

# Assessment Of Solid Waste Management Practices And Challenges: A Case Study Of Kator Block Council, South Sudan

**Kuol Patai Tut Nyal**

**Ameria Nabukonde**

Kuol Patai Tut Nyal is a Masters in Environmental Health Student at Nkumba University

Ameria Nabukonde is Lecturer at School of Sciences, Nkumba University, Uganda.

## **Abstract:**

**Background:** Solid waste management is an essential component of environmental infrastructure in human settlements and it encompass all activities undertaken from the point of waste generation up to the final disposal. The study was an assessment of solid waste management practices and challenges a case study of Kator Block Council, South Sudan.

**Methods:** The study used a cross section study design with both quantitative and qualitative approaches that helped to collect qualitative data. The main data collection instruments were self-administered question and the interview guide. Data was collected from 355 respondents.

**Results:** Diverting waste from landfill sites is an area of concern for Kator Block Council. Waste separation and recycling initiatives at Kator Block Council are not sufficient to meet international's sustainability objective of 'zero- waste-to-landfills' by 2022. Land filling is still the main solid waste management practice at Kator Block Council. Food waste constitutes the largest proportion of waste generated at Kator Block Council. It is disposed at the landfill site yet it could be segregated and used for composting, or in waste-to energy projects.

Hygiene maintenance at the waste area remained a challenge due to a broken operational high-pressure hose, minimal waste separation at source and also inadequate funding of solid waste management were the main challenges for solid waste management in Kator Block Council. The study further revealed that, solid waste generated in Kator Block Council affects the residence that is, becoming victims of malaria, chest pains, cholera, and diarrhea.

**Conclusion:** Waste management practices at Kator Block Council have created challenges that have affected the residents becoming victims of malaria, chest pains, cholera, and diarrhea.

**Keywords:** Solid waste, Solid waste management practices

## I. BACKGROUND

Solid Waste is unwanted, rejected, abandoned, discarded or disposed material, substance or object that is intended or required to be discarded or disposed of because it has no reasonable use as expected by the waste generators or holders of that said materials. Solid waste means any garbage or refuse, sludge from wastewater treatment plant or air pollution control facility and other discarded material resulting from industrial, commercial, mining and agricultural operations and from community's activities (USEPA 2016).

Solid waste management is an essential component of environmental infrastructure in human settlements and it encompass all activities undertaken from the point of waste generation up to the final disposal. In most African urban areas, solid waste management is ultimately a responsibility of municipal councils while most cases of rural areas the wastes are handled and disposed at the household level (Frank, 2006). Solid waste management (swm) is a major environmental issue particularly in municipalities of many developing countries that has been suffering from environmental problems. Alamgir, Donald, Roehl & Ahsan (2005) assert that urban population growth and economic development should

be considered key issues for Municipal Solid Waste (MSW) generation. Increasing unplanned urbanization along with user's mind-set of 'out of sight out of mind' of wastes is one of the factors that make the production of solid waste to increase and though intensifying environmental pressures including unorganized solid waste disposal in many municipalities.

In many cases, the, SWM is found to be a major concern for the municipalities and towns of many countries, and South Sudan is not an exceptional (ADB, 2012). A clear and comprehensive understanding of the solid waste management processes in the city is a prerequisite for the design of any effective remedial measures. Limited reliable data on the solid wastes generated lack of proper and effective operational plans and conflicting institutional roles, inadequate technical capacity and unsustainable financial support are some of the major reasons of failure in the management of solid wastes in most cities in the developing countries (UNEP, 2013).

Kator Block Council's solid waste management systems are not coping with the growing population and the increase in the solid waste generated (UNEP, 2013).

Despite these socio-economic and infrastructural improvement, Kator Block Council, like many developing towns in the world, is encountering tremendous difficulties in managing the generated solid wastes. The management of solid wastes is effective only if there is proper institutional setup, strong legal and policy frameworks, sufficient technical competence, sustainable financial support and adequate infrastructural facilities like roads and disposal sites. Despite considerable efforts made by many NGOs and public institutions like Juba city council in the country to tackle the issue of solid waste management in Juba three zone i.e., Juba zone, Munuki, and lastly Kator Block Council. The current thinking still indicts that poor waste management reflects largely the failure of the existing institutions to adequately address the waste problems (Yekeen, 2010). Any initiative to build capacity by urban institutions has to become attractive and conducive to environmental safeguard. Capacity needs to be weighed and understood at all level, formal and informal, to aid capacity building and then capacity assessment that is concerned with identifying existing capacity and what additional capacity is required to get things done (Yekeen, 2010).

Generated solid waste in Kator Block Council increases as a result of rural to urban migration for a better life and employment opportunities. The increased population exerts pressure on the town's service delivery level (Kubanza, 2010). Therefore, there is urgent need to carry out investigations that would divert negative impacts resulting from solid waste as evident from informal settlements, open fields, and streams. Residents of informal settlements residents are of the idea that waste management is the government's responsibility. These residents perceive dumping waste along the roads as a call to attract the municipalities' attention to the fact that removal services are needed (Moilola, 2007). Heaps of uncontrolled garbage, illegal dumping sites, and drains blocked with rubbish and health hazards to residential areas emanating from the disposal sites are aspects of solid waste management problems in South African cities (Kubanza, 2010).

Efforts to manage garbage in Kator Block Council are continuously overwhelmed and frustrated by the ever-increasing population of the urban residents and levels of economic activities. A lot of garbage being generated by Konyokonyo market and Jebel market lies on the streets uncollected causing inconvenience, environmental pollution by burning it while still on the streets and it is a risk to public health. It may lead to the outbreak of diseases. The cost of solid waste management is enormous and puts a lot of strain on the little resources of the urban authorities and constrains service delivery critical to human development.

People seem not be caring about the way wastes are handled, possibly because of the ignorance about the likely dangers of poor waste management, and the institutions like Kator Block Council might have managerial challenges that could be affecting the execution of its statutory mandate with regard to solid waste management. There are concerns about the lack of proper institutional arrangements, poor technologies like modern trucks and the lack of the capacity by Kator Block Council to handle the five clusters solid wastes generated. For instance, Kator Block council it's estimated that each household generates 10 kg per day, is hardly collected and even what is collected is not sorted and there is no gazetted area to dispose of solid wastes (development plan 2010-2014). This state of affairs is linked to management functional capacity and has far reaching implication.

