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Assessing Solid Waste Management in Kampala City, Uganda: A Case Study of Nakawa Urban Division

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Abstract

About 2.01 billion tons of solid waste were produced in 2016 across the globe. And by 2050, the waste generated in various parts of the world would have increased by 70% due in part to the rapid growth of towns and cities. In addition, municipalities generate 40% of the waste and collect only 20% to 25%. Of equal importance, 75% to 80% of the waste generated in municipalities is disposed of in the open dumps. Enshrined in the KCC (Kampala City Council, 2000) Act Section IV (2), the Kampala City solid waste management ordinance mandates urban division councils to collect generated solid waste in the region. The Act also placed emphasis on the frequency of solid waste collection and gave authority to the division councils to determine collection fees using different methods. City divisions in Kampala including Nakawa division have had poor solid waste management (SWM) facilities as well as strategies and practices characterized by poor littering of waste leading to public health risks and diseases caused by vectors and rodents. The main objective of the study was to assess the current status of the waste collection facilities, practices, technologies and strategies adopted in Nakawa urban division, in view of the region's recent experience and development. The study heavily relied on review of secondary data comprising of government reports, online data sources as well as research papers and published journal articles to generate more evidence to support the study findings. Face-to face interviews were also conducted with Nakawa division technical staff, policy-makers, community leaders, and private solid waste operators. Results show that SWM facilities used in Nakawa urban division are still of poor quality with weak rusty metal and too small to store huge amount of waste generated daily by the city residents. Due to poor support facilities, most of the solid waste end up being dumped just outside of the garbage skips hence littering the waste collection sites. A large proportion of waste is not re-used and waste sorting is rare making it difficult to re-cycle or compost. Findings

highlight the need for Nakawa Division to improve waste management with respect to facilities, methods, technologies and strategies used. Specifically, the city authorities need to enforce Kampala City Council (KCC) ordinance 2000 to avoid illegal dumping of solid waste, monitor performance of private and public waste collectors as well as regulating the fees paid for waste collection by the private firms. It is also important to increase the city's financing portfolio to support in upgrading and expanding existing SWM facilities, such as landfills, gazetted local collection sites as well as procurement of effective transportation equipment such as garbage trucks. Last but not least, the success of solid waste management programmes in Nakawa Division will depend on the efforts of the city managers to increase the levels of community participation and involvement as well as the sensitization and education of the city residents on their roles and responsibilities in addressing this intractable urban challenge.

Keywords

Solid Waste Management, Community Participation, Recycling and Environmental Health

1. Introduction

According to Asajenie (2023), 2.01 billion tons of solid waste were produced in 2016 across the globe and by 2050, the waste generated in various parts of the world would have increased by 70% due in part to the rapid growth of towns and cities (Asajenie, 2023). In addition, Nuwamanya and Byamukama (2013) states that globally, municipalities generate 40% of the waste and collect only 20% to 25%. Besides, 75% to 80% of the waste generated in municipalities is disposed of in the open dumps (Nuwamanya & Byamukama, 2013; Asajenie, 2023).

Of equal importance is that only 40% of the solid waste (SW) generated in Kampala city is collected and properly disposed of at the gazetted landfill (WaterAid, 2011). Kinobe et al. (2015) states that 70% of the waste collected and transported to Kiteezi landfill is handled by the Kampala city authorities. The rest is collected by the contracted private waste collectors and informal waste collectors (WaterAid, 2011; Kinobe et al., 2015).

Enshrined in the Kampala City Council (KCC, 2000) Act Section IV (2), the Kampala city solid waste management ordinance mandates urban division councils to collect all the generated solid waste (Kiwuwa & Alemiga, 2017; WaterAid, 2011). The Act also placed emphasis on the frequency of solid waste collection and also gave authority to the division councils to determine waste collection fees using the different methods and approaches (Kiwuwa & Alemiga, 2017; WaterAid, 2011).

Various private waste collectors engaged and contracted by the city authorities have been overwhelmed by the amount of waste generated each day in various urban divisions including Nakawa Division (Ministry of Local Government, 2013;

Kiwuwa & Alemiga, 2017; WaterAid, 2011).

1.1. Profile of Nakawa Urban Division

Nakawa division is one of the five urban divisions that make up Kampala City. Nakawa division is located in the East of Kampala. Administratively, Nakawa division has 23 parishes and 229 villages/zones. Nakawa Division also has a population of 317,023 people with 163,594 females and 153,429 males. Besides, there are 248,583 households in this city division (see Table 1 below).

Nakawa division is bordered by Ntinda to the north, Kyambogo to the northeast, Banda and Kireka to the east, Mbuya to the southeast, Bugolobi to the south, Namuwongo to the southwest, Kololo (in Kampala Central Division) to the west, and Naguru to the northwest. The road distance between Kampala's central business district and Nakawa is approximately 5 kilometers.

Table 1. Kampala district population statistics.

Division	Target Population							
	Males	Females	Total	Sex Ratio	Population Density	No of Wards (Parishes)	No of Zones (Villages)	No of Households
Central	37,435	37,733	75,168	99.2	4945	20	135	68,351
Kawempe	158,768	179,897	338,665	88.3	10,925	21	120	200,516
Lubaga	176,762	206,454	383,215	85.6	10,385	11	133	314,682
Makindye	186,368	206,640	393,008	90.2	7251	20	242	320,581
Nakawa	153,429	163,594	317,023	93.8	6004	23	229	248,583
Total	712,762	794,318	1,507,080	89.7	7928	95	859	1,152,723

Source: UBOS (2014).

