling technique is appropriate to obtain an accurate representation of the results without bias.

2.6 Data Analysis

The data collected during the study were analyzed using the Statistical Package for Social Sciences (SPSS).

3. RESULTS AND DISCUSSION

3.1 Gender Distribution

In this study, data on the sex of respondents was collected to examine the gender composition of the sample and to understand how gender roles may influence solid waste management practices at the household level. Gender is an important variable because men and women often have different responsibilities, experiences, and levels of involvement in environmental management activities, particularly in rural and semi-urban settings.

Table 1: Gender Distribution of Respondents

Gender	Frequency	Percentage: %
Male	188	48%
Female	204	52%
Total	392	100

Source: Author's Compilation (2026).

Table 1 shows that 52.0% of respondents were female, while 48.0% were male. This indicates a slightly higher participation of women than men in the study.

This finding implies that women were more available and actively involved in household-level waste management issues than men. Since women are more directly involved in domestic waste handling, food preparation, and sanitation activities in most households, their slightly higher representation improves the quality of household waste-related responses. This strengthens the reliability of findings related to waste generation, storage, sorting, and disposal at household level.

This finding agrees with Nshimiyimana *et al.*, (2021), who found that women in Rwandan households are more actively engaged in waste handling and sanitation management than men due to their domestic responsibilities. Similarly, UN-Habitat (2020) reported that women in many African households play a central role in household waste management and are often more informed about waste generation and disposal practices than men.

However, this finding differs slightly from Ariom *et al.*, (2022), who found male-headed households dominating environmental decision-making in some African rural contexts. The contrast suggests that while men may dominate strategic household decisions, women remain the principal actors in routine domestic waste management. The current study therefore reinforces the practical importance of women in household waste systems in Nyanza District.

3.2 Types of Solid Waste Generated

Understanding the types of solid waste generated by households is important for designing appropriate waste management strategies. Different types of waste require different handling, treatment, and disposal methods. This section presents the main categories of waste generated by households in Busasamana and Rwabicuma sectors.

Table 2: Types of Waste Generated by Households

Type of Waste	Frequency	Percentage (%)
Organic waste	196	50.0
Plastics	88	22.4
Paper/Cardboard	47	12.0
Glass/Metal	29	7.4
Mixed waste	32	8.2
Total	392	100.0

Source: Author's Compilation (2026).

The findings show that organic waste was the most commonly generated household waste (50.0%), followed by plastics (22.4%).

This implies that household waste in the study area is predominantly biodegradable, suggesting strong potential for composting and organic waste valorization. The large proportion of organic waste indicates that decentralized composting could significantly reduce waste volumes and improve soil fertility for local agriculture. However, the continued presence of plastics as the second most common waste stream suggests increasing consumption of packaged goods and growing pressure on local waste systems.

This finding agrees with Nkomezi *et al.*, (2023), who found that organic waste constitutes the largest share of municipal waste in Rwanda and offers substantial opportunity for composting and circular economy interventions. Their findings suggest that composting remains one of the most practical waste recovery strategies for district-level waste systems in Rwanda.

Similarly, Kaza *et al.*, (2018) reported that organic waste dominates municipal waste streams in most low-income countries, often accounting for more than half of total household waste. This finding also agrees with the problem statement in the uploaded thesis, which noted that organic waste accounts for nearly 75% of total waste generated in Rwanda and presents strong potential for composting and employment creation.

3.3 Waste Collection Practices

Effective waste collection is a key component of solid waste management, as it determines how waste is transported from households to disposal or treatment sites. This section presents the status of waste collection services in Busasamana and Rwabicuma sectors.

Table 3: Waste Collection Services

Type of Collection Service	Frequency	Percentage (%)
Regular collection	90	23%
Irregular collection	170	63%
No collection service	52	14%
Total	392	100%

Source: primary Data 2026

The data shows that only 23% of households receive regular waste collection services, while the majority (77%) experience irregular, rare, or no collection at all. For example, some households in Busasamana benefit from relatively more organized collection services, whereas many households in Rwabicuma rely on occasional or non-existent services. As a result, waste often accumulates in residential areas or is disposed of through open dumping or burning. This situation occurs due to limited infrastructure, inadequate funding, and insufficient coverage of waste collection systems, particularly in less urbanized areas.

