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EFFECTS OF THE DUMPSITE ON RUNYARARO WEST AND VICTORIA RANCH RESIDENTS MASVINGO CITY, ZIMBABWE

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Abstract:
Poor waste management practices are a major challenge in most developing countries like Zimbabwe. A number of reasons which include financial constraints, lack of skilled personnel, lack of interest by the general public to practice good waste management practices and increase in population due to rapid urbanization have led to some residential suburbs being commissioned near dumpsites. Developing countries use varying methods for waste disposal however according to literature most are below the recommended international standards hence this poses a huge danger to the environment and humans living close to the sites of disposal. The study has revealed that people living close to the dumpsite like the Victoria Ranch residents in Masvingo are greatly affected in a number of ways. These mainly include incidences of dysentery cases, high prevalent of rats, mosquitoes in wet seasons, flies in summer, permanent bad odors that prevail throughout the year and bad scavenging habits being practiced by some of their children. As with many disposal sites in developing countries no international practices are being followed so as to promote a healthy living environment to the Victoria Ranch residents and Runyararo West residents. Various reasons were stated by the responsible local authorities for the utilization of an expired dumpsite. However, there is need for the Government to cooperate with the local authorities in waste management practices so as to provide a healthy living environment to every citizen regardless of their location

Keywords: waste management, dumpsite, Runyararo West, Victoria Ranch, residents

1. Introduction

One of the major challenges developing countries are facing is waste disposal and management (Charles, et al, 2013 Nyarai et al, 2016). Due to population increase, there has been an increase in migration to urban cities in search for greener pastures hence an increase in waste generated. In sub-Saharan Africa nearly half of the waste generated is not collected (Nyarai et al, 2016). More than2.5 million tonnes of waste are being

produced from households and industries per annum in urban areas (Mubaiwa). Residents will dump waste on illegal open dumpsites and backyard incineration posing a lot of danger on the environment and the community. In Zimbabwe, waste management has reached crisis levels due to political differences, financial problems, and the absence of an integrated waste management system (Nyarai, et al 2016). Waste management involves generation, storage, collection, transportation, processing, treatment and final disposal of various forms of waste. When dealing with waste a number of factors should be considered which include the environment, people's health, financial aspects, engineering conservation and others too (Makwara and Magudu, 2013). A lot of cities have been affected by poor waste management in Zimbabwe which include Mutare (Nyarai, et al 2016), Harare (Tsiko and Togarepi, 2012), Masvingo (Herald 17 September 2017) and many others to name just a few. Other developing countries facing waste management problems are Nigeria (Charles, *et al*, 2013), Swaziland (Abul, 2010) and Pakistan (Ejaz et al. 2010).

In developing countries, most waste is not recycled but simply finds its way to the dumpsite and this causes a lot of problems to the community leaving near the dumpsite (Nyarai et al 2016, ZBC news 2017). Waste also causes danger to the ecosystems too (Makwara and Magudu, 2013). Waste disposal sites should be located at a further distance from human habitation (Mapira, 2011). However, this is not the case with Masvingo's open dumpsite.

1.1 Types of waste

Waste is defined as any substance or matter that is to be disposed as it will no longer be useful (Madzengerere and Chigwenya, 2012). Waste can exist in all states of matter namely gas, liquid or solid and all these forms can pollute the environment if not properly managed (Abul, 2010). Waste is generated from homes, street sweeping, industries, institutions and commercial areas which need to be collected from these various communities by the responsible authorities (Nyarai, et al 2016).

he most common type of waste generated is solid waste and liquid waste. Solid waste is commonly referred to as refuse, figure 1 shows the classification of different types of waste generated. Solid waste is classified into three classes depending on the source of origination. When solid waste is generated from households, it is referred to as municipality waste. Solid waste generated from industries is referred to as hazardous waste whilst that generated from biomedical institutions and hospital is referred to as infectious waste (Abul, 2010).

