

**SOLID WASTE DISPOSAL IN KENYA**

***Research paper***

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# Executive summary

This study through review of literature sought to establish the current state of disposing solid wastes in Kenya, composition of the generated wastes and the challenges standing in the way of sustainable management of solid wastes in the country. Most of the reviewed literature identified open dumping in designated sites and burning as predominant practices of waste disposal. Landfills only take place in abandoned quarries and other excavated areas. Generated wastes were mainly biodegradables that end up as livestock feeds or get composed to make organic fertilizer. Private companies and community groups are highly relied upon to collect domestic and institutional wastes. Paper, glass and metallic wastes though not highly generated as biodegradables, are highly sought by recycling industries. None separation of waste however significantly affect operation in recycling industries. This paper also highlights institutional, societal and enforcement challenges as deterring sustainable and effective service delivery to the public. Finally, conclusions and recommendations are made based on studied literature. Recommendation for further research in this paper is grounded on the informational deficiency and missing links during review of available literature.

**Keywords**: Solid waste management, Kenya, Dispose, sustainable

## 1.1 Introduction

Disposal of domestic and industrial solid wastes is a public health and environmentally an issue of primarily concern. Unfortunately, generation of these wastes over the past years have proportionately been increasing with increase in populations without any proper mechanisms of handling and safely disposing them especially among developing countries. Waste handling in these countries are characterized by poor public service delivery and unregulated private sector resulting in unfettered discarding of both domestic and industrial wastes. Reports have indicated that in Africa, only about 30% of urban waste are appropriately handled and disposed due to lack of capacity and inadequate financing (Ziraba, Haregu, & Mberu, 2016).

As the growth rate of urban population in Kenya is expected to precede the Country’s overall growth rate, safe disposal of generated solid wastes will continuously remain a challenge especially for the capital city Nairobi and other major cities like Mombasa, Kisumu, Nakuru and Eldoret. This problem is even expected to escalate by the year 2030 when 50% of the country’s population is projected to concentrate around urban centers (Government of Kenya, 2007).

Generation of waste in Kenya has correspondingly been increasing with population over the years to about 4 million tons a year presently. It is however unfortunate that the responsible urban authorities have conspicuously lacked corresponding capacity to handle and safely disposed the generated solid wastes(Gakungu *et al.,* 2012). In Nairobi alone, it is estimated that about 1500 tons of waste remain uncollected daily due to high waste generation and low collection capacities. UNEP describes Kenya’s situation as an example of an economically developing nation that pays little attention solid waste management (Tibaijuka, 2007).

Inappropriate disposal of solid wastes despite being an eyesore, is associated with a number of risks such as environmental degradation, spread of diseases, economic slug and negatively affecting people’s quality of life (National Environment Management Authority, 2014). Other studies like Oloruntoba, *et al.,* (2014) and Reed & Mberu, (2014) have additionally attributed poor waste handling to child morbidity and mortality.

As much as previous authorities and other non-state actors have been formulating policies and implementing programs over the years at the national and local levels to encounter the steadily increasing challenge of improper waste disposal, adequate support systems and consistency in enforcement of the regulatory frameworks has been lacking (Haregu et al., 2017).

## 1.2 Background information

Collection of waste in Kenya’s capital Nairobi and its environs was over 90% until in the mid 70’s when a decline in routine collection was witnessed as the collection trucks halted one by one due to lack of regular maintenance (Ikiara, Karanja, & Davies, 2004). Before the introduction of environmental management and coordination act in 2009, it was the sole responsibility of municipalities and city councils to collect, handle and dispose all domestic and industrial wastes. Any other party interested in undertaking the same had to seek authority.

In the 1980’s to 90’s, the challenge of solid waste management escalated as the city councils got overwhelmed, managing to only collect about 20% of generated wastes and leaving the rest in a dump site in Dandora 7.5km from the city center and less than 5km from the now old Jomo Kenyatta international airport. This prompted the entry of private service providers in 1986 to complement the county councils in collecting solid wastes in institutions, industries, commercial establishments and in city’s prime areas. Licensing of private companies continued until in the 1990’s when Nairobi city council undertook a pilot scheme to privatize solid waste management based on a recommendation in a study supported by Japan government. The mandate of the contracted firm in the scheme expired in 1999 and neither was it renewed nor another firm contracted (Ikiara et al., 2004).

The emergence of private solid waste management handlers thrived in an unregulated environment as they provided their services such as collection of garbage and sweeping of streets, markets, etc. in government institutions and private establishments then billed them directly for services rendered. To some extent, this improved collection of solid wastes to about 90%, but delay in payments especially by municipalities and government departments, significantly dwindled their operations (Njoroge, & Ndunge, 2014).

