

WASTE MANAGEMENT AND ENVIRONMENTAL SUSTAINABILITY IN KAMPALA, UGANDA

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ABSTRACT : This study investigates the relationship between waste management practices and environmental sustainability in Kampala, Uganda. Despite ongoing efforts by the private sector and other stakeholders, solid waste management systems in developing nations, including Kampala, continue to face significant challenges. The research employed a survey design, utilizing simple random sampling, with the sample size determined by the Taro Yamane formula. Data was collected through questionnaires distributed to respondents, and both descriptive and inferential statistical methods were used for analysis. The findings revealed that household waste accounts for 40% of total waste, followed by unpleasant fumes (30%), noxious liquids (13%), and sewage (17%). Key factors contributing to pollution include illegal dumping, waste disposal in rivers, inadequate drainage systems, and inefficient waste collection. The analysis indicated a strong relationship between infrastructural provisions, awareness, and enforcement control, with correlation coefficients of $r = 0.829$, 0.714 , and 0.738 , respectively. The study concluded that household waste and unpleasant fumes are major pollution sources in the community, and that stricter enforcement measures, including fines, are necessary to mitigate non-compliance with waste management regulations.

KEYWORDS: Waste management, sustainability, environment, human behaviour

I. INTRODUCTION

Waste release into the environment represents a significant negative externality, with the majority originating on land and being transported into the oceans by winds or waves. This pollution harms economic institutions, ecosystems, and the health of living organisms globally. Human activities, whether direct or indirect, introduce pollutants into the environment, leading to health risks, disruptions to daily life, degradation of seawater quality, and a reduction in natural amenities. Common pollutants include glass, paper, plastics, and metals, with varying degrees of hazardous impact (Walker, 2019). Marine life, human populations, coastal communities, and industries reliant on marine resources are particularly vulnerable to these pollutants.

Despite the longstanding efforts of the private sector and other stakeholders in solid waste management, developing countries continue to struggle with inefficient waste collection and disposal systems (Oduro-Kwarteng, 2011). In many cities, government organizations face challenges such as limited-service coverage, irregular waste collection, and improper disposal practices. Uganda, with an urbanization rate of 5.1%, confronts additional hurdles including informal settlements, congestion, and inadequate waste infrastructure (Environmental Resource Limited, 2009). In Kampala, the Kampala Capital City Authority (KCCA) collects only 40% of the daily solid waste, leaving the remainder uncollected and improperly disposed of. This study aims to explore mechanisms to improve waste reduction and enhance waste management systems.

In Uganda, the challenges surrounding waste management are further exacerbated by a complex land tenure system. Many urban residents, particularly in informal settlements, do not have ownership rights to the land they live on, making it difficult to establish proper waste management practices at the household level (Nyakaana, 1997). Moreover, the rapid rate of urbanization places additional pressure on local authorities, who struggle to manage the growing volumes of waste generated in densely populated areas. This inefficiency is evident in Kampala, where only 400 to 500 tons of the 1,200 to 1,500 tons of solid waste produced daily are collected. This limited capacity results in poor waste collection rates, with approximately 60% of waste improperly disposed of, exacerbating environmental degradation and health risks.

To address these challenges, this study seeks to identify strategies for reducing waste generation and improving waste management in Kampala. The focus is on enhancing infrastructure, increasing public awareness, and improving collection efficiency through better coordination between government authorities and private sector participants. By exploring sustainable solutions, the study aims to provide a framework for effective waste reduction that can be applied in Kampala and other rapidly urbanizing regions facing similar waste management issues.

II. LITERATURE REVIEW

2.1 Concept of human behaviour and environmental sustainability

Development is a social construct that is chosen by those in a society rather than something that exists in and of itself. A company is considered sustainable by definition if it can satisfy its needs without endangering natural capital or compromising the rights of future generations to have their needs met and be able to inherit a planet with healthy ecosystems still intact, ecological harmony and operation within the constraints set by the natural world (Artur, 2018). This implies that a sustainable society would produce enough for all of its members as well as the beings of the ecosystems in which they live, taking only what nature can replenish. In addition, the business must demonstrate in practice that it is able to adopt new habits and create the kind of development that the increasing awareness of environmental issues requires (Araoye & Aruwaji, 2018).

A more pragmatic interpretation would be to state that the goal of social development is to enhance the quality of human life as such; this includes promoting long and healthy lives, education, political engagement, social and participatory democracy rather than representative democracy, safeguarding human rights, providing protection from violence, and creating the conditions necessary for appropriate spiritual and symbolic expression (Artur, 2018).