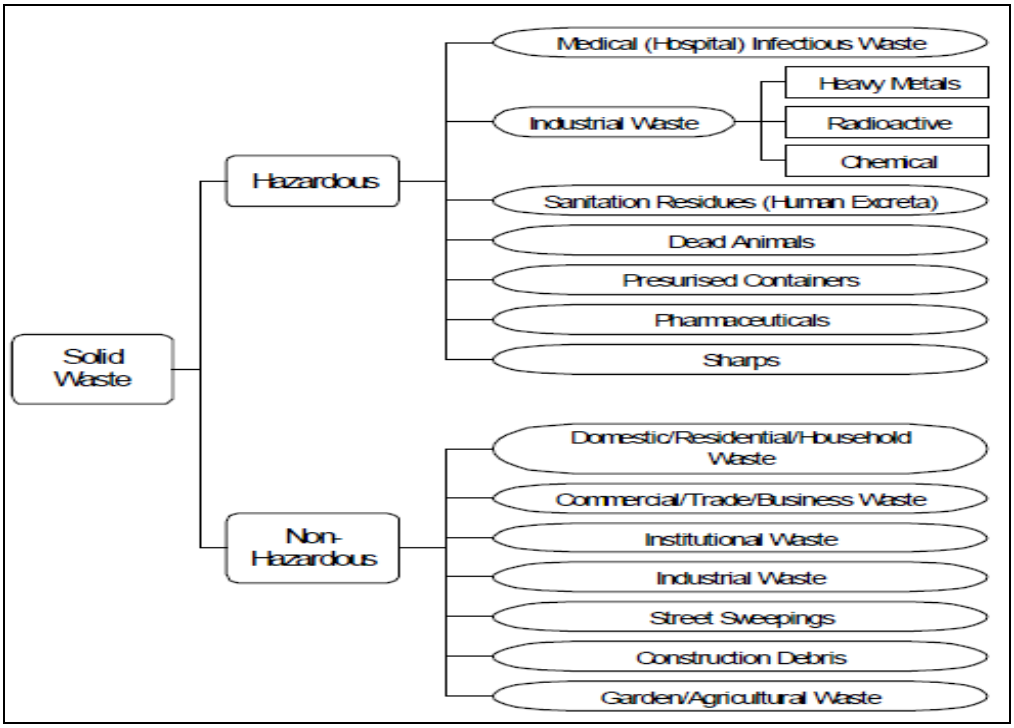

Figure 1: Classification of waste generated (Manyuchi and Phiri)

1.2 Different ways of disposal

They are three main methods used for waste disposal in developing countries namely landfills, open dumpsites and incineration. Different countries utilize different methods based on their economics and standards of living. See figure 2 below.

1.2.1 Incineration

Incineration involves the burning of waste. This method can also be referred to as energy from waste. Incineration can be carried out on both small scale and large scale basis. When incinerating waste usually high temperatures are required and this method is a recognized method of waste disposal (Abul, 2010). However, these can be sources of environmental pollution if they are not properly managed. Communities living close to these types of systems are often at great risk.

1.2.2 Landfills

Landfill systems are commonly used in developing countries as methods of waste disposal. However, their standards are usually far from the recommended ones (Charles et al 2013). Landfills utilized in Africa are usually not engineered. This method is commonly practiced as it is a cheaper method and due to the availability of whole ground. Landfill systems are often useful in reclaiming void spaces such as quarry site. Pen tipping landfill system has been replaced by sanitary landfill system. In sanitary landfill systems, engineering is utilized and the waste is compacted and often covered by soil after 1-2m daily**.** Properly engineered landfills involves the safe disposal of waste whilst minimizing environmental pollution since they are usually lined with layers of absorbent material and sheets of plastic so as to prevent pollutants from

leaking into the soil and water (Adamcová, 2016). This method if not properly managed it can cause environmental pollution. Communities living close to landfills are at great risk of many acute and chronic diseases.

