



The Enterprise of Waste management among Urban Youth for Sustainable Development in Kenya

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ABSTRACT

Sustainable development requires well-planned cities as centers of creativity, innovation and enterprise. There is need to develop strategies that integrate urban, sub-urban, peri-urban and rural areas while also addressing social, economic and environmental pillars of sustainable development in Africa, where sustainable urban development can serve as one of those strategies. Sustainability refers to a long-term commitment to economic prosperity, community well-being and environmental integrity. Sustainable waste management ensures reduction in greenhouse gases, extraction of fuel from waste, diversification of energy sources for energy security and expansion of renewable energy resources, among others. The increasing levels of urbanization have not been in tandem with waste management, yet, waste generation is expected to increase significantly due to rising industrialization, urbanization, expansion of modern agriculture and rapid growth in Information and Communication Technology (ICT), with very high turn-over in technology. The result is widening negative impacts on the environment (degradation and depletion of natural resources, climate change as well as development pressure on green spaces). In response, policy makers and development partners have shifted focus to improving quality of all urban ecosystems to provide healthy and sustainable environment for both natural system and urban communities. Protecting human and environmental health, maintaining healthy ecosystems, eliminating environmental pollution and providing green spaces in cities are some of efforts made to improve ecological sustainability of cities. Waste management sector in cities involves local communities and business, including Small and Medium Enterprises (SMEs) engaged in reuse of products, collection and transportation, brockage of wastes, sorting and storing, disposal through landfill, disposal through incineration, treatment of waste, process of recycle, composting and energy recovery. This is a review Article dealing with waste management policies and regulation together with practices in Kenya, actors in waste management, trends and emerging issues. Recommendations have been made on how the youth can be engaged and take up the emerging opportunities for enterprise development.

1. Introduction

Kenya's urban population in 2009 was 12.9 million (32 Percent) of the total population in Kenya and it is predicted that municipal Solid Waste generated in Kenya will increase to 10,170 tonnes per day by 2025, with urban population representing nearly 49 percent of the poor (Mwanzia et al 2013). The problem is more precarious in medium-sized towns as urban population continues to rise above the natural growth rates, amidst non-existent solid waste management infrastructure, with the low-income settlements suffering most. The

challenge of urban waste can present a great opportunity to youth entrepreneurship to rescue them from disillusionment and frustration due to unemployment and as they struggle to access decent jobs.

The Millennium Development Goals (MDGs) report captures this problem of youth unemployment and emphasizes the urgent need for a faster and stable economic growth in sectors with potential to absorb young workers, in which the waste management may present a valuable opportunity (UN 2012). Waste management, particularly in cities is covered by the Sustainable Development Goal (SDG) 11: Make cities and human settlements inclusive, safe, resilient and sustainable.

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Sustainable development will only be feasible in well-planned and managed cities, with a balance between human well-being and ecosystem health to enable the transfer of resources to the future generations (Disdaroghu, et al 2009). In this case, urban ecological planning (eco-planning of urban areas) is essential for long-term sustainability by curbing negative environmental impacts of pollution and poor waste management infrastructure in cities through air, water, and soil improvement, energy saving, reduction of storm water runoff, and urban heat island, aesthetic improvement of the city as well as enrichment of urban biodiversity.

This Article has reviewed the key ingredients in waste management in Kenya by examining the waste management strategies, practices and trends together with actors in Kenya. The Article ends with an examination of gaps and opportunities for youth entrepreneurship, not only in Kenya but for Africa as a whole. The Article is important in the understanding of waste practices in Kenya, existing gaps and opportunities presented for possible youth entrepreneurship. Detailed examination of individual technologies in waste management and markets are beyond the scope of the work.