1.2. Problem Statement

According to Tukahirwa et al. (2010) the various city divisions of Kampala including Nakawa division have had a poor solid waste management (SWM) record and strategies characterized by poor littering of solid waste leading to public health risks.

Mugagga (2006) and Nyakana (2012) observes that the failure by KCCA divisions to determine the size of SWM facilities to be used and properly positioned is due to high population growth rates driven by the high rates of urbanization, under funding as well as the failure to disseminate important information to key stakeholders including the city residents.

Most garbage skips used in the various parts of the city including Nakawa Division do not match the type and quantity of generated waste (Nyakana, 2012). Community garbage skips are also poorly placed, often far away from the location of waste generators forcing the city residents to dump as they wished (Kiwuwa & Alemiga, 2017; WaterAid, 2011).

1.3. Study Objectives

Specifically, the study aimed at achieving the following objectives:

- To examine the current state of solid waste management facilities in Nakawa Division;
- To investigate the current solid waste management practices and approaches used in Nakawa Division;
- To assess the main challenges hindering effective solid waste management in Nakawa urban division; and
- To propose strategies for improving solid waste management in Nakawa urban division in view of the region's recent experience as well as its development.

2. Literature Review

According to Hoornweg and Bhada-Tata (2012) solid waste is defined as all discarded solid materials resulting from households, industrial, healthcare, constructional, agricultural, commercial, and institutional sources. Solid waste generated in a city is often referred to as municipal solid waste (Hoornweg & Bhada-Tata, 2012).

Integrated solid waste management refers to the strategic approach to sustainable management of solid wastes covering all sources and all aspects, covering generation, segregation, transfer, sorting, treatment, recovery and disposal in an integrated manner, with an emphasis on maximizing resource use efficiency (Brunner & Fellner, 2007).

Henry et al. (2006) also asserts that the integrated waste management strategy relies on handling waste in a four-pronged approach: waste minimization, recycling (including composting), Energy Recovery, and finally as a last resort, landfill.

The types of solid waste identified in most cities include: 1) the household hazardous waste (HHW), 2) construction and demolition debris, 3) industrial/commercial waste, 4) hazardous waste lamps, 5) regulated medical waste, 6) used electronic equipment, 7) used oil and 8) waste tires (Brunner & Fellner, 2007).

Solid waste management involves many challenges during waste collection due to high costs that are involved (UNEP, 2013). Waste collection cost accounts for over 70% of the solid waste management budget of many municipalities in developing countries and about 60% or less for the developed countries (Henry et al., 2006).

Key costs involved in managing solid waste includes the transportation cost to different facilities such temporary storage sites and landfills as well as fixed costs and operational of facilities. This has forced many municipalities and cities especially in the de Dyson eloped countries to search for innovative solutions and scalable strategies for cost effectiveness such as route optimization (Nuwamanya & Byamukama, 2013; Nyakana, 2012).

Uganda Bureau of Statistics (2013) state that Uganda is rapidly growing with annual urbanization and population growth rates of 5.1% and 3.3%, respectively. However, the existing infrastructure for public services such as solid waste

management does not match increased urbanization (Uganda Bureau of Statistics, 2013).

Overall, approximately 28,000 tons of waste is collected in Kampala and delivered to the landfill every month, which accounts for only 40% of the total waste generated in the city (WaterAid, 2011). The remainder of the waste generated is indiscriminately disposed of resulting in environmental and public health problems such as blockage of drainage channels and consequently flush floods (Nuwamanya & Byamukama, 2013; Nyakana, 2012).

Other environmental health challenges due to poor solid waste management include water and soil pollution resulting in the spread of diseases such as Cholera and diarrhoea (Marshall & Farahbakhsh, 2013).

Out of the 1,619,900 people that live in Kampala, approximately 53.6% (868,266) live in crowded and informal slum settlements, most of which are located in low-lying zones and wetlands (United Nations, 2014). This has resulted in overcrowding and development of more informal settlements.

Migration of rural population to urban areas has escalated the rate of urbanization and increased population densities, yet these cities lack the capacity to effectively and efficiently handle the waste management service due to the high costs involved (Oteng-Ababio et al., 2013; Nyakana, 2012).

Currently Kampala city has one landfill at Kiteezi and about 40% - 45% of the generated waste is collected and disposed of at this landfill (Kampala City Council, 2006; WaterAid, 2011; Mugagga, 2006; Nyakana, 2012).

Most urban authorities including Kampala city have been found to be unsuccessful in managing solid waste despite spending more than 50% of their operational budgets serving less than 70 percent of the urban populations (Nyakana, 2012; Nuwamanya & Byamukama, 2013).

In most developing country cities, solid waste management is based on the local government's centralized collection, transportation and disposal strategy. Currently this approach has proved to be inefficient due to the heavy financial requirements involved and rapid population growth (Nuwamanya & Byamukama, 2013; Nyakana, 2012).

The increase in urban, economic and industrial activities, as well as the resultant population increase has led to an increase in the quantity of solid waste generated. The state of solid waste management in Nakawa division needs immediate attention if the urban environment is to be saved from further deterioration.