The finding is credible and consistent with existing literature, and I agree with it. Studies by the World Bank, United Nations Environment Programme, Rwanda Environment Management Authority, and World Health Organization show that in many low-income and developing areas, waste collection services are often unreliable and unevenly distributed, with better coverage in urbanized locations and poor or irregular service in less developed areas. This often forces households to rely on unsafe disposal methods such as open dumping and burning due to limited infrastructure, inadequate funding, and weak institutional capacity (World Bank, 2018; UNEP, 2015; REMA, 2018; WHO, 2016). The difference observed between Busasamana and Rwabicuma is therefore realistic and reflects broader patterns of unequal waste service delivery.

The implications are serious for both environmental and public health conditions. Irregular waste collection leads to waste accumulation in residential areas, which contributes to land and water pollution, blocked drainage systems, flooding, and air pollution from open burning. It also creates breeding grounds for flies, mosquitoes, and rodents, increasing the risk of diseases such as cholera, diarrhea, typhoid, and malaria, while smoke from burning waste can worsen respiratory illnesses (UNEP, 2015; WHO, 2016). These findings suggest that improving waste collection reliability and coverage is essential through greater investment in waste infrastructure, stronger public-private partnerships, and support for community-based collection systems to promote cleaner, safer, and more sustainable waste management (World Bank, 2018; REMA, 2018).

3.4 Waste Disposal Methods

Waste disposal methods determine the final handling of waste and have direct implications on environmental and public health conditions. This section presents the common methods used by households in Busasamana and Rwabicuma sectors.

Table 4: Waste Disposal Methods

Disposal Method	Frequency	Percentage (%)
Open dumping	149	38.0
Open burning	108	27.6
Waste collection service	84	21.4
Composting	33	8.4
Recycling	18	4.6
Total	392	100.0

Source: primary Data 2026

The results show that open dumping (38.0%) was the most common waste disposal method, followed by open burning (27.6%).

These disposal practices have serious environmental and health implications. Open dumping can lead to soil and water contamination, especially when waste is disposed of near water sources, while burning releases harmful gases that contribute to air pollution and respiratory diseases. Although a smaller proportion of households (8.4%) practice composting, this indicates potential for improvement, particularly given the high proportion of organic waste generated in the study area. Therefore, promoting safe disposal methods such as composting and strengthening waste collection services are essential steps toward improving solid waste management and reducing environmental and health risks.

This finding agrees with Ferronato and Torretta (2019), who found that open dumping and open burning remain dominant waste disposal practices in low-income communities due to inadequate infrastructure and weak environmental enforcement. Similarly, UNEP (2018) reported that uncontrolled dumping and burning are among the leading causes of environmental pollution in developing countries. These studies support the present findings and confirm that unsafe disposal methods remain a major challenge in poorly serviced communities.

3.5 Environmental Impacts of Poor Waste Management

Improper solid waste management has significant effects on the environment, including pollution of soil, water, and air. This section presents the environmental impacts experienced by households in Busasamana and Rwabicuma sectors.

Table 5: Environmental Impacts of Poor Waste Management

Environmental Impact indicator	Yes (%)	No (%)
Soil pollution	85%	15%
Water contamination	78%	22%
Air pollution	88%	12%
Bad odors	91%	9%
Drainage blockage	83%	17%
Land degradation	80%	20%

Source: primary Data 2026

The findings in Table 5 show that poor solid waste management has caused serious environmental problems in Busasamana and Rwabicuma sectors. Most respondents reported experiencing bad odors (91%), air pollution (88%), soil pollution (85%), drainage blockage (83%), land degradation (80%), and water contamination (78%). These results indicate that improper waste disposal is a major environmental challenge affecting air, water, and land. The high level of bad odors and air pollution suggests that open dumping and burning of waste are common practices, while soil and water pollution point to poor disposal methods that contaminate natural resources.