To improve efficiency, Nairobi was divided into 9 waste management sections in 2004 and contracts awarded to private companies to collect, transport and dispose wastes in each section. Each division was supervised by a municipal officer who ensured adherence. People within neighborhoods were however required to avail their wastes to a collection point along transportation corridors. Unfortunately, this arrangement left out city’s informal settlements thus compelling neighborhood associations, youth groups and other similar community organizations to stand in the gap and offered residents similar services at a fee charged monthly. This not only created employment for the youths, but also helped eradicate the menace of haphazard disposal of solid wastes in those areas.

Latest reports indicates that Nairobi generates about 2,400 tons of wastes each day, but only 1,500 tons are collected and disposed. As of February 2019, it was revealed 17 out of 28 garbage contractors had suspended their services due to nonpayment of over 600 million Kenya shillings and only 29 out of 62 city trash trucks were operational. No budget was allocated to repair the rest that had broken down. The situations are no different in Kenya’s other major cities like Mombasa, Kisumu, Nakuru and Eldoret which respectively produce about 2,200, 400, 250 and 600 tons of solid waste in a day.

**Table 1.1 Summary of SWM in Kenya’s main cities** (National Environment management authority, 2015)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| City | Generated wastes (tons/day) | Collected wastes | Recycled waste | Uncollected waste |
| Nairobi | 2,400 | 80% | 45% | 20% |
| Mombasa | 2,200 | 65% | 40% | 35% |
| Kisumu | 400 | 20% | - | - |
| Nakuru | 250 | 45% | 18% | 37% |
| Eldoret | 600 | 55% | 15% | 45% |
| Thika | 140 | 60% | 30% | 40% |

## 1.3 Objective of the study

To determine how solid wastes are disposed in Kenya

### 1.3.1 Specific objectives

1. To investigate the current approaches to solid wastes management in Kenya
2. To find out the composition of generated waste in Kenya
3. To establish challenges the country encounters in the collection and disposing of solid wastes.

### 1.3.2 Research questions

The paper focused in answering the following questions;

1. What are the current approaches to solid waste management in Kenya?
2. What is the composition of the generated wasted in Kenya
3. What are some of the challenges the country encounters in the management of solid wastes?

# Reviewed literature

### 2.1 Current approaches to solid wastes disposal in Kenya

The popular hierarchy of Sustainable Waste Management presented in figure 2.1 below has been widely accepted and adopted as a pointer towards sustainable management and disposal of solid wastes. It identifies minimization and prevention as the most sustainable and environmentally sound method of managing wastes. Non-sustainable methods like open dumping and burning are unfortunately common occurrences in most developing countries (Al-Khatib, *et al.*, 2010). Generally in Kenya, open dumping and burning of industrial and clinical wastes are the most common methods of managing solid wastes (GoK, 2019).

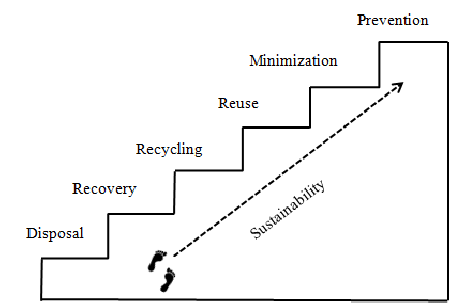


Figure 2.1: hierarchy of Sustainable Waste Management

### 2.1.1 Open dumping and burning

This can be described as arbitral dumping of wastes without any systematic control. Dumping sites are characterized by scavengers and degradation of the environment (Annepu, 2012). A significant amount of solid waste in Kenya ends up in open dumping due to lack of capacity to recycle and non-separation of wastes at source (Tan, 2012).

According to the Government of Kenya (2019), all the 47 counties in the country dispose their wastes in dump sites and are yet to upgrade to landfills. The local authorities collect unseparated garbage mostly from the slum areas dumped in undesignated dumpsites and uncontrollably dispose them in abandoned mines, forested areas, in open spaces, rivers etc. without any regard to the environment nor health of citizens. This is because the structure of managing wastes in counties isn’t clear, and as population increases and rapid urbanization is experienced, challenges of collection, recycling and safe disposal grows even bigger. Ngau & Kahiu, (2009) confirms existence of 60 illegal dumping sites in Nairobi, and whereas designated dumpsites exists in some major cities, the infrastructure supporting solid waste management are lacking. In Nakuru for instance, Gioto dumpsite have no weighbridge while the three dumping sites in Mombasa of Mwakirunge, Kibarani and Chanda, have poor roads, making it inaccessible during rainy seasons. (Oyake, 2017; Tan, 2012). All these dumping sites are unrestricted and neither are they fenced to prevent waste scattering to undesignated boundaries.

