



September 2019

National Inventories for Location of Dumpsites, Landfills and Related Hotspots in Zambia

Zambia Environmental Management Agency

1.0 Background and Introduction

The management of various types of waste has over the years been a very difficult and challenging issue. This difficulty has manifested itself in the perennial outbreak of diseases such as cholera, dysentery and pollution of water resources, air, soil or land contamination, proliferation of pests and vermin, and the loss of aesthetic beauty. Improvements are desired in waste management covering aspects of minimization of waste generation, improving collection, re-use, recycling, treatment and disposal.

Zambia is a land linked country surrounded by eight countries in the sub-region namely Angola to the West, the Democratic Republic of the Congo and Tanzania to the North, Malawi and Mozambique to the East, Zimbabwe, Botswana and Namibia to the South and South-West respectively. The country lies between 8° -18° South of the equator and 22° – 34° East of the Greenwich Meridian Time (GMT) with a land area of about 753,000 km².

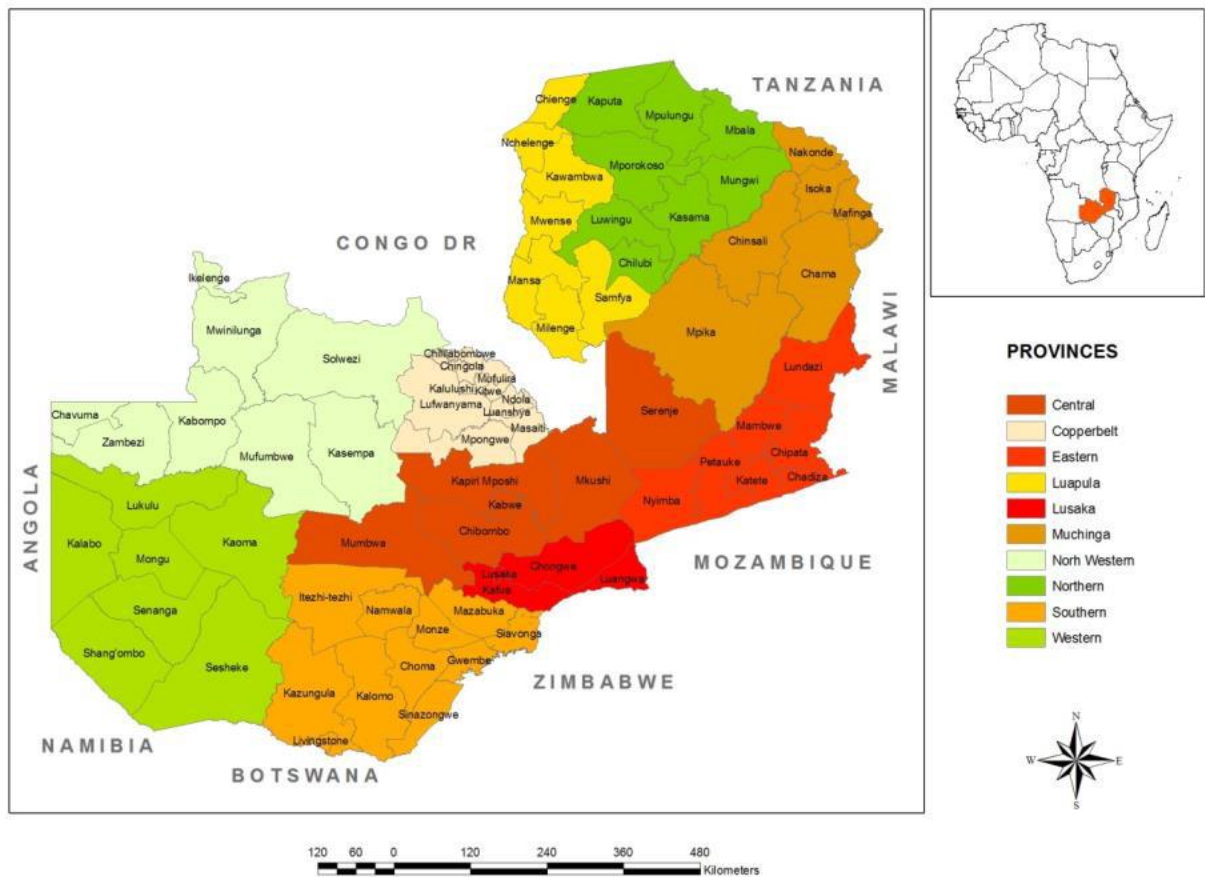


Fig. 1: Map of Zambia and Location in Africa

The population of Zambia in 2010 was 13,092,666 persons. (Table 1). It is estimated that the average annual growth rate is about 2.8 percent, meaning by 2019, the total population is estimated to be about 17,000,000 people. The regional distribution of the population shows that about 39.5 percent (5,173,450) of the population is urban compared to 60.5 percent (7,919,216) in rural areas (CSO 2012). At provincial level, Lusaka has the largest population (2,191,225), followed by Copperbelt (1,972,317), Southern (1,589,926), Eastern (1, 592,661) and Northern (1,105,824). The province with the least population was North-western (727,044) followed by Western (902,974) and Luapula Provinces (991,927).

Table 1: Total Population by Province and Region.

Region and Province	Total Population
Zambia	13,092,666
Rural	7,919,216
Urban	5,173,450
Central	1,307,111
Copperbelt	1,972,317
Eastern	1,592,661
Luapula	991,927
Lusaka	2,191,225
Muchinga	711,657
Northern	1,105,824
North-Western	727,044
Southern	1,589,926
Western	902,974

Source: 2010 Census of Population and Housing (CSO, 2012)

The country has a total of ten administrative Provinces with 118 Districts. Each District is managed by a Local Authority (LA) and these Districts are further divided into Constituencies and wards for administrative purposes.

2.0 Environmental Policy and Regulatory Framework

The National Policy on Environment