These changes result in the establishment of a number of obstacles, including distinctions in conviviality, warmth in interpersonal connections, and empathy for the next person in difficult circumstances or on the margins, as well as the development of compensatory measures and social inclusion. Earth sustainability principles are as follows;

- a) Create a sustainable civilization;
- b) Honour and take care of the ecosystem;
- c) Enhance the quality of human existence;
- d) Preserve the diversity and vitality of the planet Earth;
- e) Stay within the bounds of the ability to support the planet Earth;
- f) Modify one's own beliefs and behaviours; Artur Victoria's Environment and Human Behaviour
- g) Assist the communities in maintaining their own environmental conditions;
- h) Create a worldwide coalition.

In order to be considered sustainable, one must increase the capacity of Earth's resources, foster creativity through the use of technology, restrict the use of fossil fuels and other renewable and non-renewable resources, reduce waste and pollution through conservation of energy, resources, and policies, encourage self-consumption of materials from rich and poor nations, and step up efforts to obtain technology for the efficient and low-waste use of resources for urban, rural, and industrial development. (Artur, 2018; Aruwaji & Olorunnisola, 2019)

2.2 Concept of Environmental Management System

Using institutional or corporate structures, an environmental management system can be used to justify environmental protection measures. An organization can function more effectively and efficiently by analyzing, controlling, and reducing the environmental impact of its operations, goods, and services with the use of an environmental management system. Promoting environmental measures in all areas (including those where interference has not yet occurred), improving the environment for lowering environmental pollution, strengthening organizations' commitment to the ecological protection, and performance and enforcement controls are some of the anticipated benefits of the EMS. More about interventions on the environment. Theoretically, EMS serves as a tool for problem identification and solving, with a focus on continuous improvement.

Depending on the nature of the activity and the requirements for environmental management in each business, there are several ways to use this instrument. Specifically, the European Commission (ECO), the International Organization for Standardization (ISO), and the Management and Audit Scheme (EMAS) have produced EMS standards (UNEP, 2001; Environmental Protection Agency, 2003).

There are four primary stages in an environmental management system:

1. Plan
2. Do
3. Check
4. Act

Every environmental management project follows these four processes through a full cycle of execution.

III. METHODOLOGY

Kampala, the capital and largest city of Uganda, is composed of five political divisions: Kampala Central, Kawempe, Makindye, Nakawa, and Rubaga, with a total population of 3.85 million. The broader metropolitan region includes nearby districts such as Wakiso, Mukono, Mpigi, Buikwe, and Luweero, with an estimated population of 6.7 million and covering an area of 8,451.9 km² in 2019 (Wang et al., 2019). Kampala is a vital economic hub, producing more than half of Uganda’s GDP in 2015, with a nominal GDP of \$13.8 billion in 2011 constant dollars (Nyakwebara, 2010). It is one of the fastest-growing cities in Africa, with a population growth rate of 4.03% annually, and is regarded as a top place to live in East Africa, according to Mercer rankings.

This study employed a survey research design with a simple random sampling technique, ensuring that all participants had an equal chance of being selected. The Taro Yamane formula was used to calculate the sample size. Data was collected primarily through questionnaires distributed to respondents. Both descriptive and inferential statistics were utilized to analyze the gathered data.

IV. RESULT AND DISCUSSIONS

The result in Figure 1 showed that household waste/garbage is 40%, unpleasant fumes are 30%, noxious liquids are 13%, and sewage is 17%. It implies that the majority of the respondents are of the opinion that household waste, garbage, and unpleasant fumes are the major sources of pollution affecting the community.

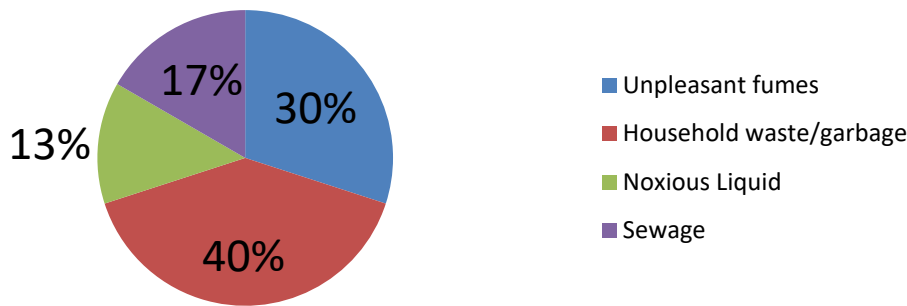


Figure 1: forms of waste

Furthermore, Figure 2 shows various factors contributing to pollution in the study area. Illegal dumping of sites, dumping of refuse and garbage in rivers, poor drainage systems, and poor waste collection systems are factors contributing to pollution in the study area. Poor waste collection systems are serious problems affecting the study area.