Ayuba, Manaf,,et al (2013). Argue that Solid waste is one of the fastest-growing waste streams, which has become an issue of concern for Kator Block Council. Organization's daily operations and improper waste disposal can despoil the natural environment and make it unattractive and less valuable (Davidson, 2011). Restaurants make food service the largest parties' functions being practiced in freedom hall with organic materials as the largest component of the solid waste stream (USEPA, 2016).

Solid waste is one of the fastest-growing waste streams, which has become an issue of concern for Kator Block Council. Sources such as food waste, glass, paper, cans, and cardboard boxes are the types of solid waste that are normally generated by the restaurant outlets, households, factories and others. In addition, the separation of waste at source stands as the most visible challenge attaining a worrisome dimension as recyclable materials are being sent to landfill sites. It was not clear how the complex mix of solid waste at Kator Block Council is being managed as well as the challenges they face in managing the waste and its effects. Most important, Kator Block Council committed to manage solid waste and which set targets for 'zero-waste-to-landfills' by 2022. It was not clear if the assessment of solid waste management practices exist for Kator Block Council to meet the 'zero- solid waste- to-landfills' targets.

This study aimed to improve these previous studies by covering a wider sample size from Kator Block Council, South Sudan. The objective of this study is to assess the solid waste management practices in Kator Block Council. Specifically, the objectives are to identify types of solid waste management practices in Kator Block Council; to examine the challenges of solid waste management in Kator Block

Council; and to determine the effects of solid waste in Kator Block Council.

## II. METHODS

### STUDY AREA

Kator Block Council. Is located in Juba County, an administrative area in Central Equatoria state, South Sudan. It was the largest county in Central Equatoria and one of the largest in the entire region of Equatoria. Its county seat was Juba, the state capital of Central Equatoria and the national capital of the Republic of South Sudan. (Arrow on Google map showing Kator Block Council in South Sudan).

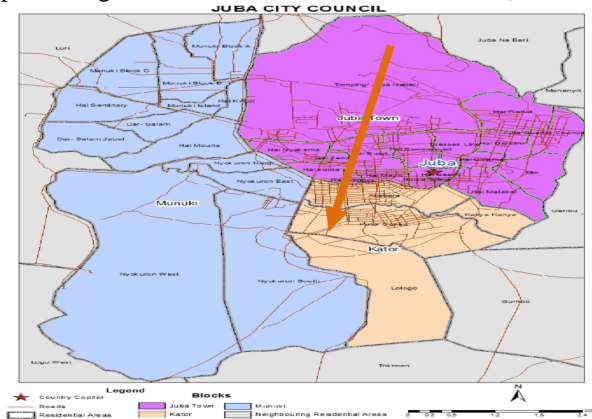


Figure 1

South Sudan 2020 population is estimated at 11,193,725 people at mid-year according to UN data. South Sudan population is equivalent to 0.14% of the total world population. South Sudan ranks number 84 in the list of countries (and dependencies) by population. The population of Juba is 403,000 and that of Kator Block is 73,000 and this was used as a target population for the study.

### DATA COLLECTION

A survey was conducted from January to May 2018. A pilot test was conducted with a small sample size of ~30 to determine the suitability of the items in the questionnaire and the time taken by respondents to complete the questionnaires (Dlamini et al. 2017).

Respondents were interviewed based on a questionnaire adopted and modified from Asante et al. . The questionnaire involved two phases; the first one was to determine the socio-demographic of the respondents, including gender, age, types of housing, religion, educational level, occupation and the number of occupants in the household. Part two was an assessment to determine the status of household management of solid waste. The questionnaire included both open and closed questions (Dlamini et al. 2017). Each question was assessed carefully and decided on with specific wording of each question to be asked. These questionnaires were designed based on attitudinal scales which are designed to assign individuals scores relative to their value commitments, beliefs, and feeling from which the Likert (1932) scale consisting of a 5-point from which 1= strongly disagree, was adapted and

later helped to measure the rate of attitude towards solid waste management in Kator Block Council.

Observation as a method was used to collect data of the current situation (Patton, 2002; Frank, 2006). Issues to be observed include garbage collection methods, equipment and tools frequently used in solid waste transportation to the disposing and dumping sites. This observation was done on the issues handled by workers for waste collection for the transfer and waste transportation to the disposal sites as well as at the dumping sites and this has been done alongside the solid waste treatment process.

To establish validity of instruments, the researcher administered five (5) numbers of questionnaires independent of solid waste experts out of the study area, in order to establish weaknesses relating to ambiguity which was done and amended. Having amended the instruments, Content Validity Index (CVI) for questionnaires was computed by first giving the instruments to two independent professional judges on a rating system of relevant and non-relevant. Judges being two with two different scores, the scores were added up and divided by two in order to get the highest rating scale. The researcher computed the CVI by dividing the highest rating scale which was 4 by the total number of the questionnaires which was 5. The CVI was therefore 0.8; Amin (2005) asserted that for the instrument to be accepted as valid, the average index should be 0.7 or above. Since this was 0.8, the researcher had to realize that the instrument were accurate enough to be used.

### DATA ANALYSIS

Administered questionnaires were processed to check completeness, accuracy and consistency of responses in order to check out and remove errors. Word-excel and Statistical Package for Social Sciences (SPSS) were used to process the quantitative data. The data was processed into statistical tables and charts for interpretation and comparison. On the other hand, descriptive interpretation and analyzing the data distribution was done during the study as an approach for qualitative data.

## III. RESULTS

### SOCIO-DEMOGRAPHIC CHARACTERISTICS AND RESPONDENTS

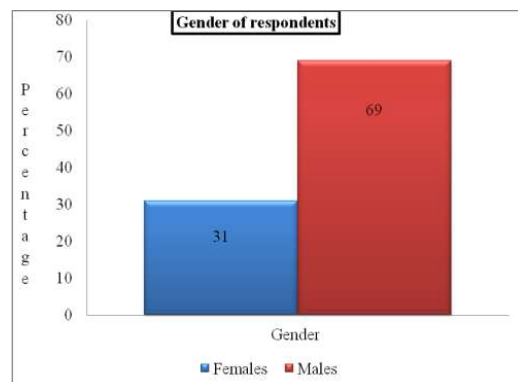


Figure 2

69 percent of the respondents were Males and 31 percent were Females. This data stems from the fact that most of solid waste management jobs are dominated by males in Kator Block Council. It was also found that even males are among the solid waste collectors working in domestic workers.