The National Policy on Environment (NPE) was adopted in 2007. The NPE provides a framework for the sound management of the environment and natural resources in the country. The NPE espouses the principles found in the Constitution. The NPE was developed by Government to avoid conflict of interest among stakeholders, harmonize sectoral strategies and rationalize legislation that concern the use and management of the environment. It was developed through a comprehensive research and consultative process with the objective of attaining an integrated approach to development through a national cross-cutting consensus.

Regulatory Framework

Zambia has recognized the need for a strengthened legal framework to the management of waste. In this regard, the Environmental Management Act and other supporting legislation were enacted in order to have legislation that encompasses all environmental aspects. Within this framework, all the stakeholders have a role to play, with local authorities playing a key role in the formulation of by-laws and regulations in their areas of jurisdiction. The 'polluter pays principle' and similar such principles guides the process.

The Environmental Management Act (EMA) No. 12 of 2011 is the principal law governing all aspects of environmental management. It provides for requirements for handling waste such as the licensing or permitting process for collection, transportation, treatment and disposal of waste. Other supporting pieces of legislation with regard to waste management include the Local Government Act of 1991, Public Health Act of 1995, the Mines and Minerals Development Act of 2015, National Health Services Act of 1996, the Ionising Radiation Act of 2005 and the Solid Waste Regulation and Management Act of 2018. In terms of waste management regulations, the Environmental Impact Assessment Regulations, the Environmental Management (Licensing) Regulations of 2013 and the Environmental Management (Extended Producer Responsibility) Regulations of 2018 that provides for procedural details of how the activities involving waste must be undertaken including the generation, storage, treatment and transportation of waste, siting of and management of disposal sites.

3.0 An Overview of the current status of Waste Management

This section highlights the current situation and gives an analysis of the various streams of waste. Generally, the current waste management situation leaves much to be desired. Wastes generated from all sectors of the economy are currently not well managed. Disposal sites in almost all the districts are either not there or they are poorly managed. Taking the Lusaka situation as reference point, less than 50% of the waste generated in the urban centers finds its way to the disposal sites. The following waste streams include domestic, commercial, industrial and hazardous waste. Currently, there is no available data on radioactive, agriculture and chemical wastes. In addition, there is generally inadequate data for other waste streams especially for areas outside Lusaka and the Copperbelt.