1.1 Waste Management Regulation and Practices in Kenya

Kenya has embraced the zero waste management approach, which requires investment in low carbon technologies and improved efficiency in the use of resources and materials. Successful implementation of zero waste management has been based on national policy objectives, a level playing field, which allows the industry to compete fairly, with confidence that regulations will be reinforced appropriately (SESA 2012). A successful and sustainable waste management ensures that:

Waste is managed safely by directing it to properly licensed sites, waste management development is located in appropriate places at suitable distances from sensitive receptors, and Environmental Impact Assessment (EIA) is carried out on proposed development to mitigate adverse impacts.

Efforts are made to tackle climate change by reducing greenhouse gas emissions, offsetting the requirement for energy intensive production from new materials and reducing dependence on fossil fuels.

Energy from waste (Efw) offers indigenous and secure energy supply.

In efforts to deal with increasing waste volumes, shrinking environmental resources, rapid urbanization, and limited financial resources, waste management in Kenya is still at its basic stage. The following section provides some waste management policies, regulations and laws in Kenya as well as some of the practices in dealing with waste in the country.

1.2 Policies, Regulations and Laws on Waste Management in Kenya

The Laws of Kenya, Act 11 of 2016 on Climate Change on Enforcement of Rights and Responsibilities

bestowed the responsibility of preventing, stopping or discontinuing any act or omission that is harmful to the environment to Public officers and Courts of Kenya.

National Environment Management Authority (NEMA) (2015) noted that commitment to sustainable development demands a balance between economic and social challenges of development, with environmental protection. The National Solid Waste Management Strategy (NSWMS) therefore seeks to establish a common platform for action between stakeholders to systematically, improve waste management in Kenya.

The National Environment Management Authority (NEMA) in 2013 developed the Environmental Management and coordination (E-waste Management) draft Regulation in 2013, an improvement on EMCA no. 8 of 1999). The Regulation provides appropriate legal and institutional framework and mechanisms for the management of E-waste handling, collection, transportation, recycling and safe disposal.

The County Government Act, 2012, section 120 on Tariffs and pricing of Public services, sub-section 3 mentions that a tariff policy adopted under section 1, Part (h) provides the following guidelines: promotion of the economic, efficient, effective and sustainable use of resources, the recycling of wastes and other appropriate environmental objectives.

The Public Health Act, 2012 Part 126 (d) covers the drainage of land, streets or premises, the disposal of offensive liquids and the removal and disposal of rubbish, refuse, manure and waste matters. Section 134 provides rules for protection of food and deals with the establishment, locality, supervision, equipment, maintenance and management of slaughterhouses as well as disposal of wastes. Section 118 describes what constitutes a nuisance.

The Kenya Constitution 2010 promises all citizens the right to a clean and healthy environment and therefore every citizen should safeguard and enhance the environment. In this respect, sound environmental management would require use of waste reduction technologies in production, sustainable product design, income efficiency and waste prevention, reuse of products wherever necessary and recovering value from products.

In Kenya Vision 2030, Kenya aims to be a clean, secure and sustainable environment by 2030. Strategies are aimed at promoting environmental conservation to support the economic pillar flagship projects and achieve the MDGs, reduce pollution and improve waste management through the application of economic incentives and commissioning of public-private partnerships (PPP) for the improved efficiency in water and sanitation delivery. Solid waste management initiative is captured in the environmental flagship projects with the aim of re-locating Dandora dumpsite. Steps are also underway to tighten regulations to limit the production and usage of environmentally-detrimental plastics bags, among others. The Vision recognized that efficient and sustainable waste management system is a prerequisite to development into a newly industrialized state by 2030.

As a response, the Kenya Vision 2030 set up flagship projects for the five major urban areas/towns, namely, Mombasa, Kisumu, Eldoret, Nakuru and Thika to fully have a functional and compliant waste management system through strategies towards achieving solid waste management and clean and healthy environment for all. In developing the strategy, it was observed that waste challenges are similar to all counties and solutions could be replicated elsewhere.

According to the Occupational safety and Health Act, 2007, Part IX, Chemical Safety, Section 83, sub-section IV, every work place where chemicals or other toxic substances are manipulated, the employer is required to develop a suitable system for the safe collection, recycling and disposal of chemical wastes, obsolete chemicals and empty containers of chemicals to avoid the risk to safety, health of employees and the environment.

