

ENVIRONMENTAL AND HEALTH IMPACT OF SOLID WASTE DISPOSAL AT MANGWANENI DUMPSITE IN MANZINI: SWAZILAND

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ABSTRACT

Solid waste disposal sites are found on the outskirts of the urban areas, turning into the child sources of contamination due to the incubation and proliferation of flies, mosquitoes, and rodents; that, in turn, are disease transmitters that affect population's health, which has its organic defenses in a formative and creative state. What to do with solid waste has long troubled governments, industries, and individuals.

Therefore, this study was design to determine the effects of the dumpsite on the surrounding human settlement in the Mangwaneni area of the Golf Course dumpsite in Manzini city. The effects that were assessed were the possible impacts of the dumpsite on the health and the environment and also the residents view regarding the location of the dumpsite. Data were collected from 78 household heads, through the use of self-administered questionnaires. Households heads were divided into strata, with 39 nearby (<200m) and 39 far away (>200m) of the Mangwaneni area. In order to achieve its objectives, a comparison between the nearby and far away residents was done. The result shows that both residents were affected by the location of the dumpsite closer to their settlements. It was also noted that the residents whose houses are less then 200 meters from the dumpsite are victims of malaria, chest pains, cholera, and diarrhea. However, residents whose houses are more than 200 meters are also affected with the chest pain and bad smell from the dumpsite, but mainly when wind is blowing in their direction. The study concludes that dumpsites should be located at least 200 meters away from human settlements. Therefore, the study recommends that dumpsites should be properly located and managed to minimize its effects on the environment. The government and municipalities should revise laws regarding the locations of the dumpsites.

Keywords: Environment; Health; Solid Waste Disposal; Golf Course; Location; Dumpsite

INTRODUCTION

Solid waste can be classified into different types, depending on their source; household waste is generally classified as municipal waste; industrial waste as hazardous waste, and biomedical waste or hospital waste as infectious waste. The term "solid waste" means any garbage, refuse, or sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility and other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations (US Law-Solid Waste Act 2, 1999).The term "disposal" means the discharge, deposit, injection, dumping, spilling, leaking, or placing of any solid waste or hazardous waste into or on any land or water so that such solid wastes, hazardous wastes, or any constituent thereof may enter the environment or be emitted into

the air or discharged into any waters, including ground waters, from community activities (US Law-Solid Waste Act 2, 1999).

Solid waste disposal sites are found on the outskirts of the urban areas, turning into the child sources of contamination due to the incubation and proliferation of flies, mosquitoes, and rodents; that, in turn, are disease transmitters that affect population's health, which has its organic defences in a formative and creative state. The said situation produces gastrointestinal, dermatological, respiratory, genetic, and several other kind of infectious diseases. Consequently, dumping sites have a very high economic and social cost in the public health services, and have not yet been estimated by governments, industries, and families.

The group at risk from the unscientific disposal of solid waste include – the population in areas where there is no proper waste disposal method, especially the pre-school children; waste workers; and workers in facilities producing toxic, and infectious material. Other high-risk groups include the population living close to a waste dump and those whose water supply has become contaminated, either due to waste dumping or leakage from landfill sites. Uncollected solid waste also increases risk of injury and infection.

Different Ways of Solid Waste Disposal

The UN Environmental Protection Agency (2006) states that, incineration is the process of destroying waste material by burning it. Incineration is often alternatively named "Energy-from-waste" or "waste-to-energy"; this is misleading as there are other ways of recovering energy from waste that do not involve directly burning it. Incineration is carried out both on a small scale by individuals and on a large scale by industries. It is recognized as a practical method of disposing of hazardous waste materials, such as biological medical waste. Many entities now refer to disposal of wastes by exposure to high temperatures as thermal treatment.

Marshal (1995) states that, waste materials that are organic in nature, such as plant material, food scraps, and paper products, are increasingly being recycled. These materials are put through compost and/or a digestion system to control the biological process to decompose the organic matter and kill pathogens. The resulting stabilized organic material is then recycled as mulch or compost for agricultural or landscaping purposes.