3.1 Domestic Waste

This category of waste comprises mainly wastes that are generated from household activities. This normally includes such materials as waste paper, plastics, wood off cuts, kitchen waste and yard waste. Currently there is no separation of the various

types that constitute this category. The waste components are usually mixed and dumped in places that are not designated for disposal. Much of this type of waste is generated from residential areas and as at 2018 records for Lusaka as a benchmark, only 35% of residential areas are serviced as regards waste management. The percentage could be a little higher on the Copperbelt especially the mining townships. Most of the mining townships have a defined waste management system. This is mainly due to the presence of programs that were driven and left by the mining giants.

The waste management situation on the Copperbelt mining towns as alluded to above, is well defined as compared to other towns in the country. There is however need to streamline the system to ensure that there is increased coverage.

3.2 Commercial Waste

This is the waste stream that is generated from commercial and business houses and will normally compose of such materials as discarded office paper, cardboard, plastic and general packaging waste.

The management of this type of waste like for domestic waste is also not well defined. This is exhibited by the presence of piles of uncollected waste in most of the town centers.

3.3 Industrial Waste

This is waste that is generated from industrial production processes. Types in this category include such wastes as industrial sludge from factories, manufacturing facilities, and refineries. It also includes food processing waste, and water treatment filter cake sludge. Other types would include ash from industrial combustion processes. This waste stream also covers wastes from mining activities.

3.4 Hazardous Waste

This is the type of waste with such characteristics as flammability, irritability, ignitability, corrosivity and toxicity. Examples include: industrial hazardous waste products such as wastes containing heavy metals like lead and chromium, polychlorinated biphenyls (PCBs), asbestos and ink sludges. Other types include, lead acid batteries, clinical waste and waste oils. This category also includes wastes from hospitals and other healthcare facilities. It is characterized by such types as sharps, swabs, pathological and cytotoxic wastes.

4.0 Inventory of locations of dumpsites and related hotspots

The recently conducted inventories identifying locations of dumpsites, landfills and other related hotspots shows that there are 116 disposal sites that are managed by the local authorities across the country. These disposal sites are poorly managed and often not fenced, not guarded, no weigh bridges, scavenging activities are conducted in an uncoordinated manner and the waste pickers conduct their activities without personal protective equipment and for various reasons open air burning of waste is conducted at these sites.

Other important hot spots where open burning is conducted are commercial trading places such as markets, un-planned/un-serviced residential areas in peri-urban areas, some rural health centers where incinerators are not effective can also be considered as open burning hot spots.

This inventory is important because it will contribute towards a coordinated approach towards sound waste management. Some of the benefits envisaged are as follows:

- a) Minimizing waste generation
- b) Maximizing the collection efficiency
- c) Reducing the volumes of waste requiring disposal and maximizing the economic value
- d) Developing environmentally sound management of waste thereby reducing its impact on health.

4.1 Lusaka

Lusaka dominates the country's urban system and has almost 70% of its population living in peri-urban areas that are unplanned settlements with access difficulties. Lusaka is experiencing typical urban problems associated with developments such as population growth, high levels of urbanization and unemployment, inadequate services which include waste management, access to clean water, safe sanitation and appropriate housing. The inadequate services make the residents of unplanned urban settlements vulnerable to epidemics such as cholera.

The city generates about 1,000 tons of waste per day. However, only about 45% of this is taken to Chunga Landfill - the designated disposal site. The volume of waste being generated continues to increase at a faster rate than the ability to manage it due to the inadequate resources. Another factor affecting Lusaka city to effectively manage waste is the indiscriminate illegal dumping and littering by the public. Most public members are seemingly not sensitive to the garbage around or indeed have any awareness of what represents responsible waste management.