#### AGE OF THE RESPONDENTS

41 percent of the respondents were in the age group between 31 – 40 years, 23 percent were in the age group between 41 – 50 years, 17 percent were in the age group between 18 – 30 years, 14 percent were in the age group between 51 – 60 years and 6 percent were in the age group of 61 and above. The data set of this nature reveals that solid waste management in Kator Block Council is never discriminative by age. The department employs all groups of people to work for a cleaner environment.

#### EDUCATION LEVEL

55 percent of the respondents had secondary education, 32 percent had primary level, 7 percent had diploma, 6 percent had Bachelor’s degrees and 1 percent was among other levels of education. The data set distribution was due to the fact that majority of the respondents came from groups that normally collect solid waste and transport it to the disposable centers. Secondary, it reveals that most of the people have low levels of education and this was created in South Sudan by the genocide of 1994 that destabilized education system in the nation.

#### OCCUPATION OF RESPONDENTS

Respondents had different occupations. Eighty seven percent (87%) of the respondents were among others that included professionals such as teachers, businessmen and solid waste operators. Nine percent (9%) of the respondents were bank officers, 2 percent of the respondents were management officers, 1 percent were managers and engineers respectively. this data set was attributed by the purposive and random sampling techniques that the study used to reach the respondents.

#### EXPERIENCE WORKING IN SOLID WASTE

59 percent had spent five years of work with solid waste management, 16 percent had spent four years, 11 percent had spent two years, 8 percent had spent three years and 6 percent had spent less than one year.

#### RANKS TO SOLID WASTE

65.9 percent of the respondents supported that the services are good, 20.6 percent supported that the services are very good, 10.4 percent supported the view that services are fair, 2.5 percent supported that the services are excellent and 0.6 percent supported that the services are bad.

#### SOLID WASTE MANAGEMENT PRACTICES IN KATOR BLOCK COUNCIL

	Frequency	Valid Percent
Strongly disagree	24	6.8
Disagree	21	5.9
Neutral	7	2.0
Agree	106	29.9
Strongly agree	197	55.5
<b>Total</b>	<b>355</b>	<b>100.0</b>

Source: Primary data (2021)

Table 4.7 Solid Waste is regularly collected

The information presented herewith in Table 4.7 shows that solid waste is collected regularly. This was supported by 55.5 percent of the respondents who strongly agreed and 29.9 percent of the respondents who agreed. On the other hand, 6.8 percent strongly disagreed, 5.9 percent disagreed and 2.0 percent was neutral. The researcher was informed that regular collection is normally done by employees of Kator Block Council as presented in plate 4.1



Plate 4.1: Collection of solid waste in Kator Block Council

The study went further to establish whether citizens use sacks to collect solid waste and quantitative results are presented in Table 4.8

	Frequency	Valid Percent
Strongly disagree	12	3.4
Disagree	9	2.5
Neutral	12	3.4
Agree	186	52.4
Strongly agree	136	38.3
<b>Total</b>	<b>355</b>	<b>100.0</b>

Table 4.8: Citizens use sacks to collect solid waste

According to Table 4.8, we see that 52.4 percent of respondents agreed that sacks are used to collect solid waste and 38.3 percent strongly agreed. On the other hand, 3.4 percent of the respondents strongly agreed while others were neutral respectively; and only 3.4 percent of the respondents were neutral. While carrying out the study, the researcher observed some of sacks that were filled with solid waste and



were ready for transportation to the disposal point. The photos were taken and presented in the plate 4.2



Plate 4.2: Sacks filled with solid waste in Kator Block Council

Sacks are bought by different households for the use of solid waste. When the sacks are full with solid waste, they are taken to the collecting sites while others are kept nearby homes waiting vehicles to transport them to disposable sites.

The study also established where the solid waste is collected from to the next destination.

	Frequency	Valid Percent
Strongly disagree	176	49.6
Disagree	108	30.4
Neutral	37	10.4
Agree	24	6.8
Strongly agree	10	2.8
Total	355	100.0

Source: Primary data (2021)

Table 4.9: Solid waste is collected from generation to transfer / storage sites

The primary information presented in Table 4.9 shows that 49.6 percent of the respondents strongly disagreed with the statement and 30.4 percent disagreed. Ten percent (10%) of the respondents were neutral, 6.8 agreed and 2.8 strongly agreed. The study therefore established varied responses of collecting solid waste from collection centers to transfer or storage sites and the biggest percentage disagreed.

Responses were also received if curbside collection system is used in solid waste management in Kator Block Council and responses have been presented in Table 4.10.

	Frequency	Valid Percent
Strongly disagree	72	20.3
Disagree	119	33.5
Neutral	70	19.7
Agree	77	21.7
Strongly agree	17	4.8
Total	355	100.0

Source: Primary data (2021)

Table 4.10: Curbside collection system is used in Kator Block Council

According to primary data presented in Table 4.10, shows that 33.5 percent of the respondents disagree with the statements and 20.3 strongly disagreed. On the other hand, 21.7 percent of the respondents agreed with the statement, 19.7 percent were neutral, and 4.8 percent strongly agreed. The study thus found that some areas of Kator Block Council use curbside while the majority of the people do not use them. On setout collection, quantitative findings are presented in Table 4.11

	Frequency	Valid Percent
Strongly disagree	6	1.7
Disagree	14	3.9
Neutral	18	5.1
Agree	201	56.6
Strongly agree	116	32.7
Total	355	100.0

Source: Primary data (2021)

Table 4.11: Setout collection system is used in Kator Block Council

In accordance to primary data in Table 4.11, a percentage of 56.6 of the respondents agreed that setout collection system is used in Kator Block Council and 32.7 percent strongly agreed. On the other hand, 5.1 percent was neutral, 3.9 percent disagreed while 1.7 strongly disagreed.