The Environment Management and Coordination (Water Quality) Regulations, 2006, Part III covers water for industrial use and effluent discharge. For instance, no person shall discharge or apply any poison in toxic, noxious or obstructing matter, radioactive waste or other pollutants or permit any person to dump or discharge such matter into the aquatic environment, unless such discharge poison, toxic, noxious or obstructing matter, radioactive waste or pollutant complies with the standards set out in the Third Schedule of the Regulations. Part IV deals with water for Agricultural use, whereby, sub-section 19 states that no person shall be permitted to use wastewater for irrigation purposes unless such water complies with the quality guidelines set out in the Eighth Schedule of the Regulations. Part V on Water for any other use, Section 24 has mentioned that no person shall discharge or apply poison, toxic, noxious or obstructing matter, radioactive wastes or other pollutants or permit any person to dump or discharge any such matter into water meant for fisheries, wildlife, recreational purposes or any other uses.

Environmental Management and Coordination Regulations 2006 puts it clear that any person whose activities generate waste is responsible for collection, segregation and disposal of that waste in a manner provided in the regulations. Further, under Regulation 5, any person whose activities generate waste is required to segregate such waste by separating hazardous waste from non-hazardous waste and shall dispose of the waste facility as provided for by the relevant Local Authority.

The Environment (Impact Assessment and Audit) Regulation 2003, which established the National Environment Management Authority (NEMA) describes what waste means and need for reporting on products or by-products as well as methods for disposal. In this case, waste includes any matter prescribes to waste and any matter, whether liquid, solid, gaseous or radioactive, which is discharged, emitted or deposited in the environment in such volume, composition or manner likely to cause an alteration of the environment. Environmental Management and Coordination (EMCA) Act (1999) provides a framework for the coordinated management of the environment. Among other things, EMCA (1999) is guided by the Principle of Public participation in development policies, planning and

processes for the management of the environment; the Principle of inter-generational and intra-generational Equity, the Polluter-Pays-Principle, and the Precautionary Principle. The Act deals with waste management (standard setting, disposal site, licensing, and control of hazardous, industrial and hospital waste). The responsibility for storage, treatment and collection of hospital, industrial and hazardous wastes is given to the waste generator, while the disposal of all kinds of wastes is the responsibility of the local governments.

2. Waste Management Practices in Kenya

2.1 Waste Segregation

Most waste in the country are generated at household level, market places, towns/cities, institutions and industrial zones with minimal waste segregation at the household and within the CBD, including industries and institutions in most towns and cities. Biomedical wastes are considerably segregated, while informal groups carry out recovery of recyclable items (plastics, papers, glass, and metals). Plate 1 shows Informal groups selecting some of the recyclables within the



dumpsite.

Plate 1: Informal groups carrying out recovery of recyclables (*Source: Field observation by Author*)

2.2 Collection and Transport

Frequency of waste collection can be used as an indicator or measure of good waste management practices (an awareness of all concerned about the need for a clean environment). Initially, the Nairobi City Council (NCC) collected 90 percent of its waste in 1970s and by 1998, with over 60 companies engaged in waste collection, only 25 percent was collected (JICA 1998). High-income and middle-income residential areas, including commercial areas were well serviced by private companies and Nairobi City Council then. The low-income residential areas, inhabited by more than 50 percent of the population in Nairobi city (slums and other unplanned settlements), have no proper waste collection services. In some cases the community-based organizations make interventions to deal with the challenge.