This study therefore is intended to assess the current state of facilities, approaches, practices, technologies and strategies adopted in managing solid waste in Nakawa urban division, Kampala city, in view of the area's recent experience and development.

3. Methods and Approaches

The study heavily relied on review of secondary documents especially government reports, text books, online data sources (internet sources) as well as research papers and published journal articles to generate evidence and support the study

findings (Bryman, 2012). Face-to face interviews were also conducted with key informants from Nakawa division such as division town clerk, division public health officer, division engineer and division physical planner. Community leaders such as the local council 1 (LC1) chairpersons were also consulted.

4. Key Findings and Discussion

Provided and explicated below are the key findings of the study:

4.1. Equipment Used

Critical assessment of important solid waste management facilities including garbage skips used in Nakawa division revealed that they are still of poor quality having weak rusty metal and too small to store huge solid waste generated each day. Some of the garbage skips were stationed in wrong places.

Of the seven (7) markets located in Nakawa division, only Nakawa market and Go-down market in Naguru have enough and accessible garbage skips. The rest do not have sufficient garbage skips and use open spaces as temporal dumping sites. Nakawa urban division is responsible for more than 60% of collected waste compared to its contracted private service providers.

Solid waste facilities and equipment used in Nakawa division do not adequately support the fundamental principles of "reduce, reuse, and recycle" due to their non-compliance. Due to poor support facilities, most of the solid waste ends up being dumped just outside of the local collection facilities such as garbage skips.

Garbage skips used in Nakawa division are not adequately maintained and emptied in timely manner thereby creating environmental and public health risks to the neighbourhood.

And when garbage skips delay to be returned to the gazetted local collection sites, the city residents would continue dumping anywhere in the vicinity due to lack of alternative arrangement from the city authorities.

Local leadership in Nakawa division however, reported the start of regular street cleaning system to help in the removal of the poorly dumped solid waste which has become a breeding place for diseases. The work of cleaners, supervisors and scouts recruited by the division is envisaged to improve the outlook of the dumping sites and facilities.

Nakawa urban division is also currently moving towards phasing out the use of garbage skips in favour of a self-loading system. Under this new system, households are responsible for temporal storage of their waste before it is collected on specific days and transported by KCCA and contracted private operators' trucks to the landfills for final disposal

Nakawa division has had challenges in the use of garbage skips because waste is often scattered around them due to delayed collection. Besides, city residents would not accept having garbage skips placed in front of their houses and shops.

4.2. Local Waste Collection Points

The study confirmed that solid waste transfer stations and local waste collection

points were insufficient in Nakawa division. Having enough transfer stations or centres would reduce piling of solid waste before it is collected and transported for final disposal at the gazetted landfill.

4.3. Landfills

Currently, there is only one gazetted landfill at Kiteezi used by Nakawa division. The landfill is located at Kiteezi. Kiteezi is Uganda's largest and only sanitary engineered landfill. Kiteezi landfill was commissioned in 1996 and covers 36 acres of land. Kiteezi landfill is located in Nangabo sub-county, Wakiso district 13 km from Kampala city centre (Kampala City Council, 2006; WaterAid, 2011).

Kiteezi landfill receives 1400 to 1700 tons of waste daily with about 600 salvagers working every day in harmony and earning their daily income from sorting rubbish (WaterAid, 2011; Kiwuwa & Alemiga, 2017).

On a daily basis, waste collectors in Kiteezi search for recyclables materials, ranging from plastics, scraps, and clothes to food leftovers. Kiteezi landfill has become source of their livelihoods with some level of pre-screening and sorting done. The landfill is an open space with limited restriction for entry and exit especially for waste pickers.

KCCA plans to turn the Kiteezi landfill site into a transfer station where garbage is first taken for sorting, then compressed and transferred to the new landfill in Ddundu in Mukono district.

KCCA is also exploring the option of planting trees at Kiteezi landfill or harvest methane gases for energy production. The 2020 guidelines for the management of landfill in Uganda will ensure that the closure of Kiteezi landfill is preceded by the preparation of a plan clearly setting out requirements for closure, decommissioning and site rehabilitation. **Photo 1** below shows local people sorting solid waste at Kiteezi landfill.

Photo 1. Kiteezi landfill (Source: Kiwuwa & Alemiga, 2017).

4.4. Transportation Facilities

The study has investigated the state of transport facilities used for SWM such as vehicles, wheel barrows, bicycles and vendors themselves. Below is the description

of these facilities and key findings:

4.5. Vehicles (Trucks and Tippers)

While Kampala Capital City Authority (KCCA) has only 15 garbage collection trucks, Nakawa Division has only three (3) vehicles (2 compactors/back-hole loaders trucks and one (1) Skit/container loaders tippers) for transportation of solid waste. These trucks operate following weekly work plans and schedules.

In terms of efficient service delivery in Nakawa division, the compactors were reported to be the best so far as each takes about 20 tons of waste in a single trip. Garbage trucks face so many mechanical problems coupled with delays in the repair workshops as well as rising maintenance costs.

Recently, KCCA introduced new hydraulic tipper trucks with loaders and this has improved service delivery in the area. Besides, solid waste from Nakawa division is collected by several private operators such as Nabugabo Updeal Joint Venture, Home Klin Uganda Limited and Kampala Solid Waste Management Consortium to collect garbage.