#### SOLID WASTE TRANSPORTATION

On solid waste transportation, quantitative findings are presented in table 4.12

	Frequency	Valid Percent
Strongly disagree	2	.6
Disagree	3	.8
Neutral	11	3.1
Agree	267	75.2
Strongly agree	72	20.3
Total	355	100.0

Source: Primary data (2021)

Table 4.12: Transportation of solid waste is done by private company

The findings presented in Table 4.12 shows that 75.2 percent of the respondents agreed that transportation of solid waste is done by private company and 20.3 percent strongly agreed. On the other hand, 3.1 percent was neutral, 0.8 disagreed and 0.6 strongly disagreed. The study went ahead to establish whether transportation of solid waste is done by appropriate equipment and the findings are presented in Table 4.13

	Frequency	Valid Percent
Strongly disagree	32	9.0
Disagree	35	9.9
Neutral	65	18.3
Agree	190	53.5
Strongly agree	33	9.3
Total	355	100.0

Source: Primary data (2021)

Table 4.13: Transportation of solid waste is done using appropriate equipments

The information presented shows that 53.5 percent of the respondents agreed with the statement,

18.3 percent were not sure, 9.9 percent of the respondents disagreed, 9.3 percent disagreed, and 9.0 percent strongly disagreed as presented in Table 4.14. Appropriate vehicles that are used in transportation of solid west include vehicles as presented in plate 4.3.



Plate 4.3: Appropriate transportation system for solid waste

From Fig 4.3, it is indicated that Kator Block Council has got different vehicles transporting solid waste. These are normally accompanied by the people who assist in collection as presented in the Fig of reference.

#### SOLID WASTE DISPOSAL

The study also established that there are different disposable practices that are normally used in Kator Block Council and quantitative findings supporting such are presented in the Table 4.14 of this chapter.

	Frequency	Valid Percent
Strongly disagree	15	4.2
Disagree	113	31.8
Neutral	46	13.0
Agree	130	36.6
Strongly agree	51	14.4
Total	355	100.0

Source: Primary data (2021)

Table 4.14: Recycling and composting are used in Kator Block Council

According to primary information in Table 4.14, 36.6 percent of the respondents agreed with the view that recycling and composting are used in Kator Block Council. 31.8 percent of the respondents disagreed, 14 percent strongly agreed, 13.0 percent were neutral and 4.2 percent strongly disagreed. This data pattern is attributed by the fact that some respondents are aware of the use of recycling and composting while others are ignorant about the practices in Kator Block Council.

On whether open dumping spaces are commonly used as final disposal facilities, the findings of the study are presented in Table 4.15.

	Frequency	Valid Percent
Strongly disagree	23	6.5
Disagree	226	63.7
Neutral	54	15.2
Agree	39	11.0
Strongly agree	13	3.7
Total	355	100.0

Table 4.15: Open dumping spaces are commonly used as final disposal facilities

As presented in Table 4.15, 63.7 percent of the respondents disagreed with the statement that open dumping spaces are commonly used as final disposal facilities, 15.2 percent were neutral, 11.0 percent agreed, 6.5 percent strongly disagreed and 3.7 percent strongly agree. Like in Table 4.14, the data patterns support the view that some respondents use open space while others do not use them.

Responses were also received examining if land filling is used in Kator Block Council and quantitative results are presented in Table 4.16 of.

	Frequency	Valid Percent
Strongly disagree	11	3.1
Disagree	87	24.5
Neutral	50	14.1
Agree	165	46.5
Strongly agree	42	11.8
Total	355	100.0

Source: Primary data (2021)

Table 4.16: Land filling is used in solid waste disposal

As presented in Table 4.16, 46.5 percent of the respondents agreed that landfilling is used in solid waste management, 24.5 percent disagreed, 11.8 strongly agreed and 3.1 percent of the respondents strongly disagreed. Despite respondents that disagreed with the statement, the researcher found that the percent of respondents that agreed was bigger enough to be convinced that land filling is used in the solid waste management in Kator Block Council, yet the technology used is still poor as the practice looks like the same as open dumping as shown on the Plate. 4.4



Plate 4.4: Disposing site (Nesitu Nimule high way road Gumba)



## SOLID WASTE MANAGEMENT CHALLENGES FACED BY KATOR BLOCK COUNCIL

Kator Block Council used ISO 14001:2015 standard as a scope to decide on the best practices for ensuring operational control. ISO 14001:2015 standard focuses on how processes interact with the environment. Most challenges related to waste management at Kator Block Council stemmed from operational control. Lack of hygiene, absence of proper waste separation at source and lack of support from top management, are some of the waste management challenges faced by Kator Block Council.

Respondents from the interviews acknowledged waste management challenges as follows:

### *Respondent 5: cluster manager*

“There is no separation at the source as waste is collected as mixed waste. Waste is put into the black round bins and wheelie bins and taken to the waste area for sorting. Inter-waste employees are responsible for waste sorting. Most challenges result from managing food waste as it is generated in larger quantities. Food waste is put into the compactors. The waste compactors are leaking and result in the leachate damaging the concrete slab at the waste area. Waste is removed from site by Inter-waste trucks on a call-out when skips are full. The fat skip area is not properly maintained by Kator Block.

### *Respondent 9: (dump Area Site Manager)*

“Solid Waste mixing remains a huge challenge as there is no separation of waste at the source. Food waste is mixed with other waste types and reduces the amount of recyclables as contaminated waste is put into the solid waste compactor for disposal at the landfill. Sometimes fluorescent tubes are put into the general waste bins”. Five variables such as lack of hygiene, containment leakage, absence of proper solid waste separation at source, poor maintenance of the fat skip bund area and lack of support from the top management were explored.

### **LACK OF HYGIENE**

The solid waste area was kept as tidy and clean as possible but current hygiene maintenance was not adequate due to the lack of solid waste compactor that has been down for almost one year according to the officials statement .to daily activities and easy to clean. The concrete flooring was damaged (Plate 4.5) by leachate with the potential to cause storm water pollution. The concrete floor was not resistant to moisture, food waste and the daily activities carried out in the waste area.