Today, the County governments are responsible for waste collection at the CBDs, while Private sector and organized groups and CBOs handle waste in residential areas at a fee, and low income and informal settlements, respectively. The County Governments provide permits to enable them collect waste at designated areas. The National Environment Management Authority (NEMA) issues annual licenses to waste transporters in accordance with the provisions of the waste Management regulations of 2006, though some waste transporters continue to operate illegally. For example, waste collected in Kenya in 2015 (major towns) according to NEMA include the following (table 1):

Table 1: Waste generated, Collected and Remaining in Major towns

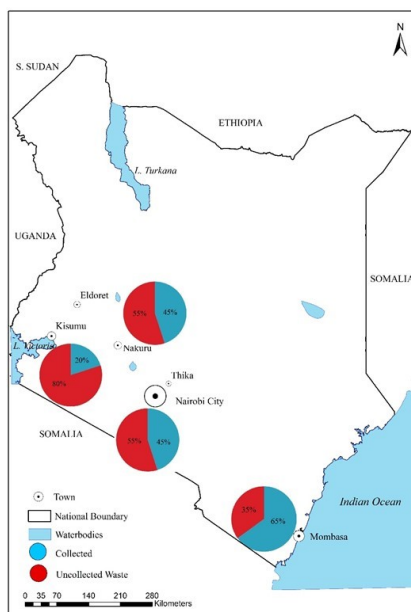
Town	Waste generated (tones/day)	Percent waste collected	Percent waste remaining
Nairobi	2,400	80	45
Nakuru	250	45	18
Kisumu	400	20	Unknown
Thika	140	60	30
Mombasa	2,200	65	40
Eldoret	600	55	15

Source: NEMA, 2015

It was reported that waste transport is basic in open trucks, hand carts and donkey carts, among others. Plate 2 (a) is an illustration of the open trucks used to transport wastes, while (b) is the dream truck for waste transportation.

**Plate 2:** Waste transport in Nairobi (a) and the dream waste transport (b) Source: NEMA (2015)

In Nairobi, in 2010, collection of Municipal solid waste was 33 percent, leaving 2,690 uncollected everyday (JICA 2010). About 100 to 150 tonnes of the solid waste is recycled per day (equivalent to 3.7 percent of total waste generated), leaving about 2,540 tonnes per day to be disposed of in an inappropriate way (burning, and illegal dumping by collectors or uncollected). Figure 1 shows the difference between waste generated and waste collected in major towns in Kenya.

**Figure 1:** Waste collected and waste uncollected in Major towns in Kenya. Source: Developed from data from NEMA (2015)

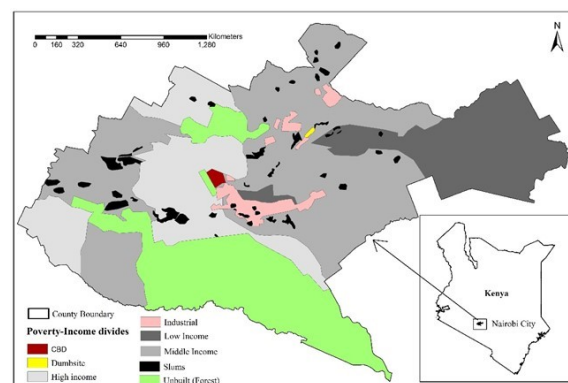
2.3 Waste treatment

Waste treatment technologies have not been fully developed in the country, though there are some ongoing efforts towards waste treatment practices (NEMA 2015). Recyclable materials constitute 50 to 80 percent of the general waste stream, whereby a number of industries make efforts to recover these recyclable materials (paper, polythene, plastics, glass, scrap metals, used oil, e-waste and waste tyres) for recycling, with their operations falling below optimal due to low public awareness of their services. There are a few composting facilities in horticultural farms, while thermal treatment of waste in incinerators and kilns is increasingly being adopted. A majority of incinerators do not comply with the Third Schedule of the waste management regulations of 2006.

2.4 Waste Disposal

Disposal of waste in Kenya is a challenge due to lack of disposal sites. In areas where there are designated zones for dumping of mixed waste, there is inadequate appropriate technology and disposal facilities. Though not recommended, most of the municipal and domestic waste generated is deposited off in open dumpsites across the country. Box 1 shows the Minimum requirements for Solid waste management in the country. The following types of wastes are disposed of as follows: Biomedical wastes (incineration and rudimentary kilns), and condemned, damaged or expired goods (incineration or cement kilns), which do not meet the Third Schedule of Waste Management Regulations of 2006 in the Kenya. There is also inadequate training within the facilities among the workforce on appropriate waste management methodologies.

