

**A PRELIMINARY APPRAISAL OF A WASTE DUMPSITE IN ZIMBABWE: A CASE OF MUTARE  
DUMPSITE IN MANICALAND PROVINCE**

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**ABSTRACT**

*The study was carried out with the objective to characterize the location and management of the Mutare Dumpsite. Onsite measurements supported by observations and interviews were used as method of data collection. The characterization of the dumpsite included its management plan (security, location, availability of leachate monitoring systems, and weigh bridges), types of waste disposed, and an evaluation of any potential environmental health risks. Waste was collected from residential areas, CBD, and industrial areas. Waste salvagers/scavengers played an important role in waste recycling and reuse. The management plan was poor, inconsistent, and inadequate. Although there was lack of documented evidence, the site posed potential negative environmental impacts, like pollution of air and water, and provided breeding places for disease causing vectors, like flies and mosquitoes, among others. The poor location and management of the site was attributed to lack of financial resources. There is need to actively involve the local people to improve the siting of a new dumpsite, as well as to follow the requirements of the existing environmental laws.*

Key terms: Location Management, Waste Dumpsite, Leachate, Pollution

## **BACKGROUND**

Waste disposal is the throwing away or dumping of unwanted material through land filling on dumpsites, incineration, and composting, among other methods (Miller, 1996:189; Michaels, 2002:14). Dumpsites are pieces of land where waste from households, commercial institutions refuse industries, or litter from the streets is dumped. Attempts towards planned waste disposal can be traced to the Ancient Greek World where disposal was done not less than 1.6 km from the city gates (Hirchorn, 2000: 213). The quality and quantity of waste disposed, however, was biodegradable compared to the environmental risks associated with modern wastes (Uberoi, 2000). This has been worsened over the years with rapid population increase associated with the process of urbanization. The resultant impact of this unchecked process was compounded by the lack of adequate planning, financial power, technology and trained personnel, under payment of municipality workers, and abuse of municipal funds. Thus, waste disposal has become a major environmental problem in urban planning, as most towns and cities in Zimbabwe lack properly designed and engineered dumpsites.

Classical unlined sanitary landfills, like dump sites, are well known to release large amounts of hazardous and otherwise deleterious chemicals to nearby groundwater and the air, via leachate ("garbage juice") and landfill gas. It is known that such releases contain a wide variety of potential carcinogens and potentially toxic chemicals that represent a threat to public health. The presence of waste dumpsites does not mean that the environment is degraded, but they do present a potential pressure on the environment (Khan 2006:9; Moyo, Keefe, and Sill, 1993). Most dumpsites are poorly located beside streams or estuaries with little or no attempt to stop wastes discharging into water. Poorly managed dump sites often smell bad and have problems with vermin related with rats and mice. They may burn spontaneously, are a source of windblown litter, and look unsightly. Some effects of landfills and dumpsites are not easily seen but may include contamination of ground and surface water and the release of greenhouse gases. As the organic matter in waste dumpsites rots, it gives off gases, mainly methane and carbon dioxide (Miller, 1996: 205).

Other problems associated with poorly operated or badly located waste dumpsites include: risks from land instability, illegal dumping of hazardous waste, and poor surface water quality. A well managed and appropriately located modern landfill with leachate collection, impermeable liners, and dumpsite management system is unlikely to have significant adverse effects on the environment. However, the general practice in the developing world is the use of unplanned dumpsites despite the adoption of stringent environmental policies and laws in recent years. On paper, such facilities are to be well planned and monitored and are expected to meet strict environmental criteria. In practice the construction of new landfill sites that meet modern environmental standards is expensive despite the increase of waste disposal costs (Michaels, 2002: 196). The basic waste management accounting terminology seems to suggest a scenario where local authorities are

spending huge financial resources on waste management without providing basic requirements to the residents. It has to be put across to the planners that environmental costs are more complicated and cross cutting than just acquiring equipment to collect and dump waste.