Plate 4.5: Damaged concrete flooring

### *Leakage Containment*

Containment measures implemented at Kator Block Council were not adequate to prevent accidental spillage or leaks and environmental pollution as required by the waste act. Visual impacts such as discharges of liquid waste were observed as drip trays were used to contain leaks from the waste compactors. The drip trays that were used to contain the leakage were overflowing (Figure 4.13). The food waste in the compactor formed leachate, which was continuously dripping onto the concrete slab with the potential to enter the storm water drains. The state of the compactors was not meeting the general requirements for waste storage as stipulated in Section 21 of the Waste Act as the containers were not leak-tight containers.



Figure 4.13: Leaking compactor and overflowing drip tray

### **LACK OF PROPER WASTE SEPARATION AT SOURCE**

The current state of waste management at Kator Block Council is not pleasing as most Kator Block Council employees do not do waste separation at the source. Management of waste at Kator Block Council is a major challenge during entertainment events which are held at the Big Top arena and Festival Lawns. This is because the capacity of the employees of the appointed contractor is exceeded by the waste generated during those events for effective waste handling. This is added to the challenge of low knowledge levels among the waste sorters. As a result, proper waste sorting is not done and recyclable materials are landfilled via the compactors and the waste skips. These actions by the waste sorters reflect how low levels of knowledge influence behavior towards waste management. They also show the challenges they experience

from the quantity and diversity of waste generated. This is a potential environmental disaster waiting to happen and a drawback to Sun International's commitment to 'zero-waste-to-landfills' by 2022.

#### *POOR MAINTENANCE OF THE FAT SKIPS BUND AREA*

During the time of the study, the researcher observed that the waste skip for grease from the fat traps and fat skip bund area were not well maintained. Contamination was visible with the potential of resulting in drain blockages and water pollution as the skip is situated next to the storm water drain. The Maintenance department and Ekurhuleni Metropolitan Municipality, manage the fat skip, not the appointed waste contractor on site. Observations from Kator Block Council's fat skip area revealed that the strategies implemented at the fat skip area were not effective and impacted negatively on the environment as contamination was visible. Fat from the grease traps is classified under high-risk waste streams. The maintenance department could not provide final disposal certificates to confirm that safe and correct disposal of the fat had taken place. Documentary review revealed that only the collection notes and invoices from Kator Block were retained by the Maintenance department.

Bund walls must be built of materials impervious to the contents of any tank or container within the bund. Bund walls must contain spillages and leaks to prevent environmental pollution (NEMWA Act no. 59, 2008, s.21). The wall was broken, rendering the containment purpose ineffective. Interviews with Council officials revealed that the maintenance department keeps repairing the bund wall but Kator Block administration is trying its best to maintain the broken trucks bump into the bund wall when they collect the skip.

#### *LACK OF SUPPORT FROM TOP MANAGEMENT*

Top management's involvement is mandatory in environmental management issues (ISO 14001, 2015). Lack of commitment and support from senior management makes it challenging for the green team and the appointed waste contractor, Inter-waste on-site solutions, to motivate Kator Block Council's employees to change their behavior and take effective steps towards effective waste management. Separation at source and recycling are done at low levels as top management focus more on casino activities and do not communicate the company's environmental objectives to employees. Top management involvement makes achievement of waste management objectives more successful (Nolan, 2016). Kator Block Council's heads of departments do not take responsibility in implementing the waste management policy. Support from top management is important in ensuring that employees comply with Kator Block Council's waste management policies.

#### *Cost Efficiencies*

Kator Block Council Maintenance department revealed that reconciliation checks made against invoices by the

Finance department are done on the assumption that Inter-waste is providing accurate data. Monthly waste volume reports reflect that no rebates are paid to Kator Block Council for common mixed paper (CWM), high-density (HD) plastics, expanded polystyrene containers and tetra recyclables as they are used in the RDF plant (Inter-waste, 2016).

Interviews with Inter-waste management revealed that the process of recycling polystyrene containers is more expensive and they hence decided to use these containers in the RDF process. Transport costs are one of the main factors that reduce recycling rebates (Northstar Recycling, 2017). At Kator Block Council, recyclable waste collections were done based on call-outs when the skips are full.

The study established that solid waste management associated problems in Kator Block Council are basically related to inadequate institutional facilities to deal with the problem arising out of shortage of expertise, financial resources, legal and administrative enforcement of environmental regulations. Coupled with these, there is lack of public awareness and environmental ethics that result in uncontrolled solid waste disposal. The financial factor remains to be the main constraint as well as lack of sufficient awareness at the grassroots level of the waste generators resulting to the problem of littering. The uncollected waste is illegally dumped in open spaces, water bodies or even burnt on the street and roadsides. The problem of solid waste in Kator Block Council is compounded by the rapid urban population growth caused by rural to urban migration which overstretch resources. The rising urban population and increasing industrial activities means larger volumes of wastes that pose threat to public health and the environment since they are predominantly decomposable organic and E-wastes are also increasing in the waste stream. The problems of SWM are of immediate importance in many urban areas of Kator Block Council and waste management is known as one of the key issues in urban management aside from water and sanitation.

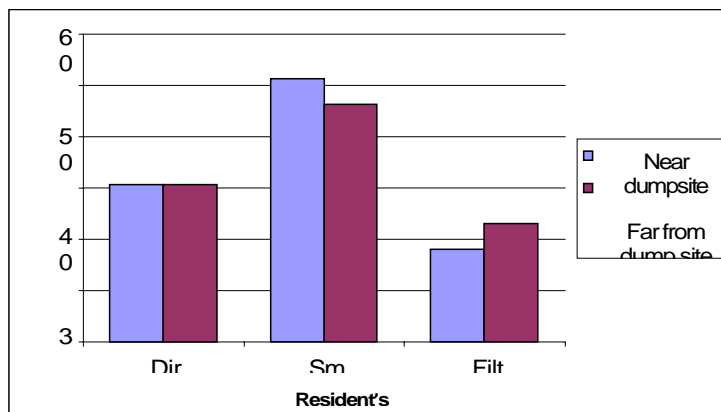
#### *EFFECTS OF SOLID WASTE IN KATOR BLOCK COUNCIL*

The study revealed that, people living in the surrounding dumping site is to be moved away to live in an area of 400 meters due to the effects of solid waste.