Besides the Kayole dumpsite (which started in 2009), Nairobi's Dandora dumpsite (located 7.5Km away from the city centre) is the only one operational. It covers 46 hectares of land, but only 2 hectares belong to the Nairobi County Council (NCC). The rest is privately owned. The Dandora dumpsite has a capacity of 1.8M3 and about 220,000 tonnes of waste had been disposed of at the site by 2009. With increasing population and urbanization, the dumpsite is nearly to its full capacity and almost inaccessible to private companies. There are other 70 illegal dumpsites scattered in different areas of the city, where most private waste collectors dump their waste. See figure 2 showing slum areas where small dumpsites may be scattered within Nairobi as well as the Dandora dumpsite.

**Figure 2:** Slum areas and Dandora dumpsite in Nairobi Source: Department of Resource Surveys, Kenya (2011)

The situation in Dandora dumpsite brings out the challenges of solid waste situation in the city and Kenya, and which requires urgent attention. Residents near dumpsites complain about smoke, smell and broken glass, while children suffer from high incidence of respiratory and stomach problems (JICA 1998). BOX 1 gives requirements for solid waste management in the country.

3. Actors in Solid Waste Management

Waste management stakeholders in Kenya include: Municipal County Authorities, Ministry of Environment, water and Natural resources, Ministry of Lands, Housing and Urban Development, Non-governmental Organizations (NGOs), Community-Based Organizations (CBOs) and Private sector.

The National Government establishes the institutional and legal framework for Municipal Solid Waste Management, ensures that the County governments have the necessary authority, powers and capacities for effective solid waste management. The county governments, like the Nairobi County Government, are responsible for the provision of solid waste collection and disposal services. The CBOs, whose objective is to create employment and upgrade environmental conditions in their areas of operation, operate where waste collection is non-existent and dumping takes place in open sites, along main roads or railways, or onto drainage or water ways.

Box 1: Minimum requirements for Solid waste management in the country, Source: NEMA 2015

Minimum requirements for Solid Waste Management
The County Governments are expected to implement the minimum requirements across the waste management cycle;

Waste collection

1. Ensure that the waste collection areas are zoned;
2. Ensure timely and regular collection of all solid wastes either through door to door collection or from centralized collection points;
3. Ensure waste collection facilities such as skips, bulk containers and waste cubicles are regularly emptied and do not become eye-sores;

Waste transportation

4. Ensure that all the collected waste is transported using NEMA licensed vehicles to designated disposal sites.

Waste disposal site

5. Ensure there is a designated site(s) for waste disposal
6. Ensure that the disposal site is secured with a fence and a gate manned by a county government official to control dumping and spread of waste outside the disposal site.
7. Ensure all incoming waste is weighed or estimated and the quantities recorded in tonnes
8. Develop and maintain motorable roads inside the site to ensure ease of access during disposal;
9. Ensure the waste is spread, covered and compacted at regular intervals
10. Put in place appropriate control measures for the management of dumpsite fires
11. Enhance security and control of the disposal sites so that illegal activities are contained.

Requirement for licensing

12. Ensure waste transportation vehicles have NEMA licenses;
13. Obtain licenses to operate waste disposal sites.

The NGOs provide a link between government and private sector, mainly in the cities informal settlements, while private sector include a wide range of enterprise types- varying from informal micro-enterprises to large businesses establishments (in some cases they are contracted individually by households, neighbourhoods, associations or business establishments).

There are over 120 private companies licensed by the NCC and more than 140 informal private companies participating in solid waste management in Nairobi city. CBOs spend the least in waste collection per tonne and are therefore the best to operate in solid waste management, particularly, in low-income areas where residents are unwilling to pay more for waste collection. Figure 3 shows an example of Nairobi with various land uses, where residential areas are scattered throughout the County.