As much as burning of wastes is prohibited in the country, Oyake, (2017) reports while undertaking a survey to have witnessed burning of wastes in Mombasa especially at collection points. It is estimated that 10% of solid wastes are disposed through burning in the county. Burning of tires by the roadsides to extract wires are some of the notorious operations that calls for awareness to the public on how the emitted smoke can adversely affect health.

In figure 2.1 adopted from Sibanda, Obange, & Awuor, (2017), wastes from households, markets, industries and institutions are either stored in bins and await collection by City’s environmental department, private collectors and community groups, or get disposed through open burning, burying or illegal dumping, the latter being common in informal settlements. Clinical institutions are however required to have incinerators before licensing. Organic wastes collected by community groups can then be composed to make agricultural manure, sold as livestock feeds or segregated for recycling. Those collected by the municipality are dumped at designated sites where informal waste collectors pick plastics and other recyclable materials. What remains behind are set on fire.

Solid waste generation from

* Household
* Markets
* Industries
* Institutions

Organic waste

Temporary waste storage onsite (bins)

Animal feed

Communal waste disposal points

Composting

Compost sold & used for agriculture

Collection by city dept. of environment

Disposal at landfill

Informal waste pickers

Open burning

Recycling industries

Informal disposal (of uncollected waste)

* Open burning
* Burying
* Illegal dumping

Collection by private sector/NGOs/CBOs

Figure 2.1: Waste disposal in Kenya (Sibanda, Obange, & Awuor, 2017)

### 2.1.2 Recycling

Recycling and re-use level of wastes in Kenya is quite low. At household level, most Kenyans would typically reuse plastic, metallic and glass containers and bottles to store household items such as paraffin, sugar, salt, pegs, honey, etc. (Sibanda et al., 2017a).

Monyoncho (2013) established that only 5% of Nairobi’s collected solid wastes is recycled. This is slightly higher than 1% alluded by Bahri, (2005) and Ngau & Kahiu, (2009). In an analysis, (Kasozi & Von Blottnitz, 2010) using JICA report (1998), and Practical Action report (2004), estimated that plastic reuse in 2005 in Kenya’s capital was about 3.6 tons per day. Ngau & Kahiu, (2009) in a preliminary qualitative report reported existence of a number of privately owned companies engaged in recycling of plastics and were all based in Nairobi. Bahri, (2005) notes that one of the companies named Green loop international had capacity to recycle about 15tons of plastics per day. In their descriptive survey, Practical Action (2009) additionally mentions that they had established 13 collection points of plastic wastes, 37 community based recyclers and 1,613 personnel to front solid waste recycling within Nairobi’s low income areas and in a legally defined framework for a five year period.

Later in 2006, Kenya National Cleaner Production Centre reports to receive financial support from UNDP and UNEP to undertake an all-inclusive reduction, reuse and recycling plan for plastic wastes in Nairobi’s central business district. In their final report, KNCPC’s strategy included establishment of a recycling plant in Nairobi within the first year of implementation and feedback used to scale up operations in the subsequent years. It further recommended regulatory, economic and voluntary based policy instruments to help enhance appropriate technologies, affordability and civic education respectively (Maranga, 2005).

Other notable solid wastes recycled in the country include daily recycling of 24 tons of paper by Chandaria and Madhupaper industry (Ngau & Kahiu, 2009; A. M. Karanja, 2005; Gakungu, *et al.,* 2012; Subbo & Moindi, 2008), 66 tons of glass per day (Sibanda, Obange, & Awuor, 2017) and about 62 tons per day of scrap metals recycled by a number of rolling mills and *jua kali* artisans. Biodegradable wastes from food markets and restaurants are either composted and sold as recycled manure by community groups (Onduru, *eta al.,* 2009) or sold as livestock feeds to peri-urban farmers (Karanja, 2005 and Ngau & Kahiu, 2009). This findings tallied with earlier studies by (Mazingira institute 1987 cited by Karanja, *et al.,* 2010) which indicated that 12-14% of livestock in Nairobi feed on domestic wastes. At a local level, some individuals, CBO’s or self-help groups would be spotted recycling some wastes into crafty material such as toys, ornaments, hats or even floor mats (Gutberlet *et al.,* 2017).