#### *RESIDENTS VIEW OF THE LOCATION OF THE DUMPSITE AND THEIR SURROUNDINGS*

The majority of the people, especially those who are located closer to the dumpsite, are not happy about the location of the dumpsite. Residents have complained that the dumpsite is too close to their houses, causing them sickness. They argued that the place is smelly and dirty, which they are against very much. They also argued that the waste from the dumpsite over laps to their house while polluting the environment.





Source: Fieldwork (2021)

Figure 2: Residents thinking about the surroundings of their community

People both near and far, indicated that their environment is dirty, while 52% near dumpsite and 46% far from dumpsite indicated that their environment is smelly, while only 18% near dumpsite and 22% far from dumpsite indicated that the environment is dirty.

#### EFFECT OF THE LOCATION OF DUMPSITE ON THE HEALTH OF THE COMMUNITY

Figure 4 indicates that 82% of nearby residents and 58% of faraway resident's health is affected by the location of the dumpsite. While only 18% of nearby residents and 43% of faraway residents think their health is not affected by the location of the dumpsite.

36% of nearby residents and 13% of faraway residents have suffered from malaria. Also 13%

44% of nearby residents and 18% of faraway residents were hospitalized for malaria, 21% of nearby residents and 50% of faraway residents were hospitalized for chest pains, while 16% of nearby residents and 26% of faraway residents were hospitalized for diarrhea and only 12% of nearby residents were hospitalized for cholera.

The focus of the effects of solid waste was on three factors, which were health, location, and the environment. In order to achieve its objectives, a comparison between the nearby residents and far away residents was very essential. As a result of the comparison, it was noted that both the nearby and far away residents were affected by the location of the dumpsite closer to their settlements.

The study revealed that, modernization and progress has had its share of disadvantages and one of the main aspects of concern is the pollution it is causing to the earth – be it land, air, and water. With increase in the global population and the rising demand for food and other essentials, there has been a rise in the amount of waste being generated daily by each household. This waste is ultimately thrown into municipal waste collection centers from where it is collected by the area municipalities to be further thrown into the landfills and dumps. However, either due to resource crunch or inefficient infrastructure, not all of this waste gets collected and transported to the final dumpsites. If at this stage the management and disposal is improperly done, it can cause serious impacts on health problems to the surrounding

environment. Waste that is not properly managed, especially excreta and other liquid and solid waste from households and the community, are a serious health hazard and lead to the spread of infectious diseases.

#### IV. DISCUSSIONS

The study established various ways of the solid waste collection, transportation and disposal practices. It was found that waste solid are collected regularly, also waste prevention, waste minimization, reuse, recycling, energy recovery, and waste disposal were found to be waste management practices implemented at Kator Block Council. This is done by men who normally move from place to another using the vehicles that were meant for the purpose. The findings from this study were found similar to the study by Hayal, Hailu & Aramde (2014) who noted that most African cities and urban centers solid waste accumulation is estimated at 0.5 kg per capita/day and are either collected by males and females to the collecting centers. They also noted that almost each day, hotels and households in the urban centers accumulate waste solid that need collection to the disposable centers. Palczynski (2002) noted that the generation of solid waste in Africa is among households, commercial centers, institutions, hotels and health facilities are the most sources of solid waste. These normally have dangerous solid waste that needs immediate attention from the municipal councils, the government and other authorities that are meant for the collection and disposal. In the road to collect solid waste, this study established that sacks are used by different households while hotels and commercial centers have got different areas for the accumulation of solid waste. In a study by Henry, Yongsheng, Jun (2006), it was found that different places of cities normally have different places for frequent collection systems such as door – door, curbside, set out, the block collection system and the sweeping of street. These have been used in the process of collection and disposing solid waste in Kator Block Council.

However, the findings of this study are contrary to the study carried out by Mohammed and Elsa (2003). Mohammed and Elsa (*ibid*) found it hard for municipalities, households and solid waste bodies to regularly and frequently collect solid waste due to the less number of laborers with their low payment.

The study also established that transportation of solid is done by private companies. In this approach, it was found that private companies are employed by the government or municipalities to keep the area clean. It was also established that transportation is done by appropriate equipment and these include Lorries for the collection of the solid waste to the disposable centers. Gombya and Mukunya (2004) remarked that various areas among cities in developing nations still have too much of wastes that stand a challenge to transportation. Accordingly, solid waste is dumped near the road and behind buildings that becomes major challenges to collection and transportation. Although this study found that at times wastes are dumped near the roads, there were fewer challenges in lieu to transportation. Sharholy *et al* (2008) noticed that despite different methods used in transportation of the solid wastes, cities in low-income countries often lack sufficient

transportation and equipment to collect wastes and transport such waste in proper manner.

The challenges faced in solid waste management include broken operational high-pressure hoses. The concrete flooring waste area is not resistant to moisture and is not conducive to handling of wet food waste and the daily activities carried out in the waste area.

Minimal waste separation at source is a barrier making it difficult to reduce waste that ends up at the landfill. It is one of the waste management challenges. Waste separation at source affects the effectiveness of waste management practices.