What to do with solid waste has long troubled governments, industries, and individuals but, in recent years, for citizens of the United States and other highly developed, rich nations, solid waste disposal has become a source of galloping trouble. In 1920, the United States cities or towns of public refuse disposal service was responsible for 2.1 pounds of solid waste per day. Then during the 1970s the wiser developed countries began to institute the "polluter pays" principle, in which those who were responsible for environmental degradation were charged with putting it right. This was because there was no proper solution for management of waste (Renzoni, 1994). According to Medina (2002), the major models of disposal of solid waste in the United States are land filling or dumping and incineration. People want their refuse taken away and do not want it disposed of near their habitat, or at least not so they can see or smell it.

However, the European countries have resolved to improving land disposal practices for solid wastes (including sludge), which may reduce the adverse environmental effects of such disposals and other aspects of solid waste disposals on land. This includes means of reducing the harmful environmental effects of earlier and existing landfills, means for restoring areas damaged by such earlier or existing landfills, means for rendering landfills safe for purposes of construction, and other uses and techniques of recovering materials and energy from landfills.

Impact on the Surroundings

The closure of existing open dumpsites and the introduction of sanitary landfill is an urgent priority everywhere in the developing world. Even where complementary disposal technologies, such as composting or incineration (waste to energy plants), are practiced, a landfill is still required and is the backbone of any sustainable disposal system. Matching grants designed to encourage landfill investments and sustainable operations may be an appropriate instrument to consider, primarily because the environmental damages and benefits tend to spill over into neighboring municipalities and regions, or into underlying groundwater resources (Daniel, 1999). This statement is true. The reason simply being because waste in the landfills is not properly managed, this results to the impacts to the environment.

Medina (2002) also supported the US Environmental Protection Agency. He states that pollution is not directly transferred from land to people, except in the case of dusts and direct contact with toxic materials. Pollutants deposited on land usually enter the human body through the medium of contaminated crops, animals, food products, or water. Land pollution can also damage terrestrial ecosystems, resulting in the deterioration of the conservation on and amenity value of the environment.

Impacts on Residents

According to Marshal (1995), open dumpsites are a major problem to the environment, especially on the air that the people inhale. Dumpsites emit obnoxious odours and smoke that cause illness to people living in, around, or closer to them. According to Wrensh (1990) dumpsites maybe a source of airborne chemical contamination via off site migration of gases and the particles and chemicals adhering to dust, especially during the period of active operation of the site. Contamination of soil and groundwater may lead to direct contact or pollution of indoor air **for example** in the case of volatile organic chemicals into basements of nearby residents and in the case of consumption of home grown vegetables **as well**. Wrensh (1990) **further** stated that in some sites, volatile organic chemicals have been detected in odored air of homes nearby dumpsites.

In a number of community health surveys, a wide range of health problems, including respiratory symptoms, irritation of the skin, nose, and eyes, gastrointestinal problems, psychological disorders, and allergies, have been discovered. **A number of** researches have been carried out in response to concerns from the public, often triggered by nuisances caused by emissions of volatile organic compounds. For example, according to Dolk (1997), dump sites closer to residential areas are always feeding places for dogs and cats. These pets, together with rodents, carry diseases with them to nearby homesteads.

The UNEPA (2006) state that wastes that are not properly managed, especially excreta and other liquids and solid wastes from households and the community, are a serious health hazard and could lead to the spreading of diseases. The report further states that unattended wastes lying around attract flies, rats, and other creatures that, in turn, spread diseases. Normally, it is the wet waste that decomposes and releases a bad odor. The bad odor affects the people settled next to the dumpsite, which clearly shows that the dumpsites have serious effects to people settled around or next to them.