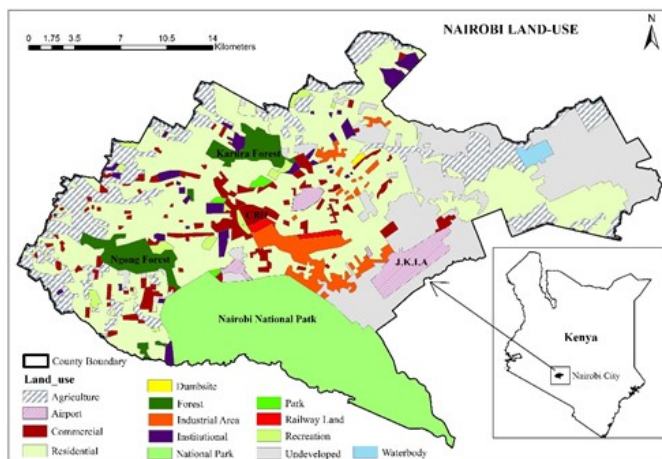


Figure 3: Various Land uses in Nairobi. Source: Department of Resource Surveys, Kenya (2011)

In residential areas, Private sector collect over 70 percent of the waste, Personal initiatives (19 percent), CBOs (6 percent), and NCC (1 percent). Private companies and personal initiatives still lead in waste collection among institutions, industrial and commercial sectors. The private sector/companies consist of family ventures or hybrid between CBOs and a private firm. The NCC concentrates its efforts to areas that can afford to pay for the service.

Community-Based Initiatives (CBOS) to waste collection, transportation and storage, trading and recycling began in 1992, when CBOs (charitable organizations, ethnic associations, self-help groups, and residential (neighbourhood) associations) were engaged in waste composting and neighbourhood cleaning. The neighbourhood/Residential associations in cities are many and engage in improving security, roads, and cleanliness as well as contacting, organizing and monitoring private collection services. For example, the Nairobi Central Business District Association (NCBDA) (made up of private business operators within the CBD, with a Memorandum of Understanding (MoU) with the NCC, engage in policing/security as well as road and public toilet rehabilitation projects.

They also donate garbage storage bins for use in the CBD. Plate 3 shows an example of waste-bins donated by the NCBDA.



Plate 3: Segregated waste-bin donated by NCBDA
Source: Author (2016)

The urban and peri-urban farmers collect poultry waste, green vegetable waste and cow dung as well as food waste from hotels, markets and other institutions and use it as either animal feed or as organic fertilizer. Other informal agents (waste pickers, traders and dealers itinerant buyers, informal dump service providers and informal recycling enterprises) provide services in solid waste management as secondary activity. They engage in waste collection, separation, storage, re-use, recovery, recycling, trading, transport, disposal and littering.

Non-governmental Organizations and International NGOs provide support to CBOs in terms of tools and equipment. Some important NGOs supporting CBOs in waste management in Nairobi city include: Foundation for Sustainable Development in Africa, Uvumbuzi Club, Undugu Society of Kenya, National Council of Churches of Kenya, Private sector, Norwegian Aid Institutions and Japan International Cooperation Agency (JICA)(UNEP, 2016).

Public-Private Partnerships include partnerships between Local Authorities and other agents (Private sector, NGOs and Communities), to facilitate sharing of sustainable waste management responsibilities and financial burden.

4. Trends and Emerging issues in Waste Management and Best Practices

Globally, and particularly, among the developed countries, changes have taken place in waste management sector over the last one decade. For instance, there has been a change from waste management associated with landfill disposal to waste treatment; increased technology to deal with or treat waste, as well as a growth in recycling and reuse of materials. The shift was driven by legislation, while diversion from landfill was prompted by new technologies.