#### REFERENCES

- [1] Achankeng, Erick (2003). Globalization, Urbanization and Municipal Solid Waste Management in Africa, 2003 Conference Proceedings - African on a Global Stage. African Studies Association of Australasia and the Pacific.
- [2] African Development Bank, (2002). Study on Solid Waste Management Options for Africa, Abidjan: African Development Bank. Retrieved from <http://www.sswm.info/library/6111>
- [3] Ahmed, S. A. and M. Ali, (2006). People as Partners: facilitating People's participation in Public-Private Partnerships in solid waste management. *Habitat International Journal* Vol. 30, (4); 781-796. Retrievable from <http://www.sciencedirect.com/science/article/pii/S0197397505000470>
- [4] Ahuja, Ram (2001), *Research Methods*, New-Dheli: Rawat Publication.
- [5] Alamgir, M. C. McDonald, K. E. Roehl, and A. Ahsan (2005). *Integrated Management and Safe Disposal of Municipal Solid Waste in Least Developed Asian Countries: A Feasibility Study*, WasteSafe Publication, Khulna: Bangladesh.
- [6] Amin, M., E. (2005) *Social Science Research: Conception, Methodology, and Analysis*. Kampala: Makerere University.
- [7] Asian Development Bank (2012). *Capacity Building for Waste Management: Status of Solid Waste Management in 58 Municipalities of Nepal*. Solid Waste Management Baseline Study Report, Project Number: 44069.
- [8] Asian Development Bank Report, (2012). *Capacity Building for Waste Management, Solid Waste Management Baseline Study Report July 2012*, Asian Development Bank.
- [9] Ally, Hatibu (2008). *Solid Waste Manager Temeke Municipal Council*, (Interview 23/04/08) Arusha Municipal Council, United Republic of Tanzania.
- [10] Anon, (2005). "Solid Waste Management - The Namakkal Experience," *Development Alternatives*, New Delhi, Vol. 15 No. 6, 2005.
- [11] Bartone, C.R. (2001). *The Role of the Private Sector in Municipal Solid Waste Service Delivery in Developing Countries: Keys to Success*. In: *Challenge of Urban Government: Policies and Practices*, Freire, M. and R. Stren (Eds.), World Bank, Washington, DC. USA., pp: 199-214.
- [12] Blanche, T., Martin, Durrheim, K. & Desmond, P. (Eds.) (2006) *Research in Practice: Applied methods for the Social Sciences*, Cape Town, University of Cape Town Press.
- [13] Blaser, F & Schlupe M. (2012). *E-waste. Economic Feasibility of e-Waste Treatment in Tanzania Final Version*, March 2012. EMPA Switzerland & UNIDO
- [14] Bryman, A. (2004). *Social Research Methods*. Oxford, Oxford University Press. Burns, R.B (2000). *Introduction to Research Methods*, 4th ed. London: Sage
- [15] Chenje, M., (2000). *State of the Environment: Zambezi Basin*. Southern African Research and Documentation Centre, Harare, Zimbabwe, ISBN 9781779100092, Pages: 332.
- [16] Chakrabarti S., Majumder A & Chakrabarti., S (2009). *Public-community participation in household management in India: An operational approach*; *Habitat International*, 33 pp. 125-130.
- [17] Cohen, L., Manion, L. & Morrison, K. (2000). *Research Methods in Education*, London, Routledge
- [18] Dhande A.D. Ingle S. T, Attarde S. B. and Wagh N.D (2005). "Eco friendly approach of urban solid waste management - A Case Study of Jalgaon city Maharashtra," *Journal of EnvironBiols*, Vol. 26 (4), pp. 747-752
- [19] Guerrero, L.A., G. Maas and W. Hogland (2013). *Solid waste management challenges for cities in developing countries*, *Waste Manage.*, 33: 220-232
- [20] Gombya S. Willium and Mukunya Francis (2000). *Solid Waste Management in Kawempe Division: Issues, Challenges and Emerging Options*,
- [21] Hayal D., Hailu W. and Aramde F. (2014). *Assessment of the Contemporary Municipal Solid Waste Management in Urban Environment: The Case of Addis Ababa, Ethiopia*. *The journal of Environmental science and Technology* 7:107-122, 2014.
- [22] Henry, R.K., Z. Yongsheng and D (2006). *Municipal solid waste management challenges in developing countries-Kenyan case study*, *Waste Manage.*, 26: 92-100
- [23] Hardoy, J.E., D. Mitlin and D. Satterthwaite (2001). *Environmental Problems in an Urbanizing World: Finding Solutions for Cities in Africa, Asia and Latin America*. Earthscan Publications, London, ISBN: 9781853837203, Pages: 448.
- [24] Hina, Zia & Devadas V (2007). *Municipal solid waste management in Kanpur, India: obstacles and prospects*. *Management of Environmental quality: An International Journal*. 18 pp. 89-108
- [25] Hogan, H (2004). *Building Capacity*, *Habitat Debate*, 10(102):12. Retrievable from: <http://ww2.unhabitat.org/hd/hd10v2.pdf>
- [26] Jane K. and Mtey (2005). *Project proposal for solid waste collection at Kawe community development trust*, The Open University of Tanzania & Southern New Hampshire University
- [27] Kathleen D. (Ed) and Lapan S. D. (Ed) (2003) *Foundations for Research*, Lawrence Elbaum Associates, New Jersey, USA.
- [28] Katju C. V. (2006), *Solid Waste Management at community level: World Bank, Report 1994*. World Web Page: <http://www.deval.org/newsletter/jun04/lead.htm>