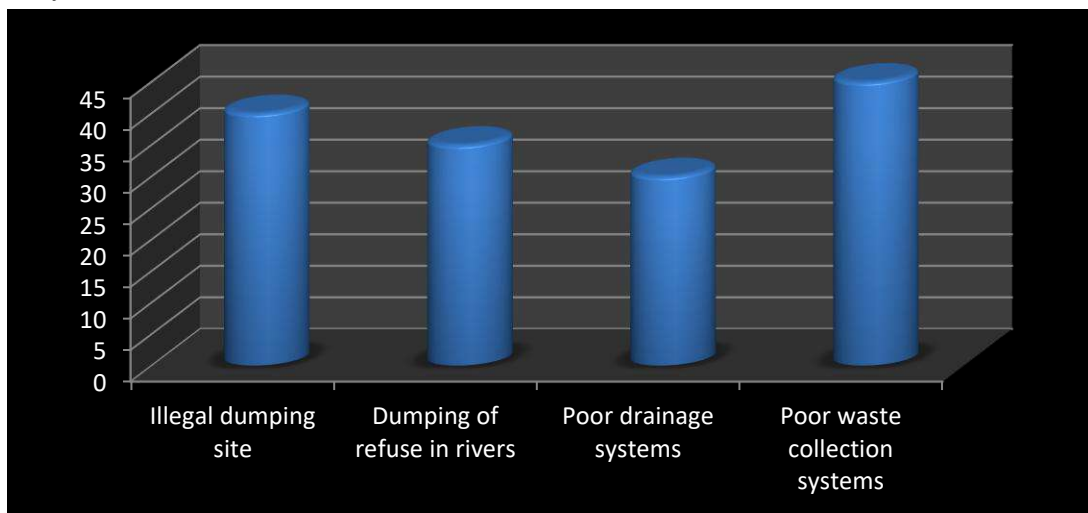


Figure 2: various means of pollution

Multi-collinearity Test

The independent variables were tested for multi-collinearity using tolerance and the variance inflation factor (VIF). The multi-collinearity test is one of the robustness tests employed in this investigation. By employing the Variance Inflation Factor (VIF) to test for excessive correlation among variables, the robustness of the model presented in this work is illustrated. A reliable indicator of multi-collinearity can be found when the Tolerance Value (TV) is less than 1 or the Variance Inflation Factor (VIF) of the variables is greater than 0.10 but lesser than 10. Finding from Table 1 demonstrated that not a single independent variable had a tolerance value greater than 1. In this situation, the tolerance values for the independent variables are 0.139, 0.441 and 0.413 which are less than 1. The VIF values of 7.219, 2.268 and 6.984 are significantly less than the threshold of 10. Therefore, the regression does not contain any multi-collinearities between the independent variables.

Table 1: Collinearity Statistics

Model		Tolerance	VIF
1	Infrastructural provisions	.139	7.219
	Awareness	.441	2.268
	Enforcement control	.143	6.984

Table 2 demonstrated the relationship between infrastructural provisions, Awareness, and Enforcement control with $r = 0.829, 0.714$ and 0.738 . It is clear from the table that the independent variables have a combined positive correlation with one another.

Table 2: Correlations

		Infrastructural provisions	Awareness	Enforcement control
Infrastructural provisions	Pearson Correlation	1	.829**	.714**
	Sig. (2-tailed)		.000	.000
	N	150	150	150
Awareness	Pearson Correlation	.829**	1	.738**
	Sig. (2-tailed)	.000		.000
	N	150	150	150
Enforcement control	Pearson Correlation	.714**	.738**	1
	Sig. (2-tailed)	.000	.000	
	N	150	150	150

** . Correlation is significant at the 0.01 level (2-tailed).

This investigation supported the views of Douglas (1986) and Bernstein (1995) that insufficient collection and disposal of municipal solid waste is a recurring urban issue in developing nations. Uncollected garbage is believed to wind up in street drains, where it can result in floods and consequent road damage, as well as in neighborhood dumps, where disease-carrying insects and rodents thrive. Additionally, this study supported the claims made by Abdulfatah Abdu Yusuf et al. (2019) that Mukono's solid waste management operation is deficient and lagging behind because of a lack of enforcement officers and poor rates of recycling and composting. Furthermore,

V. CONCLUSION AND RECOMMENDATIONS

In conclusion, the study found that household waste and unpleasant fumes are the primary sources of pollution impacting the community. Additionally, illegal dumping of waste, disposal of garbage in rivers, poor drainage systems, and inefficient waste collection practices contribute significantly to pollution in the study area. Poor waste management systems remain a major challenge for the community. The study further concluded that improvements in infrastructure, public awareness, and stricter enforcement measures are essential for enhancing waste management in Kampala, Uganda.

Based on these findings, the following recommendations were made:

1. The Kampala Capital City Authority (KCCA) should prioritize proper planning and coordination of cleaning activities.
2. The private sector, including recycling industries and other waste management agencies, should be encouraged to develop more effective and sustainable systems.
3. Public awareness campaigns should be extended to both urban and rural areas.
4. Adequate infrastructure, such as waste collection equipment and related facilities, should be provided to ensure a clean and safe environment.
5. Enforcement measures, including fines, should be imposed on those who fail to comply with waste management regulations.

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