Dumpsites pose health problems because of their attraction of mosquitoes, rats, cockroaches, and flies leading to malaria and cholera outbreaks (Masundire and Sanyanga, 1999). They also alter the edaphic and aquatic environments whose geographical extent is difficult to determine (Masocha, 2001). Leachate produced from decomposing waste percolate into the soil and contaminates surface and ground water sources. In order to correct, the problem there is need to analyze the effectiveness and reliability of waste disposal and to address and analyze the environmental and health threats that have arisen, particularly from unplanned dumpsites. Though sanitary land fills are a better environmental cancer, they are not immune to negative environmental impacts and there are no known provisions from a policy and planning perspective that guarantee the prevention of either air pollution from gaseous emissions or groundwater pollution from liquid emissions (Cairncross, 1992:85; Clark and New, 1999:33).

High levels of technology have been implemented to the management of the generated waste in developed countries, but third world cities are still struggling with waste management. This scenario exposes the existence of a vast field of study in waste management engineering and environmental studies. Thus, the environmental impacts of dump sites have to be explored with a view to find ways of improving their management and to avoid catastrophic outcomes, like pollution and health problems. The garbage usually ends up in streets and people's homes, as there is no security. It is also tempered with by waste collectors (salvagers) or scavenging animals due to poor control of the site. The scavengers play a significant ecological role in the waste recycling process as they reduce the volumes of waste material that could accelerate environmental degradation (Toepfer, 2002:54). In this regard, an appropriate urban waste planning process should consider the continuity of this essential service through giving this ecologically important group more financial resources to incentivize them.

The general picture emerging in southern Africa is one where disposal sites are poorly managed and close to residential homes. Waste disposal issues are highly emotive topics, as disposal costs need to be balanced against environmental impacts. The characterization of dumpsites in terms of management and engineering are very poor. Most dumpsites in Zimbabwe are not by design but rather by taking advantage of excavation pits left by the construction industry or a natural accident that created a depression suitable for waste dumping. There are financial merits to this as no environmental impact assessment reports are compiled and little investment, if any, is done on the sites. A better picture of the waste authorities' behaviour can be best understood through conducting an appraisal of the activities around such environmentally important facilities. Thus, the research

aimed to describe the location, determine the type of waste on the dumpsite, determine the management plan of the dumpsite, and analyze the potential environmental effects of Mutare Dump site.

## **STUDY AREA**

Mutare is the capital of the eastern Province of Manicaland (18° 58'S, 32°38'E) founded in 1897 as a fort about 8 km from the border with Mozambique. The population has been growing fast from 7,500 in 1982 to 11,376 in 1992 to 170,466 in 2002 to the current estimated population of over 250,000 approximately.

Mutare supports a large agricultural base, as it is richly endowed with a wide variety of quality agricultural produce, particularly in fruits and vegetables (including apples, bananas, grapes, oranges, tomatoes, beans, avocados, tea, and coffee). Processing plants, textile industries, and tobacco auction floors have developed and opportunities exist for the establishment of linkages with these industries. Over the past few years, the city has suffered tremendously as a result of the extensive collapse of the country's economy. The city is struggling to maintain a clean environment due to the increase in population and the lack of resources in all their dimensions.

## **METHOD**

The research design was based on a two pronged approach. Onsite description of dumpsite attributes that included location, identifying types of waste disposed, sampling of wastes using 50 kg bags, activities at the site, and profiling of the potential environmental health risks. To give a detailed analysis of the study issue, a second approach that combined document analysis and profiling of people' views through use of interviews both onsite and offsite. This had an effect of effect of projecting a quasi accurate social setting of the dump.

Key informants' interviews with officials from the responsible authorities enabled the evaluation of documents and the general waste management system. Though there are always discrepancies on what are official and the general environmental practices, such interviews helped to identify the constraints the municipality encountered, like rising costs. The technique was used as it is most effective and allows flexibility and a face-to-face interaction with the interviewee as a type of systematic sampling method. One of the greatest advantages of using this method was that most of the questions asked were deliberately kept open-ended to enable the respondents to give answers that accurately represented their opinions, values, needs, and feelings about the dumpsite.

Field observations and measurements were used as an on-site verification mechanism for characterizing the dumpsite location and management aspects and it was carried with the aid of a field observation guide. This provided a full appraisal of the management and design of the dumpsite. The aspects of measurements that were done in the field included measuring slope angles on the highlands flanking the dumpsite, and conducting

estimates of wastes deposited on a daily basis.