- [29] Krejcie, R.V., & Morgan, D.W., (1970). Determining Sample Size for Research Activities. Educational and Psychological Measurement.
- [30] Kurian, Joseph (2002). "Perspectives of Solid Waste Management in India", International Symposium on the Technology and Management of the Treatment & Reuse of the Municipal Solid Waste, Shanghai, China
- [31] Kumar, S.N (2006). Report on Setting up compost Plants for Municipal Solid wastes in Uganda.
- [32] EMCBP- II World Bank & National Environment Management Authority, Kampala Uganda
- [33] Likert, Rensis. 1932. "A Technique for the Measurement of Attitudes," Archives of Psychology, Number 140
- [34] Liyala C.M (2011). Modernising Solid Waste Management at Municipal Level: Institutional arrangements in urban centres of East Africa, PhD Thesis; Environmental Policy Series, Wageningen University: The Netherlands
- [35] Mamdouh, A. El-Messery, Gaber, A.Z. Ismail and Anwaar, K. Arafa (2009). "Evaluation of Municipal Solid Waste Management in Egyptian Rural Areas", Journal Egypt Public Health Assoc, (84) 1 & 2.
- [36] Maree, K. 2008. First Steps in Research. Van Schaik Publishers. Pretoria, South Africa.
- [37] Matete N & Trois, C (2008), Towards Zero waste in Emerging countries – A South African experience, Waste Management, 28, 1480-1492
- [38] Mbeng, L.O., Phillips, P.S & Fairweather. R (2009). Developing Sustainable Waste Management Practice: Application of Q Methodology to construct new Strategy Component in Limbe- Cameroon, The Open Waste Management Journal 2: 27-36.
- [39] Medina M. (2000). Globalisation, Development, and Municipal Solid Waste Management in Third World Cities.
- [40] Mohammed, N. and Z. Elsa, (2003). Waste management programme, UNIDO View Document, No. 3765. Tokyo, Japan.
- [41] Mugagga, Frank (2006). The Public-Private Sector Approach to Municipal Solid Waste Management, How does it Work in Makindye Division, Kampala District, Uganda
- [42] Mugambwa, E., Kizito (2009). What is Waste Management?  
URL:[http://www.nemaug.org/index.php?option=com\\_content&view=article&id=69:whatis](http://www.nemaug.org/index.php?option=com_content&view=article&id=69:whatis)
- [43] Mukisa, Philemon Kirunda (2009). Public Participation in Solid Waste Management: Challenges and Prospects; A case of Kira Town Council, Uganda; University of Agder, Kristiansand, 2009.
- [44] National Solid Waste Management Strategy for Swaziland Vol I. Swaziland. Retrieved from: [www.environment.gov.sz/files/nswms/nswms\\_vol1.pdf](http://www.environment.gov.sz/files/nswms/nswms_vol1.pdf)
- [45] NEMA -National Environment Management Authority, (2007). Clean Development mechanism (CDM)–Uganda solid waste composting project; Analysis Report – 2006, State of Environment Report for Uganda 2006/7. NEMA, Kampala.357pp.
- [46] NEMA & UNEP (2010). Guidelines for E-Waste Management in Kenya, Ministry of Environment and Mineral Resources, Kenya.
- [47] NISR - National Institute of Statistics of Rwanda. 2012 Population and Housing Census, Final Report. 2012.
- [48] Nzeadibe, C (2009). Solid Waste Reforms and Recycling in Enugu Area, Nigeria, Habitat International: 33 pp. 93-99
- [49] Oberlin, A.S (2011). The Role of Households in Solid Waste Management in East Africa Capital Cities, PhD Thesis, Environmental Policy Series, Wageningen University, The Netherlands.
- [50] Oberlin, A.S & Sza'nto' G. L (2011), Community level composting in a developing country: case study of KIWODET, Tanzania. Waste Management & Research. 29(10) 1071–1077
- [51] Oso and Onen, D (2008). A general guide to writing Research Proposal and Report, Nairobi: The Jomo Kenyatta foundation.
- [52] Patton, M Q (2002), Qualitative Research and Evaluation Methods, London: Sage
- [53] Palczynski, J.R., 2002. Study on solid waste management options for Africa. African Development Bank, Abidjan, Cote d'Ivoire.
- [54] Raili Hasheela (2009). Municipal Waste Management in Namibia: The Windhoek Case Study. Universidad Azteca.
- [55] Ram Chandra T.V. and Bachamanda S (2007), "Environmental audit of Municipal Solid Waste Management," International Journal of Environmental Technology and Management, Vol. 7, Nos. 3/4, pp. 369-392, 2007
- [56] Rathana, K (2009). Solid waste management in Cambodia, CICP Working Paper No. 27, Cambodia Institute for Cooperation and Peace, Cambodia, pp: 1-35
- [57] Ramachandra T.V and Shruthi Bachamanda (2007). "Environmental audit of Municipal Solid Waste Management" Int. J. Environmental Technology and Management, (7)
- [58] Republic of Rwanda, Water and Sanitation Sector Strategic Plan 2013/14-2017/18, Ministry of Infrastructure
- [59] Shivashankara G.P., Rekha H.B (2005). "Solid waste management in suburban areas of Bangalore," Journal of Nature Environment and Pollution Technology, Vol. 4(4); 495- 500.
- [60] Tadesse K., 2004. Dry Waste Management in Addis Ababa City, Ecological and Environmental Economics Programme, Adis Ababa, Ethiopia.
- [61] Thurstone, L.L. 1929. "Theory of Attitude Measurement," Psychological Bulletin, Volume 36
- [62] Trochim, W (2005), Research Methods: the concise knowledge base, Ohio: Atomic dog Tukahirwa, J.T (2011). Civil Society in Urban sanitation and Solid waste Management, PhD Thesis, Wageningen University, The Netherlands
- [63] Sharholly, M., Ahmad, K., Mahmood, G., Trivedi, R.C., (2008). Municipal solid waste management in Indian cities– A review Waste Management, 28 (2), PP: 459–467.



- [64] Supriyadi, S., Kriwoken, L.K., & Birley, I (2000). Solid waste management solutions for Semarang, Indonesia, *Waste Manage Res* 18: 557-566
- [65] UNDP, (2004). Urban agriculture: Food, jobs and sustainable cities. UNDP Urban Harvest Working Paper Series, Paper No. 1. New York
- [66] UNH, 2012. Solid Waste Management Assessment within urban settings in Burundi, Rwanda and Tanzania, Robert Goodwin, UN HABITAT report 2012. Retrievable from [http://mirror.unhabitat.org/downloads/docs/2527\\_1\\_5954\\_21.pdf](http://mirror.unhabitat.org/downloads/docs/2527_1_5954_21.pdf)
- [67] Vincent Ifeanyi Ogu (2000). Private sector participation and municipal waste management in Benin City, Nigeria; *Journal of Environmental & Urbanization* Vol 12 No 2
- [68] Wang, J., Han, L & Li, S (2008). The collection system for residential recyclables in communities in Haidian District, Beijing: A possible approach for China recycling. *Waste Management* 28, 1672-1680.
- [69] Wang, F. and Huisman, J. 2012. "The Best-of-2-Worlds philosophy: Developing local dismantling and global infrastructure network for sustainable e-waste treatment in emerging economies", in *Waste Management*, Vol. 32, No. 11, pp. 2134–2146
- [70] Wilson D.C (2010) Comparative Analysis of Solid Waste Management, In: *Cities around the World*. Paper Delivered at the UK Solid waste Association, Nov.2010
- [71] Yekeen A. Sanusi (2010). Capacity issues of Private Sector Participation in urban Solid waste management in Nigeria, *Humanity and Social Sciences Journal*, 07-18.

IJIRAS