To ensure effective management of waste, the Municipality works in partnership with private waste management companies Franchise Contractors and Community Based

Organizations that service conventional and peri-urban areas in the city. Currently, the Council has 16 waste management districts (WMD), and of these, 15 are manned by the private sector while the other one that covers Central Business District (CBD) is under the Council. A franchise system has been implemented in Lusaka that encourages the participation of the private sector in solid waste collection. A franchise contract provides a private waste collector with the sole right and obligation to collect and transport waste from all premises in a franchised waste management district to the dumpsite. The franchise collector awarded with a franchise contract has the responsibility for collecting waste fees for the services provided. The fee range depending on different factors is set in liaison with all stakeholders with a ceiling set by the Council. The fees vary depending on the residential areas.

In peri-urban areas, Community Based Enterprises (CBEs) have been given the mandate to collect waste within these areas. There are 109 CBEs across the city's peri urban areas providing waste collection services and the modality of collection is either through direct collection from prospective residents, and in recent times, Care Zambia and People's Process on Housing and Poverty in Zambia have been supporting tariff bundling that entails waste collection services being bundled with water bills.

The system explained herein describes the collection of waste from the conventional areas. The entities mentioned collect waste in low-density areas e.g. Rhodes park, Woodlands, Libala etc. The types of vehicles used in the conventional areas are compactor trucks, tipper trucks, skip trucks.

The City Council collects waste from the central business district (CBD) and has an additional mandate to manage the landfill. Waste is now seen as an economic resource. Waste recycling is currently progressing well in Lusaka through initiatives by corporate entities such as Zambia Breweries through their Manja Pamodzi program. Waste sorting sights are now found in Zam leather, Bauleni and soon in Chawama. At the moment less than 10% of the generated waste is recycled. Waste generation is projected to reach 500,000 tonnes per year by 2020.

Table 4.1: Solid waste collection in Lusaka for the period 2016 – 2018

Year	Waste tonnage/year	Percentage
2016	257,143	24%
2017	300,000	28%
2018	375,000	35%



Fig. 4.1.1: Chunga landfill in 2007



Fig. 4.1.2: Chunga landfill in 2019

4.2 Chongwe

Chongwe is a district based on agriculture, mining, mineral processing and transport services (Chongwe district actually hosts the Kenneth Kaunda International Airport, which was formally called Lusaka International Airport and is Zambia's most important air travel hub). Military bases, which include the Zambia Air Force base at KKIA, two Zambia National Service camps and Mikango Barracks of the Zambia Army, add to the public sector activity and population.

The resident population of the District is 186,000.

The Central Business District is a short stretch measuring about 0.25km wide on each side of the Great East Road running for some 1.5km.

Chongwe has some of the most unusual spreads of population centers of all districts in Zambia. Many of the affluent areas are the ones bordering Lusaka city near the

Western district boundary (Airport Road hosting various industries and organizations such as Delta Auto, Hitachi Construction Machinery, National Institute for Scientific and Industrial Research, Medicines Regulatory Authority National Laboratory; Waterfalls Shopping Mall; Garden City Shopping Mall; Meanwood Ibex Hill residential compound; Mika Convention Centre; OP Compound; parts of Chelstone township; Silverest housing community etc.) The farming blocks are sparsely populated and then a cluster of mid-to-low market residential properties forms what may be referred to as Chongwe district proper. The rest of the population is in the military establishments, the several boarding schools and Chalimbana University in addition to the rural-most village dwellings further west, southwest and northwest.

The Public Health department has recently demarcated the district into seven waste collection zones (called "districts"), but these are yet to be mapped, although they are described based on existing flagship area names.