## RESULTS

### Description of the Mutare Dumpsite

The Mutare Dumpsite was located within a distance of 100 m from industrial areas and approximately 500m from a medium density residential area. The dumpsite was located on a naturally occurring depression from which Munende Stream drains. The surroundings had also evidence of quarrying activities that were done in the past. The average slope angle from the southern and northern ends were 30 degrees, giving high chances for a fast flow of surface water, particularly during the rain season. The site was densely vegetated, including a variety of deciduous tree species, grasses, and shrubs. The cover had high potential for ground water pollution through leachate as by and large the geological material on its base was generally porous.

The dumpsite was poorly located, as odors wafted into homes and the industries. Though there is no general standard required distance of the location of dumpsites, this situation did not provide a comfortable environment for the residents. There is need to reconsider its siting and its proper maintenance to avoid negative environmental impacts. This supports results reported from Botswana by Sanyanga & Masundire (1999:47) who noted that little attention was given to the management and monitoring dumpsites.

### Types of Waste on the Mutare Dumpsite

The dumpsite encompassed various wastes collected and transported to the dumpsite by municipal vehicles and individuals. Figure 1 shows the estimated quantities in percentages of waste disposed on the Mutare Dumpsite.

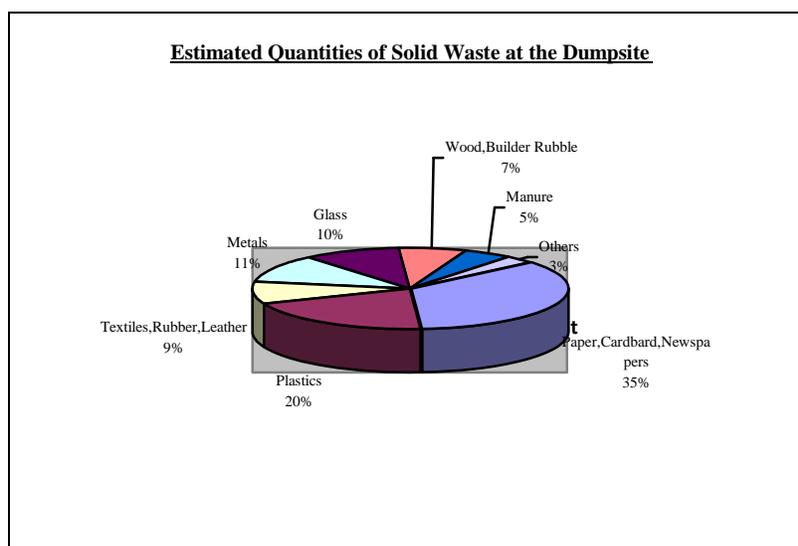


Figure 1: Estimated Quantities of Solid Waste at the Mutare Dumpsite

Approximately 5 tons of co-mingled wastes were dumped on the site on a daily basis. The waste came from three sections of the city; namely residential areas, the Central Business District (CBD), and industrial areas. The mean distance travelled to the dumpsite by a truck was 5 km. Sampling done on the site using a 50kg bag established that paper constituted a large portion of the waste on the dumpsite; 45% paper, 30% plastic, and other wastes constituted 25% of the waste content.