1.2.3 Open dumpsites

Open dumpsite is a commonly used method of waste disposal in Nigeria (Saidu, 2011), Ugwoha, 2015) and Zimbabwe (Mapira, 2011). Masvingo utilizes this method of waste disposal which is causing a lot of dangers to residents of Victoria range who in the worst scenario live less than 200m away from the dumpsite with Runyararo west and Garikai residents living near 1.5km away from the dumpsite. Different forms of waste are disposed on the ground which is not protected in anyway. This type of disposal method enhances contamination of groundwater (Ugwoha, 2015) and soil pollution (Praveena and Rao, 2016). Open dumpsites are known for their smelly and unattractive sights. Most methods utilized in developing countries show lack of careful planning and management as they later cause a lot of danger to the environment and human health (Abul, 2010). Good disposal sites that take the environment and human health into consideration must have a control for leachates, control for dumpsite gases and a lined pit (Galarpe, 2017).

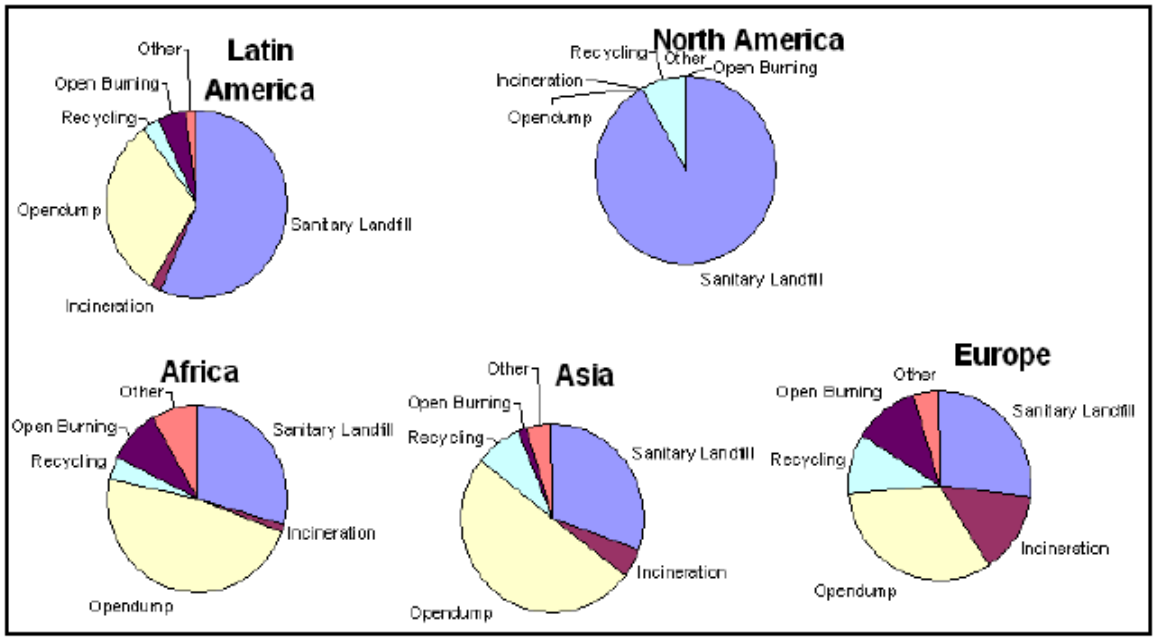

Figure 2: Waste management methods in different continents (Shanghai manual)

1.3 Effects of improperly managed landfills and open dumpsites on groundwater

Poorly managed waste sites are sources of groundwater pollution as they produce leachate which migrate through refuse into the water table posing a high risk to groundwater resource. Due to the chemical properties of water, many chemical suspend, dissolve, adsorb and absorb in water hence the contamination of water bodies. Water has unique chemical properties due to its polarity and hydrogen bonds which mean it is able to dissolve, absorb, adsorb or suspend many different compounds

(Charles et al, 2013). Charles et al 2013 noticed a variation of the Manganese concentration in groundwater from waste sites and the WHO standards which he attributed to the impacts of leachates. Ugwoha and Emete (2015) compared the physico-chemical parameters of a dumpsite leachate from Alakahia Dumpsite in Port Harcourt, Nigeria and groundwater with the WHO standards for drinking water. The concentrations of the parameters for the leachate were above normal. Hence the leachate had a possibility of contaminating groundwater. Of interest was the fact that the concentration of the groundwater parameters decreased with an increase in distance from the dumpsite. Hand dug wells close to dumpsites are not safe for drinking (Saidu 2011).