On waste map and waste characterization:

- The district produces around 61tpd of disposable waste.
- About 34% of this waste is collected and transported to the Council dumpsite.
- The rest of the waste – approximately 40tpd is disposed of by burying, open burning and incineration.
- Waste from one waste management district which incorporates the farming blocks of Chalimbana and Kanakantapa is neither picked nor known in overall quantity or specific characterization.
- A basic characterization (with heavy down-sampling due to non-availability of weighbridge or industrial scales was carried out based on samples from zero to three-day old waste piles at the dumpsite. It was found in order of percent by weight: Organics: 53, Plastics: 18, Glass: 16, Wood and Paper: 7, Rubber: 3, Metals: 1, Textiles: 1, Other: <3.
- An unusually large number of organic components were noted and accepted after justification. It is expected to continue for the foreseeable future as Chongwe's economic activities (agriculture, food, international transit, and educational institutions) are the ones which give rise to the organic wastes. This component makes Chongwe a good potential host for composting and similar projects which require organic waste as key raw materials.



Fig. 4.2.1: waste pickers at Chongwe dumpsite

4.3 Livingstone

Founded in 1905, with a rich multi-cultural history, Livingstone is a city based almost entirely on tourism. The Zambia Tourism Agency (ZTA) reports that in 2018, visitors to Livingstone exceeded 250,000 (up 36% from 2017). Every year, Livingstone hosts major international events. No doubt one of the key attractions is the Mosi-Oa-Tunya (Victoria Falls) which is one of the Seven Natural Wonders of the World and a UNESCO World Heritage Site.

The resident population of the city is 180,000. At least 50% additional headcount is the transit/visitor population.

The government is the largest employer, through the various public service departments and the military camps. Much of the rest of the population is connected directly or indirectly to the tourism industry.

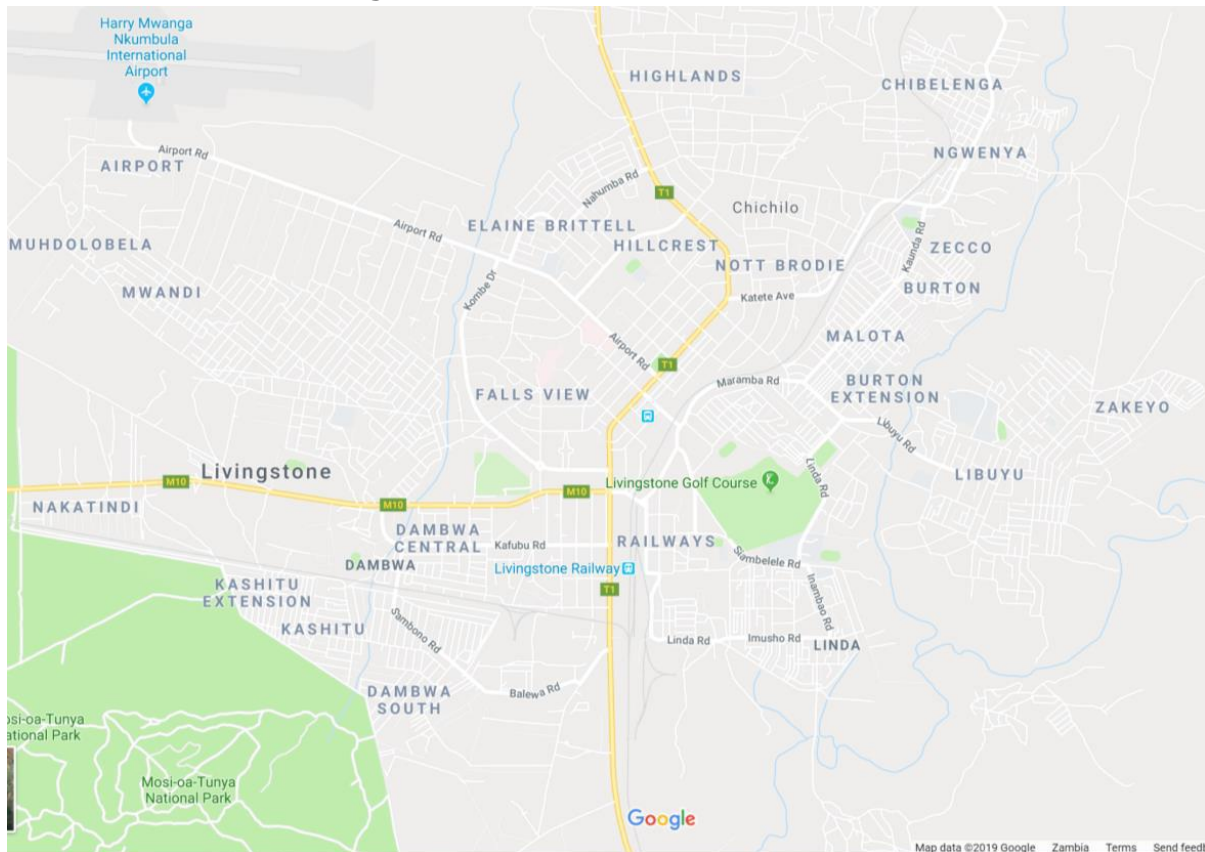
Spreading out from the CBD, there are 6 major population centers or waste management districts.