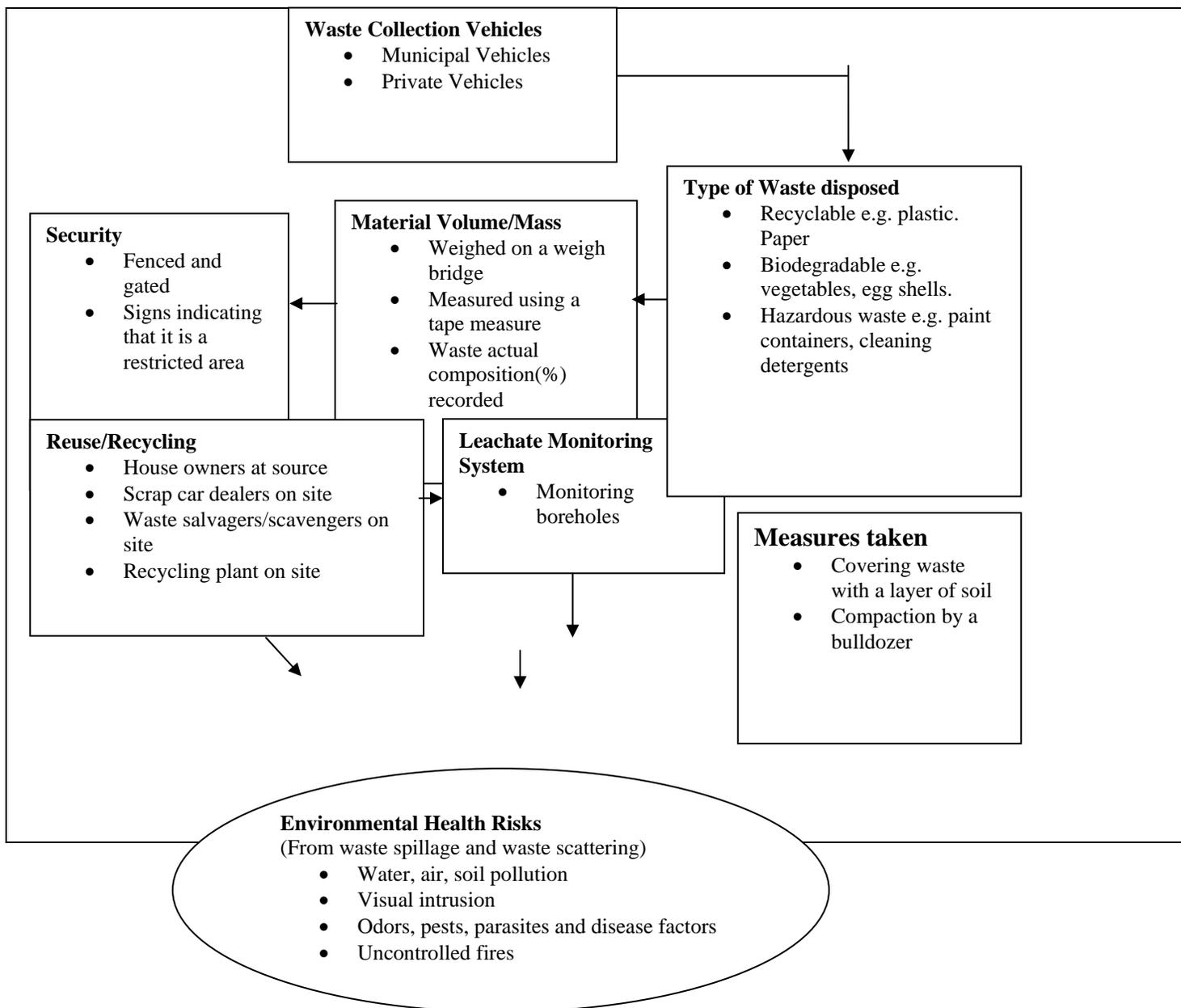
Hazardous waste was not accepted on the dumpsite but there were high chances of it being dumped on the site since they did not account for industrial waste. In addition hazardous waste (paint containers, pesticide containers, cleaning detergents were identified) was collected from residential homes and it constituted about 5% of the waste on the site. This showed the lack of efficient physical control mechanisms for the quantity and quality of waste deposited on the dumpsite. Under strict monitoring the industry has selected the type of wastes that they dump on the site or to carryout primary treatment processes before the waste is added to the municipal wastes. A number of explanations can be proffered for the long life the dumpsite. Firstly, the dumpsite has been in existence for over a century because of the possibility that those quantities of the wastes are washed by the stream that drains the area or because only a fraction of the waste that is generated reaches the dumpsite. Secondly, it could be the positive impact of waste recycling activities or probably the material was highly degradable. Properly and highly maintained dumps have a limit in terms of the capacity of the waste they can sustain and can only last approximately 10 years.

In developed countries, due to technological advancements, the sites are able to cater for every type of waste that is produced and disposed of including hazardous waste from both households and industrial areas (Weiss, 1992:55). Contrary the lack of equipment or the finance for the installation of apparatus in developing countries like Zimbabwe makes it difficult to reduce the adverse impacts of wastes (Vigil, 1998). This is also not attainable on the Mutare Dumpsite and a properly engineered site has to be established immediately to avert related environmental risks.