Wastes from agriculture and industries can also cause serious health risks. Other than this, co-disposal of industrial hazardous wastes with municipal wastes can expose people to chemical and radioactive hazards. Uncollected solid waste can also obstruct storm water runoff, resulting in the forming of stagnant water bodies that become the breeding ground of disease. Wastes dumped near a water source also cause a contamination of the water body or the ground water source. Direct dumping of untreated wastes in rivers, seas, and lakes, result the accumulation of toxic substances in the food chain through the plants and animals that feed on it (Medina, 2002). This clearly shows how waste disposal seriously affects the health of residents located closer to dumpsites.

The effect of solid waste disposal in African countries faces a great problem. It is imperative to note that Swaziland is planning to address the issue of solid waste disposal. The major problem of Swaziland is that, they are engaging in a long term plan, while damage is increasing every day. The National Solid Waste Management Strategy for Swaziland represents a long-term plan up to year 2010 for addressing key issues, needs, and problems experienced with waste management in Swaziland. The strategy attempts to give effects to the National Environmental Policy, the National Environmental Management Act of 2002, and the Waste Regulations Act of 2000. The focus of the strategy is to move towards a holistic approach in waste management, in line with the internationally accepted principles, but taking into account the specific context of Swaziland, with regard to the institutional and legal framework, as well as land tenure and resource constraints. Integrated waste management, thus, represents a move away from waste management through impact management and remediation to a proactive management system that focuses on waste prevention and minimisation (The National Solid Waste Strategy for Swaziland, 2003).

Dumpsites are known for their smelly and unsightly conditions. These conditions are worse in the summer because of extreme temperatures, which speed up the rate of bacterial action on biodegradable organic material. Most developing countries, like Swaziland, use such dumpsites rather than properly managed and environmentally safe landfills. Lack of capital and poor government policies regarding to wastes contributes to such conditions. There is therefore considerable public concern over the possible effects of dumpsites on the health of people living nearby, particularly those where hazardous waste is dumped.

Most solid wastes are disposed on the land in open dumps. Disposal of solid waste on the land without careful planning and management can present a danger to the environment and the human health. The environment should be clean and less polluted by all means. This means that waste should be managed at all costs to limit its effects to the environment (US Environmental Protection Agency, 2006).

Location of Dumpsites

Mustafa (1993), states that dumping sites are the most common way of disposal of municipal solid wastes in the cities. Generally, they are found on the outskirts of the urban areas, turning into sources of contamination due to the incubation and proliferation of flies, mosquitoes, and rodents. That, in turn are disease transmitters that affect the child population's health, which has its organic defenses in a formative and creative state.

Mustafa (1993) stated that decomposition of organic compounds by micro organisms is a common phenomenon. Most organic materials, such as food, wood products, or other remnants of plants, decay, and finally return to the environment in the form of simple compounds, such as carbon dioxide, water, or ammonia. Surprisingly, it was found that most synthetic organic polymers, including the majority of plastics, are extremely resistant to biodegradation. This phenomenon starts to create significant economical and environmental problems when landfills sites overflow with plastics. According to Najem & Strunk (1994), an increasing number of dumpsites are identified in site assessment conducted by the Californian Integrated Waste Management Board (IWMB).

The location of dumpsites has proved to be a problem to nearby residents in most parts of the world, particularly in Africa. Swaziland is no exception in the problems associated with waste disposal. These include the development of unofficial dumpsites and littering. In cases where there is a dumpsite, it is either unmonitored or creates an unsightly surrounding. For example, a dumpsite in Manzini is poorly managed, yet it is too close to the residential community of Mangwaneni location and other nearby communities. There are homes which are hardly 200 meters away from the dumpsite.

According to Marc (2006), the location of the dumpsites should be properly planned and managed to avoid risks to human health and the environment, at large. Corrective and management measures are likely to be expensive, complex, and pose serious threats to the environment and its habitants. Therefore, this study was design to determining the effects of the dumpsite on the surrounding environment of the peri-urban environment of a golf course dumpsite in Manzini, to examine the possible impacts of the dumpsite on the health of nearby residents, and to determine the resident's views regarding the location of the dumpsite, as well as to determine the main impacts of the dumpsite on the environment.