Waste map and waste Characterization

- The city produces around 90tpd of disposable waste.
- Around 50% of this is collected from the CBD and public spaces like markets.
- Up to 5% is collected from single-user facilities run privately by high waste institutions like the hotels.
- The rest of the waste – approximately 41tpd – is in the townships where the collection rate varies depending on success of the contracted waste collection company to receive user fees and collect the waste.

- Using a limited-time truck count at the dumpsite, an estimate has been made that up to 60% - 24tpd – remains uncollected in the townships and is either burned or buried.
- A basic characterization (without systematic down-sampling to ensure best representative sample) was carried out of fresh waste piles at the dumpsite and found in % by weight Organics: 35 Plastics: 17 Textiles: 9 Wood and Paper: 9 Rubber: 3 Metals: 3 Glass: 23 Other: 1
- During the study period, waste directly from representative households was not available (only the waste mixed with other stock from skips, shops and lodges operating within the townships). Some characterization was carried out of waste from few households near the CBD, but its representativity was doubtful and the results are therefore not reported.

Figure 4.3.1 is a map of Livingstone showing the major population centers and the CBD. The six waste management zones are also identified.



The six collection zones are managed by contractors while the rest of the areas are serviced directly by the City Council.

Table 4.3.1 Characterization of Dumpsite inlet sample

Line	Step	Tools	Details	Results
1	First Sample Dig-Out	Spade Shovel Polyethylene Bags	Dig out approx. 1.0m diameter, 0.5m depth, cylinder of waste from the stockpile	
2	Mixing	Garden Folk Spade	Use the garden folk to turn the waste around to homogenise the distribution of materials through the sample Use spade to cut and break down large pieces of waste	
3	Down-sampling	Spade Shovel Clear floor space Polyethylene Bags	Cut out about 20% of the sampled material from the waste poured on a clear floor	
4	Drying	Garden folk	Spread out the re-sampled materials to dry out naturally from daylight heat	
5	Filtering	Grid/sieve	Use a grid (mesh size at least 50mm) to filter out abnormally sized objects	
6	Separation	Garden folk	Spread the filtered materials out on clear floor and manually separate into the various material categories	
7	Weighing	Scale	Weigh each of the materials separately	Glass: 25.83 kg Plastic: 19.09 kg Organics: 39.30 kg Wood & Paper: 10.11 kg Textiles: 10.11 kg Rubber: 3.37 kg Metal: 3.37 kg Other: 1.12 kg Total 112.29 kg
8	Report	Calculator	Calculate the percentage of each type of waste by weight	Glass: 23%, Plastic: 17%, Organics: 35%, Wood & Paper: 9%, Textiles: 9%, Rubber: 3%, Metal: 3%, Other: 1%



Fig. 4.3.2: Waste from the CBD delivered by Council tractor



Fig. 4.3.3 pickers surround truck about to tip waste. Not the burning piles nearby



Fig. 4.3.4: Waste and evidence of fire around the waste skip at Dambwa North market

4.4 Copperbelt

The Copperbelt Province is the industrial core of Zambia and the vast majority of people reside in this Province outside of Lusaka. The region is rarely visited by tourists, but unique attractions, like the largest chimpanzee sanctuary in the world, make it worth a visit.