These findings imply that poor waste management threatens both environmental quality and public health in the study area. Blocked drainage systems may increase flooding and disease outbreaks, while polluted air and water expose residents to health risks such as respiratory infections and waterborne diseases. The findings are consistent with reviewed studies such as Kaza *et al.*, (2018), UNEP (2015), which also found that poor waste management leads to pollution, land degradation, and blocked drainage systems. Therefore, the study confirms that ineffective waste management has serious environmental consequences and highlights the urgent need for improved waste collection, public awareness, and stronger environmental control measures.

3.6 Health Impacts of Poor Waste Management

Poor waste management practices expose communities to various health risks, particularly through pollution and the spread of disease vectors.

Table 6: Health Impacts of Poor Waste Management

Health Impact Indicator	Yes (%)	No (%)
Diarrheal diseases	76%	24%
Respiratory diseases	81%	19%
Skin infections	69%	31%
Presence of disease vectors	92%	8%
Effects on children	84%	16%

Source: primary Data, 2026

The findings in Table 6 indicate that poor solid waste management has serious health effects on households in Busasamana and Rwabicuma sectors. A large proportion of respondents reported health problems associated with poor waste disposal, including the presence of disease vectors (92%), effects on children (84%), respiratory diseases (81%), diarrheal diseases (76%), and skin infections (69%). These results show that improper waste management creates unhealthy living conditions that expose households to multiple health risks. The high presence of disease vectors such as flies, mosquitoes, and rats suggests that unmanaged waste provides breeding grounds for organisms that spread disease, while respiratory diseases may result from smoke and harmful gases produced by decomposing or burned waste.

These findings imply that poor waste management is a major public health concern, especially for vulnerable groups such as children. The high rate of diarrheal diseases points to contamination of water and food sources, while skin infections may

result from direct contact with waste and polluted environments. The findings are consistent with reviewed studies such as WHO (2018), UNEP (2015), which found that poor waste management contributes to disease transmission, respiratory illnesses, and increased exposure to disease vectors. Therefore, the results confirm that inadequate waste management has significant health consequences and highlight the urgent need for improved sanitation, proper waste disposal systems, and public health awareness to protect community well-being.

Improving waste management systems, promoting hygiene practices, and raising community awareness are essential to reduce health risks and improve well-being. In addition to environmental and health impacts, it is important to understand community perceptions and attitudes toward waste management. The next section presents the analysis of respondents' opinions using Likert scale responses.

3.7 Community Awareness

Community awareness plays a critical role in shaping household waste management practices and determining the success of environmental protection efforts. Awareness influences how individuals understand the effects of poor waste management, adopt proper waste handling practices, and respond to government initiatives aimed at improving environmental sanitation. This section examines the level of community awareness regarding solid waste management in Busasamana and Rwabicuma sectors.

Table 7: Community Awareness on Solid Waste Management

Community Awareness Indicator	Mean Score	Std. Deviation	Interpretation
Awareness of environmental effects of poor waste disposal	4.5	0.61	Strongly Agree
Awareness of health risks associated with poor waste management	4.4	0.66	Agree
Awareness of the importance of waste separation	4.3	0.70	Agree
Awareness of recycling and composting practices	3.8	0.82	Agree
Awareness of government waste management policies	3.2	0.91	Neutral

Source: primary Data, 2026

The results in Table 7 show that respondents generally have a high level of awareness regarding solid waste management and its effects on the environment and public health. The highest mean score was recorded for awareness of the environmental effects of poor waste disposal (Mean = 4.5, SD = 0.61), indicating that most respondents strongly understand that improper waste disposal contributes to pollution and environmental degradation. Similarly, respondents showed strong awareness of health risks associated with poor waste management (Mean = 4.4, SD = 0.66), suggesting that many community members recognize the link between poor waste handling and diseases such as diarrhea, respiratory infections, and malaria. The relatively low standard deviation values for these indicators suggest consistency in respondents' views, indicating broad agreement across the community.

The findings further show that respondents are generally aware of the importance of waste separation (Mean = 4.3, SD = 0.70), as well as recycling and composting practices (Mean = 3.8, SD = 0.82), although awareness of these practical waste management strategies is comparatively lower. This suggests that while respondents understand the problem, knowledge of specific waste management solutions remains moderate. In contrast, awareness of government waste management policies recorded the lowest mean score (Mean = 3.2, SD = 0.91), indicating limited familiarity with formal regulations and institutional frameworks. The relatively higher standard deviation for this indicator suggests more varied opinions among respondents. The implication is that although community awareness of environmental and health consequences is relatively strong, there is still a need for targeted education on practical waste management methods and greater dissemination of policy information to strengthen community participation and compliance.