1.4 Effects of improperly managed landfills and open dumpsites on soil

Soil pollution is a consequence of waste dumping on land and this greatly affects soil fertility. Both developing and developed countries have waste management practices that are affecting soil fertility. In developing countries, the poorly managed and unscientific dumping of waste due to leachate affects soil fertility. Praveena and Rao 2016 analyzed the impact of leachate on the soil physico-chemical properties of a dumpsite in Visakhapatnam India. The leachate from dumpsites contains both chemical and biological components which affect the soil fertility. The biodegradable and non-biodegradable components find their way into the soil strata. The pH and the conductivity of the soil samples were seen to be greatly affected by the dumpsite (Praveena and Rao 2016).

1.5 Effects of improperly managed landfills and open dumpsites on nearby communities and residents

1.5.1 Effect on waste pickers

In developing countries waste pickers operate informally hence, they do not have adequate protective clothing. This has led them to be at high risk of being infected by HIV as a result of handling contaminated hospital waste. Most metal found in dumpsites have been oxidized by oxygen hence they contain rust thus exposing waste pickers to tetanus. Waste in dumpsites especially in developing countries is burnt in the open without using any proper technology hence waste pickers and nearby residents are likely to suffer from respiratory problems due to exposure to smoke. Due to the unhealthy environment, waste pickers who frequently visit dumpsites are likely to suffer from skin and gastric problems (Shanghai Manual – Chapter 5, Ejaz, 2010)

1.6 Effect on surrounding

1.6.1 Odor

Dumpsites emit dangerous and smelly odors smoke that cause illness to people leaving close to the dumpsite. The air that people breathe is greatly affected pollutants from the dumpsite. The air that nearby residents breathe may be contaminated by chemicals which are volatile or those that stick on dust particles hence posing a great risk on

residents. Indoor air of close residents can be contaminated and vegetables can also during photosynthesis. The odor prevail a lot in summer as the higher temperatures speed up the rate of bacterial action on organic and order biodegradable matter (Abul 2010, Maheshwari 2015, European commission 2013).

1.6.2 Rats and other vermin

Waste lying around often attracts rats, flies, mosquitoes and birds that often spread diseases. If these animals and insects are exposed to pathogens that cause diseases such as Diarrhoea, Cholera, skin diseases, respiratory allergies, Malaria, Tuberculosis, they become sources of communicable diseases. Biological vectors such as flies, rodents and insect pest also cause other diseases such as dysentery, worm infection, food poisoning, dengue fever, leptospirosis and bacterial infection (Abul, 2010; Maheshwari, 2015). Rats find habitats in waste generated and disposed in dumpsites. Rats destroy and consume food, spread disease, damage properties and inflict unpleasant bites. (Madzengerere and Chigwenya, 2012)

1.6.3 Toxic Gases

Gases released from dumpsites are main sources of environmental pollution. Volatile organic compounds (VOCs) cause various types of cancer and birth problems. The gases emitted from dumpsites depend on the type of waste present and the stage of waste decomposition. Generally, methane (CH_4), carbon dioxide (CO_2) and nitrogen dioxide (NO_2), sulphur dioxide (SO_2) as well as others are the gases often released. Nitrogen dioxide and sulphur dioxide are sources of acid rain and they are irritants which can affect immune cells. Hydrogen flouride and hydrogen chloride are irritants too which can disrupt the mucosa membrane and affect the respiratory tract. These gases have been found to be carcinogenic hence; waste should be treated and disposed with caution with the health of the surrounding community in mind (Maheshwari, 2015).

1.6.4 Health and Sanitation

Low birth weight and preterm birth has been reported for families living close to the dumpsite hence this proves the dangers of living close to a dumpsite. Other health problems have been reported in literature as being prominent in people living close to dumpsites. They include eye irritation, skin rashes, learning problems, abdominal pain, hypersensitivity, incontinence and seizures found in both the young and adult who live close to dumpsites. Short term and long term health effects on people living close to dumpsites have been reported. The short term health effects include respiratory infection, asthma and congenital anomalies, eye & respiratory irritation, headache, stress, anxiety, dizziness and nausea. Long term effects include cancer, brain, liver, chronic respiratory and cardiovascular and nerves disorder. Breast milk was also seen to be contaminated by dioxins (Abul, 2010, Maheshwari, 2015, Galarpe, 2017). Living close to the dumpsite has a lot of negative impacts on both the environment and

humans. Hence, Masvingo residents living close to the dumpsite are most likely to be exposed to bad living conditions.