Nabugabo Up-deal Ltd has 5 trucks that can carry 30 tons of garbage and 21 trucks of 7 tons each operating in Kampala city.

Interviews conducted with the Nakawa division mayors revealed that in order to improve waste management services, Kampala city needs about 65 garbage trucks. Photo 2 below shows a newly acquired garbage truck by Nakawa Division.

Photo 2. A waste collecting truck.

4.6. Wheel Barrows, Vendors and Bicycles

Based on the face-to-face interviews carried out with key informants, it was established that some of the city residents resorted to transporting solid waste using wheel barrows from homes to gazetted local dumping sites. Informal waste collectors also use wheel barrows and bicycles to transfer solid waste from homes to the dumping sites (WaterAid, 2011). Such an approach according to Kiwuwa and Alemiga (2017), was due to lack of a coherent policy on solid waste management in the city.

Because of increased operational costs and constant breakdowns of trucks, simpler and cheaper methods like animal carts, hand carts and humans were being used in some areas with poor terrain and road network (Nyakana, 2012). Scouts

deployed by the city division have also managed to reduce cases of illegal dumping and sensitizing the community about the need to embrace self-loading as a new approach to solid waste management in the city division (Kiwuwa & Alemiga, 2017).

4.7. Protective Personal Equipment (PPE)

The study revealed high vigilance among the workers in using their protective gear especially the KCCA branded uniform, helmets, hand gloves, gumboots, and masks. Not common among them was the disinfectants and eye gurgles.

Most cleaners would also carry jerry cans, buckets and wheelbarrows for ferrying waste from one place to another.

4.8. Private Operators

Findings show that the private companies contracted by Nakawa division to manage solid waste collection are not enough to provide the required services. Given that section IV (4) of SWM ordinance of KCC (2000) mandates the city division to charge a fee from the waste generators to cover costs related to the collection and disposal of solid waste, some of private companies charged very high collection fees of UGX 1000 to UGX 10,000 which could not be afforded by the urban poor.

Such a practice has also led to the emergence of illegal waste collectors and transporters' who charged very low fees (between UGX 200 shillings to UGX 1000) using poor waste collection methods such as wheel barrows and bicycles.

It was also established that the contracted private waste collectors and transporters are motivated by profit and do mostly serve the interests of rich city residents who can afford the charges. This has forced the urban poor to dump the waste indiscriminately especially at night.

Some of the private operators interviewed reported that the fees charged are closely associated with the high cost of their operations in the city.

It was also established that the private operators prefer to collect solid waste generated from neighborhoods that are able to pay their exorbitant fees, to the detrimental of the poor especially those in hard-to-reach areas such as the informal settlements and slums.

Based on the Solid Waste Public Private Partnership agreements signed in 2015 to improve waste collection and transportation, KCCA has sub-divided Kampala into 7 Solid Waste Management service zones managed by three (3) concessionaires, namely: Nabugabo Updeal Join Venture, Homeklin Uganda Limited and Kampala Solid Waste Management Consortium (see **Table 2** below).

According to the signed contracts, the private waste operators are required to levy a monthly charge of 30,000 Shillings for premium services (3 bags per week) and 3000 Shillings per month for bring-to-truck services.

In June 2022, Kampala Capital City Authority (KCCA) extended the contracts of the same companies for ten years. However, this prompted the elected councilors

to pass a resolution to recall the review contracts including an audit.

Companies that have exclusive rights to collect garbage in their respective zones and wards and concessionaires are shown in Table 2 below:

Table 2. List of contracted private waste collection firms in Kampala city.

Concessionnaire/Private Waste Collector	Zone	City Division
M/s Kampala Solid Waste Management Consortium	2	Nakawa
M/s Homeklin (U) Limited	3 & 4	Makindye & Rubaga
M/s Nabugabo Updeal Joint Venture	5 & 7	Rubaga & Central

Source: KCCA: https://www.kcca.go.ug/waste collection and transportation sourced on 28/11/2022.

Most of the waste from various parts of Nakawa division is collected and transported by M/s Kampala Solid Waste Management Consortium.

There have been emerging issues in the implementation of the waste collection concessions. Table 3 below indicates the complaints/issues and possible solutions to poor waste management in Nakawa division.

Among the key complaints reported are: High waste collection fees, Infrequent collection of waste as well as indiscipline among the private waste collectors. Highlighted and provided as possible solutions to the complaints include: objective assessment and charging of waste generators, public sensitization and awareness creation about proper waste management.

Table 3. Summary of complaints and issues as well as solutions to poor waste management in Nakawa division.

	Issues and complaints about waste collection	Suggested Solutions
1	High waste collection fees	Contract stipulates UGX30,000 for premium services (3 bags per week) and UGX3000 per month for bring-to-truck services. Concessionaires advised to assess and charge each client objectively depending on how much garbage is generated.
2	Waste generators are charged varying amounts	Concessionaires in collaboration with KCCA field teams continue to sensitize people that some premises generate more garbage than the others thus the need for different charges.
3	Infrequent collection of waste	Contract managers have been appointed to enforce clauses of the contract regarding collection schedules.
4	Lack of information especially on political leaders' role and funds for the collection and management of solid waste in the city	Funds for education, awareness creation and sensitization of leaders and the public need to be availed.
5	Indiscipline among employees of the contracted private waste collection firms	KCCA continues to advise citizens to report any complaints to the contract managers. Signed contract provides for penalties in case the concessionaire does not address the complaints.