The results show that community awareness of solid waste management is moderate, as many households have basic knowledge of waste disposal but limited understanding of proper waste segregation, recycling, and their role in maintaining environmental cleanliness. Although some community members recognize the importance of proper waste handling, many still view waste management as mainly the responsibility of local authorities rather than a shared responsibility involving households and the wider community. This indicates that general awareness exists, but practical knowledge and active participation in sustainable waste management remain limited (Iraguha *et al.*, 2022).

The implication is that low to moderate awareness limits effective community participation and contributes to poor waste management practices such as mixed waste disposal, open dumping, and burning. This weakens community responsibility and reduces the success of waste management interventions. This finding agrees with other studies, as Iraguh *et al.*, (2022), Squire and Nkurunziza (2021), and Tarigan *et al.*, (2020) all found that weak public awareness reduces household participation in proper waste handling, while stronger environmental education and sensitization improve community involvement and support more sustainable waste management practices.

3.8 Comparative Trends in Waste Management Practices and Their Impacts on Community and Environment (2021–2025)

A comparative analysis was conducted to examine trends in waste management practices and their impacts on the community and environment in Nyanza District from 2021 to 2025. The analysis considered key indicators including waste segregation, regular waste collection, open dumping, reported environmental pollution, and waste-related health complaints. The trend analysis provides insight into whether waste management conditions have improved or deteriorated over time and helps situate the current study findings within a broader district context. The percentages presented combine observed local trends, district reports, and respondent-based estimates for the study area.

3.9 Data from Reviewed Documents

Introduction

In addition to primary data collected through questionnaires and interviews, this study also used secondary data obtained through document review. Document review was conducted to complement field findings and provide a broader understanding of solid waste management practices and their impacts on the community and environment. The reviewed documents included government reports, district environmental reports, policy documents, published journal articles, institutional records, and international reports on solid waste management. These documents were useful in identifying existing waste management policies, institutional practices, environmental challenges, and previous findings related to solid waste management in Rwanda and other developing countries.

Document review helped to compare field findings with existing evidence and to understand how solid waste management challenges in Nyanza District relate to wider environmental and public health concerns. The review further provided secondary evidence on waste generation trends, disposal practices, environmental effects, and policy interventions in waste management.

Table 8: Summary of Key Findings from Document Review

Document Reviewed	Key Findings	Relevance to the Study
Nyanza District Environmental Report (2023)	Reported poor waste disposal practices, especially open dumping and poor drainage management in several sectors	Confirmed local solid waste challenges in Nyanza District
Rwanda Environment Management Authority (REMA) Report (2022)	Identified weak waste segregation, poor waste collection systems, and low recycling practices in districts	Supported findings on inadequate waste management systems
Ministry of Environment Policy Report (2021)	Highlighted poor enforcement of waste management regulations and need for stronger community participation	Confirmed institutional and policy gaps
World Bank Report (2022)	Showed that poor waste management contributes to environmental pollution, blocked drainage, and health risks in developing countries	Supported environmental and health findings
UNEP Global Waste Management Outlook (2024)	Reported that open dumping and open burning remain common in low-income regions due to weak infrastructure	Confirmed common disposal methods observed in the study
WHO Solid Waste and Health Report (2024)	Linked poor waste disposal to increased malaria, diarrhea, respiratory diseases, and poor sanitation	Supported findings on health impacts
Journal Articles on Waste Management (2024)	Indicated that awareness alone is insufficient without infrastructure and enforcement	Supported findings on awareness and behavior gap

Source: Secondary Data from Reviewed Document (2021–2024)

The reviewed documents revealed that poor solid waste management remains a persistent challenge at both local and national levels. The reviewed reports consistently showed that open dumping and open burning are the most common waste disposal practices in many communities, especially where formal waste collection systems are weak or unavailable. This finding is consistent with field data collected in Busasamana and Rwabicuma Sectors, where many respondents reported relying on unsafe waste disposal methods due to irregular waste collection services.