Kasozi & Von Blottnitz, (2010) in a situation analysis of Nairobi’s solid waste management, estimated the city’s capacity to reuse and recycle solid wastes at between 100 and 150 tons per day, an amount comparable to 5% of all the wastes generated, a pointer of Kenya’s low recycling capacity.

### 2.2 Composition of solid wastes in Kenya

Solid wastes are categorized as either compostable e.g. food remains, recyclable e.g. paper, or inert (those that can neither be composted nor recycled). The composition of these wastes are determined by population, purchasing power and societal behaviors (Njoroge, Kimani, & Ndunge, 2014). This is important because it determines management strategies to be applied . Generally, biodegradables forms the largest composition of solid waste at any given time, followed by recyclables and inert respectively.

**Table 2.1 Composition of solid wastes**

|  |  |
| --- | --- |
| **Components of solid wastes** | **Examples** |
| Compostable/biodegradables | Food remains, leaves, wood, |
| Recyclable | Paper, plastic, glass, metals, tins, |
| Inert | Stones and similar inorganic materials |

In Nakuru, 187,469 tons of waste is generated annually, out of which 80% are biodegradables and 20% non-biodegradables consisting mainly of industrial wastes (GoK, 2017). To enhance effectiveness, Nakuru was divided into 40 waste management locations with each unit managed by a community based organization contracted by the county government. Similar arrangement has also been reported in Nairobi, Mombasa, Eldoret and Kisii counties. (Tan, 2012; Cerella, 2014; Mecheo, 2019).

From table 2.2, organic or biodegradable wastes forms the largest composition of solid wastes in all the four cities ranging from 50% -80%. Nairobi is the highest generator at 2,400 ton/day whereas Kisumu is the least generating about 500 tons/day. The sequence of the generated wastes correspond to the order of population size of the listed cities based on the 2009 national census report.

**Table 2.2 Composition of solid wastes Composition of solid wastes in Kenya’s main cities.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Waste composition | Nairobi | Mombasa | Kisumu | Nakuru |
| **Organic** | 50.9% | 53 | 65–70% | 80% |
| **Paper** | 17.5% | 9.5 | 5–9% | - |
| **Plastic** | 16.1% | 20 | 6–12% | - |
| **Glass** | 2% | - | 0.7–4% | - |
| **Metal** | 2% | 2.7 | 0.3–3% | - |
| **Other** | 11.4% | 8.1 | 0.4–1% | 20% |
|  | (UNEP, 2009) | (Cerella, 2014; Tan, 2012) | (Okot-Okumu, 2012a) | World Bank, 2017; |

## 2.3 Challenges in disposing Solid wastes in Kenya

Previous studies have shown that municipalities in most developing countries encounter a number of challenges ranging from policy, enforcement, commitment, resource allocation, and public awareness when undertaking public service delivery (McAllister, 2015). This section reviews literature on the difficulties hindering efficient management of solid wastes in Kenya.

### 2.3.1 Institutional problems

Management of wastes is indeed an expensive exercise requiring financial resource to obtain the right equipment, establish infrastructure and train manpower. Where these resource are meager, service delivery is severely jeopardized (Frediani, & Butcher, 2014). The same sentiments were shared by Liyala, (2011) and Kain *et al.,* (2016) who cited financial limitations and low budgets in the department of environment as a major hindrance to management of solid wastes in Kisumu county. This condition is further degenerated by the fact that significant number of populations especially in informal settlements of Nairobi, Mombasa, Kisumu and Eldoret towns are unable to pay for waste disposal services (Liyala, 2011). The resultant effects of this is that broken waste collecting vehicles fails to get repaired and personnel salaries remain unpaid on time, hence frequent strike by municipal workers.

Besides finances, Kain *et al.,* (2016) added poor political environment, lack of institutional support, inadequate civic education and bad societal behaviors and attitudes as other waste management deterrents. It gets even worse in the absence of appropriate technologies strategies and institutional capacities.

### 2.3.2 Inappropriate societal behaviors and attitudes

Emphasis about participation and cooperation of the public in effective management of solid wastes cannot be undervalued considering that they are the generators. According to Zurbrugg, (2003), the public are key determinants in every waste management stage including willingness to pay for the service. Sibanda *et al.,* (2017) points that the arbitral and irresponsible dumping of wastes in Kisumu is an indication of poor attitude among the people which can be remedied through civic education as recommended by (Njagi *et al.,* 2013). In the development of a sustainable waste management policy, the ministry of environment and forestry highlights community’s perception of “nothing is wasted until it’s wasted” as one of the social barrier to waste management (GoK, 2019).