### **Management of the dumpsite**

Figure 2 summarizes the ideal management plan and environmental risks of dumpsites. The dumpsite did not have a weigh bridge to measure the mass of the waste, thus they resolved to determine waste only by volume, which the workers regarded as easier. A tape measure was used to measure the width, length, breadth of the waste inside the truck. The quantities and qualities of wastes differed with location of the suburb in terms of high densities and low densities. The waste was compacted and covered with soil, but during the time of visit to the site, the caterpillar that was used to perform this function had broken down. The council had no funds or budget to repair it or to hire private companies to do the job. Most of the equipment was in a state of disrepair.

In terms of leachate monitoring, no measures were taken, like installation of monitoring boreholes, as a result the leachate contaminated water sources, like the Munende Stream, that flows into Mozambique. The stream most likely is transporting hazardous wastes into the neighbouring country and potential conflicts could arise on this aspect. Pollution is usually monitored through the drilling of boreholes at specified points around the dumpsite or establishing strict surface water quality monitoring criteria.

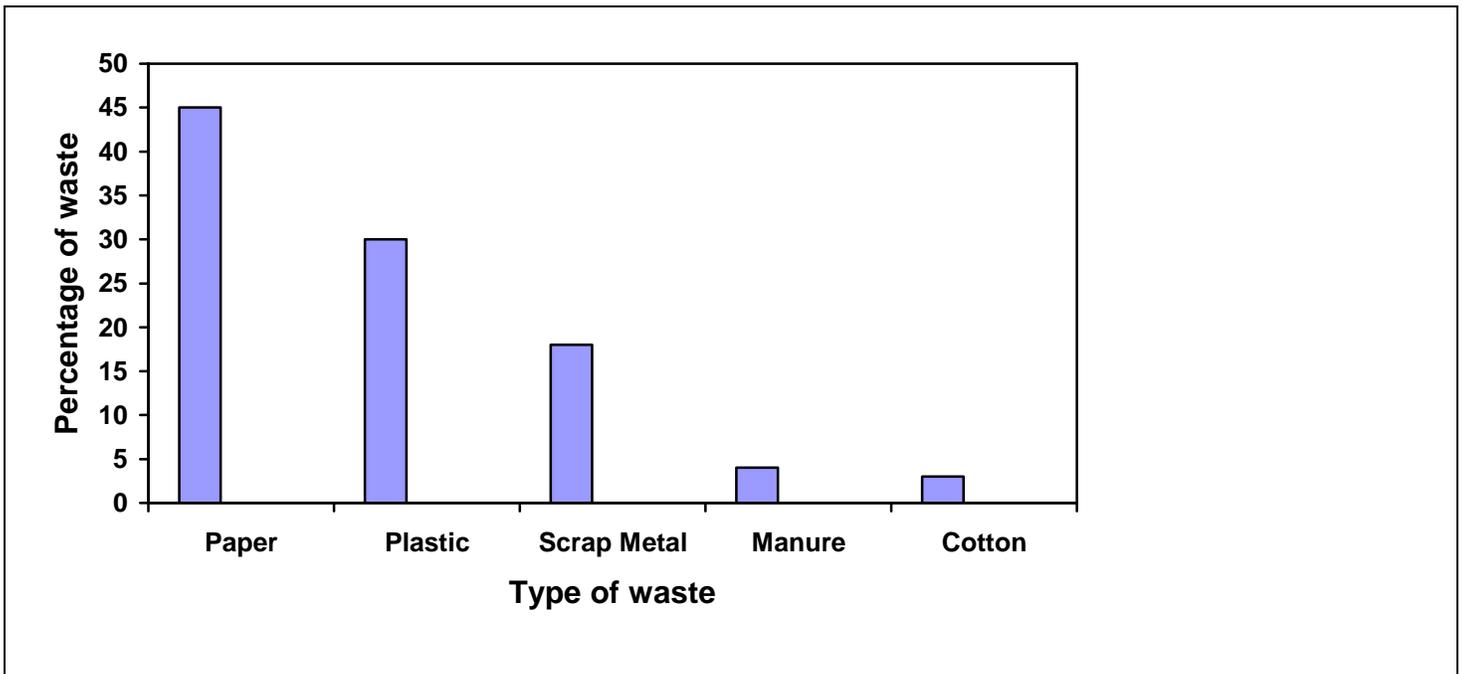


**Figure 2: The Ideal Management Plan and Environmental Health Risks of Dumpsites**

Waste was not burnt on the site to avoid pollution as a result of the smoke produced by burning waste. However, accidental fires were common usually after the disposal of waste with burning charcoals; a minimum of three fires were reported per month. This in turn lit other highly inflammable waste like paper, cotton, plastic, and methane which collected in cans at the site. Fires could also have been intensified by static electricity related with electric wires that pass over the area. There was high potential that these could spark fires.