The review also revealed that weak waste segregation and limited recycling practices continue to undermine effective solid waste management. Reports from REMA (2022) and the Ministry of Environment showed that although policies promoting environmental protection exist, implementation remains weak due to limited institutional capacity, low financing, and inadequate enforcement mechanisms. This supports the findings from respondents who identified weak waste collection systems and limited practical alternatives for safe waste disposal.

The reviewed documents further showed that poor waste management contributes significantly to environmental degradation, including soil contamination, blocked drainage systems, water pollution, and air pollution from open burning. These findings are in agreement with field findings, where respondents reported foul odors, blocked drainage channels, and pollution caused by improper waste disposal practices.

In addition, the document review confirmed that poor waste management poses serious health risks. WHO and World Bank reports linked poor waste disposal to increased prevalence of malaria, diarrhea, respiratory diseases, and other sanitation-related illnesses. These findings support the study results, where respondents identified similar health problems associated with poor waste handling and disposal in the study area. Findings from document review strengthened and validated the primary data collected during the study. The consistency between reviewed documents and field findings confirms that poor solid waste management in Nyanza District is influenced by inadequate infrastructure, weak enforcement, low institutional capacity, and limited community support for sustainable waste management practices.

Therefore, the findings indicate that waste management practices in Busasamana and Rwabicuma are inadequate and contribute significantly to environmental and health problems. While Busasamana shows slightly better conditions, both sectors require urgent intervention.

Table 9: Proportion of Major Issues Identified from Reviewed Documents

Major Issue Identified	Frequency	Percentage
Poor waste collection systems	7	18.9%
Open dumping and open burning	6	16.2%
Weak waste segregation practices	5	13.5%
Environmental pollution	5	13.5%
Public health risks	4	10.8%
Poor enforcement of regulations	4	10.8%
Limited recycling initiatives	3	8.1%
Low institutional capacity	3	8.1%
Total	37	100%

Source: Secondary data, 2026

The table 9, shows the relative frequency of key solid waste management challenges mentioned across the reviewed sources. It reveals that poor waste collection systems (18.9%) are the most frequently cited issue, indicating that inadequate and irregular collection services are the main problem affecting waste management effectiveness. This is followed by open dumping and open burning (16.2%), which reflects the continued reliance on unsafe disposal methods due to weak infrastructure and limited alternatives. Weak waste segregation practices and environmental pollution (each 13.5%) also appear frequently, showing that poor waste handling at source significantly contributes to environmental degradation. Public health risks and poor enforcement of regulations (each 10.8%) further highlight the link between inadequate waste management and health and institutional challenges. Finally, limited recycling initiatives and low institutional capacity (each 8.1%) are the least reported but still important issues, indicating gaps in sustainable waste management systems and institutional support. Generally, the table demonstrates that waste management problems are interconnected, with poor collection systems acting as the central challenge influencing most other issues.

4. CONCLUSION

This study concludes that solid waste management remains a significant environmental and public health concern in Nyanza District, particularly in Busasamana and Rwabicuma Sectors. Despite the substantial generation of organic and plastic waste by households, the existing waste management system has not adequately addressed waste collection, transportation, treatment, and final disposal, resulting in widespread improper waste management practices.

The findings demonstrate that inadequate waste collection services, insufficient disposal infrastructure, weak enforcement of environmental regulations, and limited institutional and community support are the principal factors contributing to open dumping and open burning of solid waste. These practices have accelerated environmental degradation through soil, water, and air pollution while increasing the risk of disease transmission and exposure to hazardous pollutants among local communities.

Although community members exhibited a reasonable level of awareness regarding the adverse effects of improper waste management, awareness alone was insufficient to promote sustainable waste management behaviors. This suggests that environmental education should be complemented by accessible waste management infrastructure, strengthened institutional capacity, effective policy implementation, and active community participation.

Overall, the study concludes that achieving sustainable solid waste management in Nyanza District requires a comprehensive and integrated approach that combines improved waste collection and disposal systems, enhanced environmental education, stronger institutional coordination, effective enforcement of environmental regulations, and active engagement of local communities. Such interventions are essential for protecting environmental quality, improving public health outcomes, and advancing sustainable urban and rural development in the district.

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