Source: KCCA (2022), https://www.kcca.go.ug/Waste-Collection-and-Transportation.

4.9. Solid Waste Workforce and Employees of Nakawa Division

As indicated in Table 4, Nakawa division has one (1) waste management officer, 52 waste supervisors, 15 scouts and 476 cleaners and sweepers to manage the collection of solid waste. However, there is improved staffing at dumping sites and food markets in the city division. This has also improved service delivery in the division.

Nakawa main market has 16 workers (cleaners/sweepers) and 4 supervisors paid monthly (UGX 180,000) of which 63% are women. The market is usually clean and vendors are happy, according to face-to-face interviews conducted. Market cleaners are often provided with the necessary protective gear and wheel barrows.

Nakawa division has ensured that there is at least one staff stationed at each local waste dumping site to manage it. Some supervisors have under-performed leading to waste accumulation on some of the roads especially in Naguru go-down market area.

There were also complaints of frequent transfers of supervisors by the KCCA management on short notice which affects service delivery in various areas during transfers.

Table 4. Main workforce in waste management in Nakawa Division.

Position	No	Role and Responsibility
Waste Management Officer	1	Based at Nakawa division to provide technical guidance and quality assurance role as well as carry out field checks
Supervisors	52	Play supervisory role on the cleaners. Each must have smart phone for communication in what's app group
Scouts	15	They do sensitize the community members and implement enforcement. They also have their what's app group for communication
Cleaners	476	Ensure the cleanliness of the assigned sites. They sign on the work register daily to ensure their presence at work and demand for payment at every end of month of UGX 180,000
Truck Drivers	3	To ensure the trucks collect waste as scheduled from specific collection points (gazetted places) and households as well as institutions

4.10. Methods, Practices and Approaches

The study results show that in Nakawa division, a large proportion of waste is not re-used. Waste sorting is also rare and therefore this makes it difficult to re-cycle or compost. As a result, a large proportion of solid waste is mostly disposed of in

the open dump sites and many times burnt especially at household level.

Variations in waste management practices in the division are due to limited funding, composition and quantity of waste generated. Collection is often from source i.e. temporary dumping ground, and final disposal is often at landfill at Kiteezi.

Due to insufficient sorting at the source, solid waste composition is still a complex issue. Collected waste comprise of industrial, medical, electronic, and human waste dumped in the open ground at Kiteezi.

A study by Akiteng (2021) in Nakawa division revealed that polythene and plastic materials are the biggest waste generated by 46.3% of households compared to other types of waste.

The primary sources of solid waste (MSW) generation in Nakawa division are the households, transient population, market places, commercial areas, industry, public institutions, kindergartens & schools and hospitals among others (WaterAid, 2011; Nyakana, 2012).

Nakawa division prohibits any burning of waste in public which may attract stringent penalties at courts of law. Communities have been sensitized and warned against burning of waste in the division either at household level or dumping sites. This is similar to what WaterAid (2011) reported about a large proportion of solid waste in developing countries is often disposed of on the open dumping sites and many times burnt.

Nakawa division has 6 informal settlements, namely: Banda, Bukoto I, Butabika, Kinawataka, Mambo Bado Kisenyi, Luzira and Naguru. Waste generated in these settlements is often dumped in un-gazetted areas.

Nakawa city division has not employed various practices expected to control and minimize the solid waste generated which included recycle, reuse, waste reduction, compositing, energy recovery, compaction, dumping, incineration. It has relied heavily on solid waste reduction through dumping at the Kiteezi landfill (Nyakana, 2012; WaterAid, 2011).

The main types of solid waste generated in Nakawa division include: paper and carton, yard trimmings, food scraps, wood glass, plastics, metal and clothes. This is similar with findings by Nicholas Wire (2018) in his study on solid waste management in Makindye division.

4.10.1. Volume of Waste Disposed of by Nakawa Division

Figure 1 below shows that, there is a downward trend on the volume of solid waste collected and disposed of by Nakawa division from 2882.6 tons in January 2022 to 1365.4 tons in November, 2022 due to fuel crises which loomed during the period as well as frequent breakdown of trucks. Nakawa division continued to use the previous (old) budget yet prices for fuel increased.

Although KCCA has a repair workshop for its fleet, trucks sometimes delay to be repaired and this affects timely delivery of services causing garbage backlog.

The increased generation of waste as depicted in the above results in Nakawa division is due to the increase in population, coupled with improved incomes,

their lifestyles and changing consumption patterns as a result of rapid economic growth in the city (Kiwuwa & Alemiga, 2017).

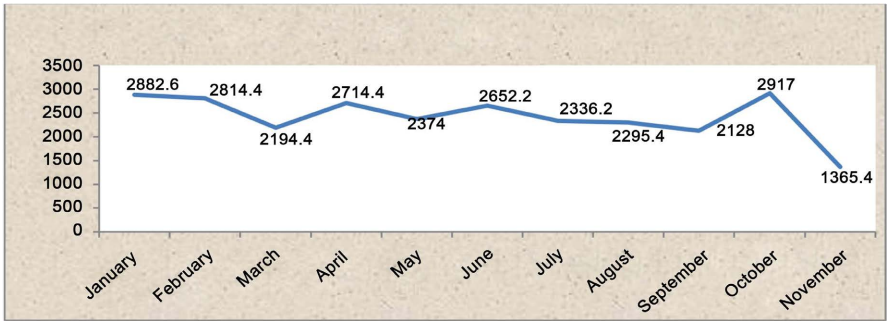

Figure 1. Quantity (Tons) of solid waste disposed of by Nakawa Division in Jan.-Nov. 2022. Source: Nakawa Division Solid Waste Management Office (Nov. 2022).