### 2.3.3 Relaxed enforcement

While Kenya’s constitution in article 42, the national environment policy of 2014, Environmental Management and Conservation Act 387, banning of polythene papers through a gazette notice in 2017 and Kenya’s commitment to Paris Agreement provide reasonably adequate legislations and policy framework for a cleaner and healthier environment, there exist a breach in execution of these laws due to capacity deficiencies of both logistics and personnel (Baabereyir, 2009; GoK, 2019; ). This statement corroborated with (Haregu *et al.,* 2017) who also attributed poor SWM in Nairobi and Mombasa to weak implementation of legislative frameworks, giving cartels and gangs the thrive to control the sector.

# Conclusion

This paper has reviewed a number of studies on the past and current state of waste management practices in the country, waste composition and the challenges experienced in the sector. It is no doubt that a lot still need to be done both at the national and county levels if sustainable ways of disposing wastes are to be achieved.

The current practice of dumping and burning wastes is harmful not only to the environment but also to human health, a fact supported by (Okot-Okumu, 2012; Selin, 2013). On the other hand, the rate of recycling is on a very small scale in relation to the amounts of waste generated. Of concern also is that, most of the recycling industries are based in Nairobi thus discouraging those in other cities to take their wastes for recycling due to transportation costs involved as pointed by Alison (2010). As much as handicrafts have helped in recycling by creating some products out of wastes, their efforts are greatly hampered by unstructured markets for their creations making some of them give up along the way. The government’s strategy contained in the national sustainable waste management policy developed in April 2014 however provides a clear roadmap and a hopeful future that Kenya would in future attain sustainable levels of managing its solid wastes.

Regarding the composition of the wastes, domestic and institutional biodegradables were found to be highly generated than any other foam in nearly all the major cities. Their mode of dispose is mainly used as livestock feeds or get composted and sold as organic manure. Paper and plastic wastes are also generated at a relatively high levels but based on the review, these types of wastes are also the highly sought after by the few existing recycling industries. Of interest was that Kenyans would typically reuse glass and plastic containers at household level as storage msterials. Metallic wastes are the least generated but also fetch highest prices when sold at scrape metal yards. In an economy of a developing country like Kenya, vandalism of guard rails and masts along the roads are common occurrences as people try find even illegal ways of meeting their basic needs.

On the SWM challenges, the country seems to get overwhelmed nearly at every stage of SWM and it even gets worse with the rapid rate of population increase, high rate of urbanization and the ever changing lifestyles. First of all, there’s a societal attitude and behavioral problem where people are least concerned on the waste they generate and even how they discard it. Formative challenges emerge when wastes are not segregated because it makes it difficult to recycle. Although containers for separate types of wastes has been strategical placed in some cities like Nairobi, wastes still get mixed up due to inadequate awareness of the public. Collection of wastes is also problematic in the sense that a large junk of wastes remain uncollected by the municipal because of long distances or inexistence of working trash trucks.

Where private operators are relied upon, charges are high and unaffordable to many hence opting to illegally dump or burn their wastes in the open. Most disposals of solid wastes in Kenya are done mainly through open dumping, landfills takes place mainly in abandoned quarry sites or gouges as reported by Sibanda *et al.,* (2017) and Monyoncho (2013). The current disposal option is not sustainable because of overflowing and impacts of leachates on the environment. Dandora dumping site in Nairobi for instance is characterized by scattered litter beyond designated boundaries and heavy smokes from burning wastes. The site was long declared full yet damping continues to date.

The conclusion of this study therefore is that solid waste management in Kenya is a serious environmental issue that needs tackling from a multidimensional approach. It requires behavioral change and active involvement of citizens themselves, assistance of development partners in raising required resources, commitment and enhanced capacities of municipal enforcers, assistance of civil societies and community groups in creating public awareness, and investment of industry entrepreneurs in more sustainable SWM options.

# Recommendation

*Solid waste disposal costs*: Further research leading to the actual costs of disposing wastes using various methods needs to be undertaken. Available literature shows that private collectors levy arbitral charges to the public without any basis. Availability of accurate information on this subject would be useful to prospective entrepreneurs in the sector.

*Effects of leachates:* While there’s an amplified advocacy on environmental protection, there is deficiency of information on the effects of leachate on the environment. This is deemed necessary in Kenya’s situation because of the highly practiced open dumping.

*Willingness to pay:* community or area specific studies need be undertaken and information extracted from the public in terms of their readiness to pay and participate in the management of solid wastes. Public apathy is unusual where “one size fits all” solution approach is applied.

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