2. Study area

Masvingo is the oldest city in Zimbabwe. It was established on the 13th of August in 1890 by the Pioneer Column, a group of white settlers from South Africa (Bulpin, 1968). It is a provincial capital city in Masvingo province. The city is estimated to cover an area of 6 835 hectares.

2.1 Research Methods

This study used both primary and secondary sources of data. Primary data involved field trips to the dumpsite near Runyararo West and Victoria ranch, EMA, Masvingo City Council, and the three close residential areas namely Runyararo West, Garikai and Victoria ranch. Secondary information was derived from various sources such as books, journal articles, online news websites and online newspapers.

2.2 Location of dumpsite

Masvingo's open dumpsite is located about 1,5km from Mucheke township, whilst it's not far from Runyararo West. The dumpsite is directly opposite Victoria Ranch with some houses less than 50 metres away from the open dumpsite. Location of the dumpsite is in line with the prevailing wind direction and it lies only 200m away from a stream which feeds into Mucheke River. Mucheke River drains into Shagashe which feeds into Mutirikwe Dam, Masvingo's main water source. Hence, the site of the dumpsite poses dangers to surface water, ground water, the environment and human health. The dumpsite is the seventh since the existence of Masvingo. The current Masvingo open dumpsite commenced operations in 1996 and is now due for decommissioning. Although the dumpsite expired in 2006, there have been conflicts on a suitable site for a new dumping area. The dumpsite covers an area of 10 000square meters and the distance right round is not fenced. Other facilities at the dumpsite include a non-operational incinerator, a pit for disposal of infectious and hazardous hospital equipment, a wooden shed for employee has since been vandalized and a leachate pond for trapping waste water from the dumpsite

The dumpsite is hardly 200 metres from some houses which could be a potential hazard to the living conditions of residents who live close by. The Masvingo open dumpsite like most dumpsites in Africa is poorly managed (Mapira, 2011; Abul, 2010).

The aim of the study was to determining the effects of the Masvingo open dumpsite on the nearby environment. It also sought to examine the effect of the dumpsite on the health of Victoria Range, Runyararo West and Garikai Residents.

3. Results and Discussion

3.1 Residents view of the location of the dumpsite and their surroundings

A. Victoria Ranch

In Victoria Ranch, residents that live further away from the dumpsite indicated that they were not directly affected by the dumpsite. However, they complained the existence huge numbers of flies during summer seasons. The residents that live directly opposite the dumpsite expressed their dissatisfaction on the location of the dumpsite as they were greatly affected by its existence. The problems that they face include persistant bad odours from the dumpsite, high prevalence of rats, flies during sunny days especially summer seasons as well as high prevalence of mosquitoes during wet seasons. According to the residents there are no health personnel or any of the responsible authorities that ever visit them so as to educate them safety measures to take as they are victims of an unhealthy environment. Some households are less than fifty metres (50m) from the dumpsite and these are most vulnerable. The residents also appreciated the move by the council to frequently cover the waste in 2018 unlike the previous years where the waste would lie idle on the surface for a very long time which resulted in the waste being burnt by scavengers. Some residents complained on the fact that the dumpsite was not protected or fenced hence their children frequently visited the site. This has led to a number of dysentery cases being recorded in children. Most residents living close to the dumpsite would want the council to decommission the dumpsite as soon as possible. Some residents complained of additional living costs as they had to frequently buy insecticides so as to reduce the number of flies in their homes. The residents were also not happy with the fact that they have to keep their windows closed especially in summer to avoid huge numbers of flies in homes. Some complained of the fact that they would hardly stay outside to eat especially during summer due to high numbers of flies. Most of these residents feel the Masvingo city council and EMA are marginalizing them; they would want these two organizations to speed up on commissioning a new dumpsite.