Waste collection is still wholly done by KCCA in the poor areas and markets, totaling to about 71% of the waste collected from Kampala to the landfill. Private operators manage about 29% of the waste collected and transported to the landfill, which comes from business centers and upscale residential areas (WaterAid, 2011; Kiwuwa & Alemiga, 2017).

This compares with Kinobe et al. (2015) who found out that food and yard wastes constituted 92.7% of the waste generated in Kampala. Recyclables and other special wastes constitute only 7.3% of the total waste, mainly because of the increased level of reuse and recycling activities.

4.10.2. Waste Recycling

Recycling as one of the ways of managing solid waste was not applied in Nakawa division and yet this method and practice could actually be very useful not only to protect and promote public health and the environment but also create incomes for the majority of the people in the division.

However, at Kiteezi landfill, some private individuals and companies engage in sorting and separating materials daily to be recycled. There are some Chinese recycling firms already located near the Kiteezi site.

Nakawa division should therefore, be supported to sort the generated waste at –source and recycle where possible through a private-public partnership arrangement.

4.11. Strategies for Solid Waste Management

The study identified and analyzed several strategies used by Nakawa division to improve the SWM. Notable among them are:

4.11.1. Stationing of Solid Waste Collection Facilities at Central Points

Nakawa division authorities have ensured that solid waste collection sites are located close to the generation points and based on population size. Garbage skips are also placed near the major food markets such as Nakawa market and Naguru

go-down.

WaterAid (2011) and (KCCA, 2013) stress that solid waste collection facilities have to be centrally stationed with wide access routes coupled with a good traffic flow; land for expansion; good topology; and access among others.

Waste management in the markets is undertaken by KCCA, and each division caters to its local food markets. This is because local food markets generate tons of waste every day, composed of mainly food and yard wastes.

All activities involving street sweepings and drainage channel de-silting generate waste that is managed by KCCA as guided by each urban division.

4.11.2. Kyanja Demonstration Farm in Nakawa Division

At a newly established city-owned farm in Kyanja, Nakawa Division, the sorted and collected waste is used to make manure for distribution to farmers undertaking urban agriculture. The farm also promotes backyard farming practices using sacks and buckets as a way of utilizing the small piece of land available. The Kyanja demonstration farm aims to encourage the city residents to grow their own food.

4.11.3. Effective Planning for Transportation of Generated Waste

There is improved transportation of solid waste in Nakawa division through use of daily, weekly and quarterly work schedules followed by all truck drivers, supervisors and cleaners. The drivers are not allowed to leave without following the daily programme schedule. Currently the division cannot follow the route schedules due to frequent truck break down.

Other schedules are based on the demand of waste to be collected in particular wards, and on the driver's discretion on the route to be followed. The truck drivers are well skilled and knowledgeable about the waste pickup points; traffic level and flow; safety measures (environment and public health); road terrain and the likely amounts of waste to be collected from each point.

It was reported that in some inaccessible places with poor road infrastructure, small trucks could be used to collect waste in poor communities. According to Katja (2012), the city authorities should effectively plan for the routes used by waste collection vehicles.

4.11.4. Enforcement of KCC Ordinance 2000

There is evidence that Nakawa division authorities have relied on enforcement of the section V (4) of the SWM Ordinance 2000 which prohibits illegal hauling (transporting) of solid waste along any public street unless that waste is in a vehicle or receptacle(container) so constructed or covered as to prevent the contents from falling; leaking or spilling and to prevent any obnoxious (unpleasant) oduor escaping from waste.

It is also an offence to transport; remove or dispose refuse for a fee or other consideration without a valid permit from the Council (KCC, 2000). This has worked very well and people are well-informed about SWM in most wards.

4.11.5. Self-Loading System

A self-loading system was introduced by the city authorities in 2015. Before its

introduction, there were several illegal dumping sites in Kampala. City divisions also tried to reduce the use of garbage skips because of delayed waste collection. Some city residents would not accept having garbage skips in-front of their houses and shops.

Under a self-loading system, the city authorities ensured effective management of waste by the generators themselves, while the division provided transport facilities such as garbage trucks.

Interviews conducted with the key informants revealed that a self-loading system reduced waste collection points and stopped people from practicing indiscriminate dumping of waste.

4.11.6. Involvement of Private Operators/Waste Collectors

Nakawa urban division has involved the private operators as provided for in the legal framework for waste management under the Local Government Act and laws of 1997. KCCA garbage trucks are responsible for disposing of approximately 946 tons/day to Kiteezi landfill, and this tonnage represents about 70% of the waste generated in the city while the rest is by private operators (Kiwuwa & Alemiga, 2017; WaterAid, 2011).

Private waste management operators mainly collect waste from upscale residential places and institutions such as hospitals, educational centers, clinics, clubs and industries. Unscale residential places in Nakawa division include upper Naguru, Muyenga, Bugolobi, Ntinda and Nakawa.