The journey to the zero waste emphasizes investment in low-carbon technologies and improved efficiency in the use of resources and materials. Successful implementation has been based on national policy objectives, a level playing field (which allows the industry to compete fairly), and confidence that regulations will be reinforced appropriately (SESA 2012). Progress towards zero waste relied on stimulating private sector investment in new waste management facilities; a more responsive planning system which delivers greater certainty and efficiency, as well as a more informed debate at the local level on the need and benefits for sustainable waste management.

Kenya like any other African country faces many of the emerging issues in waste management in Africa. These include: Poor waste management practices (widespread dumping of wastes in water bodies and uncontrolled dumping in dumping sites) which contribute to low sanitation levels in many areas. Besides, the infrastructure (including waste management) is not congruent with land use planning despite the increasing urbanization. As compared to urban areas, rural areas are faced with inadequate waste infrastructure. Capacity constraints and limited waste management facilities widen the gap between waste management policy and legislation and actual waste management practices. Industrialization, urbanization and modernization of agriculture in many areas significantly increase waste generation, thus aggravating capacity constraints in waste management. Further, a growing e-waste stream from ICTs and high turn-over in technology contributes to disposal of e-waste within municipal dumping sites, thus worsening the precarious waste management capacity in the stream. The above trends are complicated by the changing lifestyles and growing number of middle class which increases the complexity of waste streams.

However, progress has been observed on waste management policies and strategies, though the use of economic instruments, while implementation of Polluter-Pays-Principle still require some attention. Biogas and compost production from organic waste has been accepted as a best practice together with energy production from agricultural residues (including co-generation). Resource-efficient and sustainable consumption and production has emerged as a best practice for reducing waste from business and other organizations. The conclusions section discusses some of the existing gaps and opportunities for youth entrepreneurship on waste management sector.

5. Conclusions and Recommendations

Some of the gaps identified in this review include: lack of data on waste management in other parts of Kenya together with lack of effective coordination among the numerous actors in the cities sustainable waste management. Private garbage collectors operate in an environment of open competition, with little or no cooperation with Municipal Authority, while waste management of the firms are not geared towards waste recycling, re-use or minimization.

Further, there is minimal public support for some separation of waste and waste recycling, reuse and minimization due to low public awareness and the models of operation of actors in solid waste management is not well understood. There is need for effective coordination of the actors together with regulation of private companies and specific structures for monitoring of sustainable waste management activities (generators or private sector collection companies) are urgently needed to reinforce the law. There is also a gap in handling of biomedical, industrial and hazardous wastes as these wastes are mixed up in dumpsites, disposed of by road sides or buried without any appropriate measure. Strict reinforcement of law on solid waste management together with specifications of roles and responsibilities by individuals, enterprises and government as well as sanctions to law breakers on solid waste management is necessary. All these gaps present opportunities for youth entrepreneurship to enhance urban environmental quality and ensure sustainability of ecological systems in urban areas of not only Kenya, but the entire continent of Africa.

Currently, women and youth participate in recycling, by collecting the polythene and taking it to waste recyclers. By 2016, more than 200,000 jobs have been created across the country in this way. There is great opportunity in exploring the energy potential of organic waste in institutions as a way to saving the current high energy costs, while also creating jobs and improving urban livelihoods and environment. Institutions should be part of the target for youth entrepreneurship, by examining how closed systems of waste management can be implemented to increase efficiency and economic benefits. The gap between waste generation and collection presents opportunities for the youth and can be used to create jobs to many more people. The youth can also work with small clinics on best possible ways for appropriate disposal of their biomedical wastes which is currently a challenge to many of them.

There is great opportunity for the youth to segregate, collect and recycle waste while also establishing facilities for recycling to create more employment opportunities. Efforts that save energy and are less hazardous are needed together with awareness on waste issues. New collection practices and investment in waste infrastructure, with stakeholder support can create jobs for the youth, while investment in new waste recycling infrastructure and waste pre-treatment facilities and fund allocation towards zero waste programmes can go a long way in supporting youth entrepreneurship. Above all, these opportunities must be supported by inbuilt training for the youth to enable them become innovators in both conventional and emerging waste streams, like e-waste management.

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