B. Runyararo West

Most residents of Runyararo West suburb are not directly affected by the location of the dumpsite though they live close to the dumpsite. The majority of the people in Runyararo West complained of the smell that usually rises as a result of the burning of the waste at the dumpsite. The residents confirmed that the burning used to be frequently done nearly two to three times a week in 2017.However they have since witnessed a decrease in the frequency of burning waste at the dumpsite. In 2018, the residents have only experienced bad odours during the early hours of the morning at around 2: 00 am less times as compared to 2017. Some residents complained of a lot of flies especially during summer. The flies are said to be existing in high numbers in Runyararo West as opposed to other suburbs like Rujeko which are significantly far away from the dumpsite.

C. Garikai Residents

Garikai residents emphasized the fact that they were not directly affected by the dumpsite however they also complained of bad odours that they frequently experienced in 2017 during the early hours of the morning. As with Runyararo West residents, they also noticed a significant decrease in the bad odours experienced as a result of burning waste at the dumpsite. The high number of flies also gives them problems which they said are likely to cause diseases like cholera, dysentery and typhoid. Of the households sampled non experienced cholera cases however dysentery and typhoid were said to be experienced in some household especially in summer. Residents related the occurrence of such diseases to the poor sanitary conditions at Garikai as there is no adequate water supply and they have no toilets.

4. Measures that are employed to protect the community from the dumpsite effects

According to the residents interviewed, they have not been educated on precaution measures to take on how to survive when living close to the dumpsite.

4.1 What Residents think should be done

Residents want the dumpsite to be decommissioned as soon as possible however; Masvingo city council is currently searching for a new site but have been facing a lot of challenges. However, the council also argues that the dumpsite was commissioned before the residential area was put in place.

4.1.1 Possible solutions

Most developing countries including Zimbabwe still utilize the Conventional waste management system which mainly focuses on waste collection, treatment (composting and incineration) and disposal (landfills). A shift from conventional waste management to an integrated solid waste management (ISWM) system should be done. An Integrated solid waste management (ISWM) is a comprehensive waste prevention, recycling, composting, and disposal programme which promote the protection of human health and the environment. ISWM includes looking at the needs of local residence and conditions so as to select the most appropriate waste management activities for those conditions (Shanghai Manual – Chapter 5)

Table 1: Comparison of the Conventional Waste Management against Integrated Solid Waste Management

Conventional Waste Management	**Integrated Solid Waste Management**
Poor efficiencies which involves a centralized approach leading to poor health condition for residents living close, environmental problems	Combines both centralized and decentralized systems of solid waste management, which efficiently controls pollution of the environment. Environmental pollution control measures include leachate treatment and gas capture systems
Focuses on local authorities and other government ministries whilst neglecting the involvement of all	Promotes multi-stakeholder participation in decision-making and implementation process by

stakeholders. Some important stakeholders include NGOs and the various communities	involving Non-Governmental Organization (NGOs), Community Based Organization (CBOs), rag pickers, private sector, residential and commercial communities with the government
No attention given innovation in the handling of waste and its management in order to create a sustainable waste management system	Promotes innovation and technology development in areas of recycling, waste to energy whilst enhancing green job creation
	Promotes recycling of valuable resources such as plastic, glass, paper and metals, recovery of alternate Promotes recovery of biogas or compost from biodegradable waste
	Strategically planned waste management and green procurement programmes which lead to a more sustainable system whilst promoting economic development

Source: Shanghai Manual – Chapter 5

4.2 Other solutions that can be implemented

Other solutions which can be adopted include:

- Introduce activities that promote the engagement of the public in the participation of solid waste management so as to benefit the residents of suburbs near dumping areas and the rest of Masvingo residents;
- Hold regular meetings with the residents of Masvingo to discuss issues of public service delivery, garbage collection, disposal and recycling;
- Hold periodic public awareness campaigns in order to educate the public on the dangers of solid waste and the benefits of living in a clean sustainable environment where everyone is a responsible citizen. These campaigns also enhance the correction of the attitude of residents on waste management. School children should be educated too on the advantages of an ISWM;
- Encouragement of waste separation at source so as to improve the efficiency of waste management systems.