Waste collection from these areas is largely undertaken by the private operators and to a small extent by Kampala Capital City Authority (KCCA). The garbage from the households is placed in polyethylene bags provided by the private operator companies.

Private companies collect the polyethylene bags containing solid wastes after they have been placed along the streets by the collectors or from their houses and/institutions daily, or once to five times per week depending on the agreed collection frequency.

Households pay a monthly fee that ranges from 30,000 to 70,000 Uganda shillings (United States Dollars (US$12 to US$28) and institutions pay 30,000 to 100,000 Uganda shillings (US$12 to US$40) for collection and transportation of waste that is undertaken by private operators. In both cases, the fee depends on the quantity of waste generated and the agreed frequency of collection, where more collection times per week reflect higher pay.

Willingness to pay for the service in these areas is high, thereby making collection of wastes less problematic. Plastic bags and bins of differing colors according to a particular private company are provided and given to the waste generators and later collected by the subsequent company. The division has also made private arrangement for collection of waste from medical facilities through private operators.

4.11.7. Effective Monitoring and Evaluation of the Performance of Private Collectors

Nakawa city division authorities have not developed any effective M&E and

reporting mechanism to monitor and evaluate the performance of SW private collectors. It is important for the division authorities to allocate contracts to competitive firms that offer comprehensive services through collecting, transporting and disposal including those that are able to build and operate a waste management facility to assign stations, develop landfill facility, recycle and generate power.

Tukahirwa et al. (2010) stress that exclusive licenses should be given to private companies to provide services to specific zones or wards and charge the residents fees and in return pays a license fee to the city government. Companies should provide periodic reports to the division authorities as stipulated in the KCC Ordinance 2000.

Waste management officers of the city urban division usually undertake quality assurance through field checks and liaise with private companies, supervisors and other community workers. There is also daily, weekly and quarterly work schedule followed by all garbage truck drivers and other field staff.

4.11.8. Scaling Public Participation through Education and Training

It was established that there was little effort by the Nakawa division authorities to sensitize the citizens and increase the levels of public awareness on proper waste management.

A study by Kiwuwa and Alemiga (2017) also revealed that there was minimal use of mass media (radios, televisions, newspapers, posters and market loud speakers among others) to encourage citizens to participate in the proper management of waste in Kampala city.

Tukahirwa et al. (2010) state that education programmes and sensitization campaigns should help all the stakeholders' to exchange ideas and knowledge; follow-ups to resolve any complaints that relate to the best practices based on the five collection process that includes: house to dustbin; dustbin to truck; truck from house to house; truck to transfer station; and truck to disposal in this order to encourage good citizen cooperation in SWM.

By developing appropriate training and education programs, Nakawa division would help provide vital information and knowledge to the people in the areas of SW collection, storage, transfers, transportation, and final disposal and better methods of reuse; recycling and energy recovery as well as solve the problem of illiteracy; ignorance; and poor cultural attitudes to better SWM (Tukahirwa et al., 2010; Kiwuwa & Alemiga, 2017).

It is important to establish strong training program that empowers people to acquire skills and knowledge on best practices in SWM given the high rates of population growth and urbanization. Such continuous training would enable community members to quickly adapt to the SWM methods thereby saving costs; use solid waste as source of generating income; protect and promote environmental and public health safety (Kiwuwa & Alemiga, 2017).

Private waste collectors such as Nabugabo Updeal reported that Kampala Capital City Authority (KCCA) should sensitize the public on proper waste disposal.

The participatory approach towards effective and efficient SWM by the urban public helps to protect and promote the public health and the environment through public awareness, education and training on proper habits of SWM methods such as sorting; recycling; energy recovery; use of skips; home composting; waste minimization and adherence to waste management laws.

Nakawa Division Waste management officers also reported that they took great effort through their 15 scouts recruited to sensitize the community on penalties and enforcement on illegal dumping of waste along the roads. Feedback has shown that, there is great improvement in overall cleanliness of the community and key local institutions.

Communities have taken charge in the management of their waste both at household level and institutions. Whenever a garbage truck arrives, citizens are able to deliver their waste individually to the trucks especially in areas with no central collection site/container.

Use of the scouts in waste management. Scouts have become change agents in the community due to the tremendous work they are doing in awareness creation and enforcement.

4.11.9. Appropriate Technologies and Innovations Adopted

It is strategically important for the authorities of Nakawa Division to adopt the application of modern technologies that support the type and volume of solid waste generated given the high population growth rates. This will help in averting both public health and environmental impacts affecting the population. The discussion on this important issue is provided below:

4.11.10. Introduction of New Hydraulic Tipper Trucks with Loaders

The introduction of the new hydraulic tipper trucks with loaders has improved service delivery especially in the markets where KCCA has more vested interests. These trucks now take only 2 hours to deliver rubbish to Kiteezi landfill.

4.11.11. Use of Community Based Structures for Management of Solid Waste

The 52 supervisors, 546 cleaners and 15 scouts recruited by Nakawa division have been able to communicate effectively and in real time through what's app groups created by the waste management officer. These work alongside the waste management officer who is able to get daily real time information and feedback. Each worker is required to have a smart phone.