Waste recycling was carried out by waste salvagers at a monthly fee of Z\$20 million dollars. The Council itself lacked any recycling apparatus, thus it encouraged other groups to recover certain material. At the time of visit to the site, there were only 10 waste collectors and their numbers had been decreasing generated very little to sustain their families. Thus, the rate of collection depended on the willingness of the companies to pay for the material.

Waste salvagers were only permitted to collect one item (for instance, one had to choose whether he/she was interested in collecting paper or plastic among other recyclables). The reason being that monitoring of the waste recovered would be relatively easy. There were no designated containers for placing the recovered material and the paper was placed in heaps all over the site by the waste scavengers/salvagers. Figure 3 shows the estimated percentages of waste collected on the site.



**Figure 3: Estimated Percentage of Waste Collected for Recycling and Reuse**

The municipality failed to properly monitor the site due to inadequate finances and human resources. Most of the municipality property is in a state of neglect making it difficult for the dumpsite management plan duties to be carried out effectively. Sustainable ways of managing the dumpsite have to be employed to reduce adverse

impacts of the disposal sites. There was concern over the lack of proper management apparatus needed for a properly engineered dumpsite.

## **CONCLUSIONS AND POLICY IMPLICATIONS**

### **Location of the Dumpsite**

The location of dumpsites had a strong influence on the cost of operating a waste dumpsite through its convenience to the public and on operational problems associated with sound human and environmental health. Notwithstanding these issues, suitable land may not always be available in the best general location or may not be acceptable to the public. Overall, all aspects of dumpsite location considered, the location of the Mutare Dumpsite was unsuitable. The City Council should involve NGOs, donor agencies and other private organizations to acquire funds for a properly engineered dumpsite. The Municipality should thrive to establish properly engineered landfills with proper Environmental Impact Assessment as stipulated by the environmental management laws of the country.

The quantity of waste disposed on the dumpsite increased over the years, but little was done to develop the site to cater for the increasing amounts of waste (Yap, 1999). The waste disposed on the dumpsite can be grouped into three major categories, that is recyclable waste (waste which can be recycled, like paper and newspapers), biodegradable waste (wet waste of plant and animal origin, like vegetables and meat), and household hazardous waste (materials like paint thinners and pesticides, which are used in homes but are harmful to the environment and human health). Support for the poorer groups in the society, like waste pickers, with technical assistance and advocacy, would promote recycling of waste on site and off with an overall view to minimize wastes. There is need to enhance contribution to problem-solving at the local level by local municipalities and authorities; for example, setting up and supporting primary waste collection schemes.

The dumpsite posed environmental health risks, despite the lack of documented evidence to quantify this aspect. Environmental impacts mainly associated with the dumpsite included bad odours, cholera, and breeding of mosquitoes. The Mutare Dumpsite contaminated the Munende Stream which flowed into Mozambique and, thus, posed potential health effects on the users of the water from the stream. Documented evidence from elsewhere has indicated towards the upsurge of cancers, still births, and asthma, among other factors as a result of the poor location and mismanagement of dumpsites.

The Mutare City Council faced major drawbacks in trying to manage the site. The drawbacks were a result of fuel shortages, lack of equipment (like waste collection vehicles, and weigh bridges) and monitoring of boreholes that were essential for an effective management of a dumpsite.

Overall, it can be noted that solid waste management will continue to be a big problem if measures are not taken now to adequately address it. There is a need to have enforced policies which adequately deal with solid waste management issues. The proper management of waste should not only be the responsibility of local authorities, but communities should also be involved in the collection of recyclable products. Research also confirmed that the budgets for waste management by town and city councils in most developing countries were usually low. As a result, it was difficult to effectively manage solid waste on dumpsites. The lack of knowledge and information about waste source reduction, recycling, and waste management was a serious obstacle to the efforts of urban councils in developing countries, like Zimbabwe, to reduce waste related problems.

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