Other than Lusaka, the Copperbelt Province is the only place where you can see the urban side of Zambia, and Ndola especially makes that a very pleasurable experience.

The Copperbelt Solid Waste Management Company (COP-WASTE) is a wholly Zambian owned company whose shareholders are Kitwe, Chililabombwe, Chingola, Kalulushi, Luanshya, Mufulira and Ndola Councils. It was incorporated as a private company limited by shares under the Companies Act in December 2006 and commenced operations on January 1, 2007.

Its core business is collecting, treating, processing, reusing, recycling and disposing of municipal solid wastes (MSW) generated by all urban population groups in an environmentally and socially satisfactory manner using the most economical means available.

In total, Cop-Waste services over 300 commercial clients across the seven major towns of the Copperbelt.

Cop-Waste's commercial services are customized and tailored to suit individual customer's needs. As a result of such Cop-Waste offers a variety of receptacles such as skip bins, drums, bins and refuse bags. From here, commercial clients waste is collected on a weekly basis.

The second focus of Cop-Waste's waste management service is on residential customers across the Copperbelt. The company provides waste disposal services for customers across the seven major towns of the Copperbelt.

Cop-Waste services over 5000 residential clients across the Copperbelt.



Fig. 4.4.1: Cop Waste refuse collection truck



Fig. 4.4.2: A disposal site in Kitwe

The waste management situation on the Copperbelt mining towns as alluded to above, is well defined as compared to other towns in the country. There is however need to streamline the system to ensure that there is increased coverage. Some statistics in terms of waste management is shown in table 4.4.1 below:

Table 4.4.1: waste management for some mining towns

Town	No. of households	Solid waste (SW) generated in tons per year	Annual SW in disposal site in m ³	Annual area for SW disposal in m ³
Chililabombwe	5528	5720	15,717	5239
Chingola	7783	10,620	29,195	9732
Kitwe	10,572	15,140	41,621	13,874
Luanshya	9281	14,560	40,043	13,348
Mufulira	9678	18,060	49,671	16,557
Total	42,842	64,100	176,246	58,749

4.5 Healthcare waste

In terms of Health Centers, there are 913 managed by the Government, 53 managed by the private sector and 6 managed by missionaries. Again, estimates from compliance monitoring reports shows that about 60% of the hazardous waste from these facilities is poorly managed. Some statistics concerning the generation of healthcare (HCW) wastes are given in table 4.5.1 below:

Table 4.5.1: Healthcare waste generation levels

Name of site	Level	HCW in kgs/day
University Teaching	National reference	952
Kitwe Central	Level III	321
Arthur Davison	Level II	125
Solwezi General	Level II	151
Livingstone General	Level II	250
Liteta Liprosarium	Level I	73
Mazabuka District	Level I	98
Yeta District	Level I	60
Mwandi Mission	Level I	43
Kalomo District	Level I	28
Chipata Clinic	Urban health center	11
Mutanda	Rural health center	8
Mutanda Research	Rural health center	0.2
Kazungula	Rural health center	0.8
St. Johns Med, Center	Private Hospital	2
Total		2,123

5.0 Conclusion

The respective Government Agencies, based on their mandate, roles and responsibilities will participate in waste management, through formulating policies and legislation that assist in enhancing and improving services for waste collection, treatment and disposal.

The Government supports and will promote waste management principles of waste prevention, reduction, recycling and treatment before disposal.

Local authorities are the backbone in terms of providing collection services, designating and development of waste disposal sites in their areas of jurisdiction and in establishing organizational setup. Local authorities are currently involving the private sector in achieving these objectives.

It is worth noting that a detailed assessment of the state of each market is not yet complete, but an assessment of the few markets visited shows that about 50% of the market sites have open burning activities.