4.11.12. Establishment of Staff Savings and credit Cooperative Societies (SACCO) at KCCA

KCCA has supported its staff members including the community workers and casual labourers from Nakawa division to form a saving SACCO currently with a standing of over UGX 500 million where they can easily save and borrow cheaply. Contributors to this saving SACCO are also registered with the National Social Security Fund (NSSF).

4.11.13. Opening of New Waste Treatment and Disposal Facility (Landfill) at Ddundu

A new landfill has been proposed by KCCA at Ddundu in Butaba village in Mukono District. This new landfill is envisaged to employ an appropriate choice of technologies which include: composting, energy from Waste, Anaerobic Digestion, etc.

4.11.14. Sorting of Waste at Source

Vendors buying plastic bottles for recycling are now a common business by the youth in the division especially at Go-down market in Naguru ward. A kilogram of plastic bottles is bought by vendors at UG 400 and sold to recycling companies in Namanve at an appropriate profit margin. Plastics bottles are recycled to make blankets, tiles, etc.

It was also established that the cleaners employed by the division do the cleaning as well as private sorting of the essential waste materials for sale as source of income for themselves. There is a ready market for some of the valuable waste materials such as plastic bottles, polythene bags, metals, paper boxes, etc.) at the landfill site.

Some of the schools in the division are also doing waste segregation and it has become easy to collect and sell sorted products.

4.11.15. Tracking System Application for Garbage Trucks

Nakawa division is planning to develop a new tracking system application for monitoring and evaluation as well as tracking of movement and performance of garbage trucks during waste collection and final disposal.

4.11.16. Use of Small Trucks to Pick Waste from Inaccessible Areas

It was established that, the division sometimes hires small trucks to deliver waste to the big trucks in inaccessible areas. However, in many cases it has involved private companies to operate in such areas.

5. Key Challenges Faced in Managing Solid Waste

Over flowing garbage skips at the local dumping sites. Cases of over flowing garbage skips have been observed at Nakawa daily market, Naguru go-down market and Kasenge Naguru. It was also established that in many places generated waste was not regularly collected due to common break down of vehicles and fuel shortages especially for KCCA garbage trucks as opposed to private service providers.

Lack of a coherent regulatory framework for waste management in the urban division. Currently, more than 35 solid waste private operators are providing the waste collection service with little or minimum regulatory framework or guidance from Kampala Capital City Authority (KCCA). For instance, the garbage trucks used are not recommended for waste collection and on many occasions litter the city, thereby complicating the garbage collection arrangement. Despite this, private operators have greatly contributed to solid waste collection in the city division.

Inadequate garbage trucks. KCCA has only 12 functional garbage collection trucks. Only about 56 percent of the garbage is collected while the contracted firms collect 32 percent and KCCA 24 percent. There is evidence of KCCA's low capacity to offer free garbage collection to low-income earners and residents have resorted to using private collectors to supplement their services.

6. Innovations and Best Practices

Among the reported innovations and best practices in managing solid waste in Nakawa division are:

Sorting of waste at the source. As explained in the preceding sections of this paper, vendors buying plastic bottles for recycling are now a common business by the youth in the division especially at Go-down market in Naguru ward. A kilogram of sorted plastic bottles is bought by vendors at UG 400 and sold to recycling companies in Namanve at an appropriate profit margin. Plastics bottles are recycled to make blankets, tiles, etc.

Contracting of private companies to collect solid waste in Nakawa Division. Under this initiative, the city authorities have contracted several private companies to collect and transport waste for final disposal at the gazetted landfill. Such an initiative has also improved service delivery and reduced pressure from the city government to perform in the face of insufficient financial resources as well as competing development priorities.

Self-loading of generated waste to municipal garbage trucks. As explained before, Nakawa is one the city's divisions that introduced a self-loading waste management system. As an innovative strategy, self-loading allows the households to temporary store their waste and wait until garbage trucks are sent on the agreed days and with clear collection schedule. Self-loading system has reduced the number of gazetted community waste collection points as well as illegal dumping of the waste.

Waste Composting to produce manure used to support urban agriculture in Nakawa division. Owned by Kampala Capital City Authority (KCCA), the Kyanja demonstration farm in Nakawa Division deals with sorted organic waste that used in producing manure. Which is distributed to the urban farmers. The Kyanja farm also promotes backyard farming using sacks and buckets as a way of utilizing the small piece of land available.

7. Conclusion

The study concludes that Nakawa Division has demonstrated some level of improvement in SWM with respect to facilities, approaches, methods, technologies and strategies used amid high rates of SW generation by the high population.

Results show that generated solid waste in Nakawa division is rarely sorted making recycling difficult but also more hazardous to handle from point it is generated to final disposal posing health risks to the general public. In addition, waste collection and transportation is an important municipal service that involves high

expenditures if not handled efficiently.

To improve solid waste management in Nakawa Division, it is suggested that the city authorities effectively enforce Kampala City Council (KCC) ordinance of 2000 to avoid illegal dumping of solid waste, monitor the performance of private and public operators as well as regulate the fees paid by the solid waste generators.

City managers in Nakawa Division should also aim to increase its financing portfolio to support upgrading and expanding of existing SWM facilities, such as landfills, collection sites, as well as the procurement of effective and sufficient transportation equipment, such as garbage trucks.

Above all, there is need to build the capacity of private and public waste collectors, especially the introduction of modern technology in SWM in collection, recycling, energy/power production, home composting as well as waste minimization.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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