4.3 Roles of (Environmental Management Agency) EMA in Waste Management

EMA serves as the environmental watchdog for good and sustainable living conditions at both local and national levels. (Mapira, 2011). The Environmental Management Act states that EMA is responsible for regulating, monitoring the collection, treatment as well as the recycling of waste. (Environmental Management Act Chapter 20:27, Section 10). Hence, EMA plays a pivotal role in the maintenance of a sustainable clean environment. In Masvingo EMA is involved in a number of activities that promote the maintenance of a clean sustainable environment. These include facilitating the proper functioning of community based organizations which promote recycling of waste and clean environments. EMA is also promoting clean sustainable environment in schools by facilitating the creation environmental clubs whose roles include promoting a clean

and sustainable environment with an integrated approach to waste management. In addition to this EMA Masvingo also conducts regular cleanup campaigns in Masvingo city and other areas. Recently, there has been an increase in the number of adverts that promote maintaining a clean environment on the national television ZBC (Zimbabwe Broadcasting Cooperation).

4.4 Roles of local authority in controlling plastic waste

Local authorities have the responsibility to collect solid waste, street cleaning services and waste disposal services in urban areas (Urban Councils Act (CAP 29:15)). Together with the municipality By-laws, the local authorities play important roles in promoting a clean sustainable environment.

5. Problems facing the Masvingo City in waste management

A. Poor public education and awareness campaigns

Most of the public is either ignorant or have a bad attitude towards their involvement in waste management practices. Hence, more educational campaigns on the importance of proper waste management are needed. The public needs to be constantly alerted on the fact that waste is their own disadvantage.

B. Poor cooperation between important stakeholders

The levels of co-operation between important stakeholders such as communities, local civil society organizations, councilors and technical personnel in local authorities is to greatly improve so as to come up with an integrated solid waste management systems.

C. Lack of compliance of the community to the existing legislations on management of waste

Members of the public are often seen dumping waste on open spaces and burning waste too. The practices contribute to environmental pollution whilst affecting public health. The public is encouraged to cooperate as poor disposal waste is a danger to everyone including those that live further way from the dumpsite.

D. Difficulties in commissioning site for a new dumpsite

Masvingo City Council has been facing difficulties in acquiring new land for a waste disposal site. The council had been given land by the Ministry of Local Government, Rural and Urban Development for the new site. However, the same land was later sold to someone hence; the council is trying to acquire new land. Masvingo City Council believes acquiring another site will take them a long time (www.zbc.co.zw)

6. Conclusions

Waste management is a problem in most developing countries, affecting almost every city and in most cases high density suburbs. In cities like Masvingo which have seen an increase in population due to rapid urbanization the suburbs have extended to places near the dumpsite. The existence of a residential suburb near a dumpsite poses a lot of

health risks on human life. Due to the high increase in population and the high demand of housing property, people build houses on unauthorized land or near hazardous sites such as dumpsites. In Zimbabwe due to the economic crisis, a lot of local councils and authorities are operating below international standards of waste management hence this poses a lot of risks on the environment and humans. However, the most vulnerable humans are those that live very close to a dumpsite like the Victoria Range residents in Masvingo. Besides financial constraints, some councils like Masvingo have also been facing political challenges in acquiring new land for commissioning a new landfill. Hence, there is need for the government to cooperate with local councils in promoting an integrated approach to waste management so as to promote and provide a healthy living environment to every resident and citizen. Every citizen should be educated on the fact that waste is a danger to everyone hence; hands should be joined in managing waste. Residents should also be educated on the effect of sorting waste at site and the dangers of reckless dumping of huge amounts of waste on the residents who live close to the dumpsite. The council and other relevant stakeholders should try and assist as well as monitor the wellbeing of the residents who live close to the dumpsites. These important stakeholders should also try and follow international standard recommended for the type of waste disposal method they used in a particular city or town so as to provide a healthy living environment to everyone.

About the Author

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