METHOD AND MATERIALS

Study Area

Swaziland is a landlocked country found in Southern Africa, lying between latitude 25° 39' and 27° 25' south and between longitudes 32° 10' and 31° 48' east (Mbuende, 1997). Swaziland shares a common border with Mozambique in the east and the Republic of South Africa in the west, south and north. The Mangwaneni area is found between latitudes 26° 20' east and 26° 30' south and between longitudes 31° 27' east and 31° 35' south (Swaziland Statistical Office, 1997).

The area is distinctly tropical and is characterized by high summer temperatures and low, but variable, rainfall between September and March. It is one of the hottest areas during the summer. Temperatures of this area are always escalating, which makes the presence of the dumpsite to be felt by the surrounding communities. Average summer temperatures for this region are between 28⁰ C and 33⁰C. This clearly shows that the area is amongst the hottest areas in Swaziland (Mbuendi, 1997).

According to the Swaziland Statistical Office (2007), the area consists of a total population of about 850 people. Most of these people are unemployed and under the poverty line. Means of survival are tough. The population affected by the dumpsite is located at Mangwaneni, which is closer to the Manzini city hence their activities are carried out in town. Manzini offers a number of **social welfare and commercial** services to the people.

Methodology

The study implemented a case study research design. Data for this study were collected from a wide variety of sources to present a description of the phenomenon or the experience from the perspectives of the respondents. Instruments used included a questionnaire guide, an interview guide and a field observation guide. The questionnaire contained both close ended and open ended questions in order to solicit information.

Data collection and sources

Primary data was collected in a golf course at Manzini, from residents of Mangwaneni area because these residents are closer to the dumpsite. Sources of data were the residents of Mangwaneni area who were the part of the sampled population. Secondary data was also used and gathered from **National Census, Library and internet**, as well as waste recycles were also used to acquire information.

Sampling method

The study area consists of a total population of 850 people and 121 households (Swaziland Statistical Office, 2007). A stratified-simple random sampling method was used. Out of 121 households, 78 households (65%) were selected to be part of the study. **65% sample size** was a representative population, which was easy to manage and come up with the good results. This method ensured that there was no biasness in the selection of the population who were part of the sample. This was the case because in order to determine the effect of the dumpsite it was crucial to have two strata (**layers**) of the residents near dumpsite and those residents far from the dumpsite. Moreover, through stratified-simple random sampling every member of the area had an equal chance of being selected to be part of the study. Descriptive statistics were used to analyze the data. Bar graphs, pie charts, and tables were also used to present the data. Narratives were also used to further present the data.

Results and Analysis

Socio-economical profile of the respondents

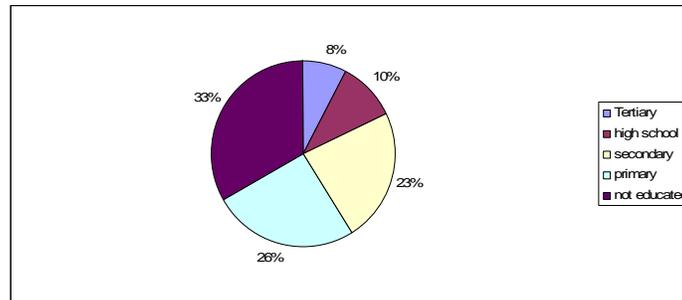


Figure 1: Educational level of respondents

Source: Field work

On the 78 residents interviewed, 62.8% of them were females and only 37.2% of them were males. This shows that there are more females than males at Mangwaneni location. Out of the total respondents, 33% of the respondents were not educated. 26% of them attained a primary school education, 23% a secondary school education, 10% attained a high school education, and only 8% attained tertiary education.

Table 1 reveals that 48.7% of them were not employed, whilst 32.1% were self-employed, and only 19.2% were employed. This means that a majority of the respondents are unemployed, making life difficult for them, resulting to scavenging in the dumpsite.

Table 1: Employment status of respondents

Employment status	Frequency	Percentage
Self employed	25	32.1
Employed	15	19.2
Unemployed	38	48.7
Total	78	100

Source: Field work

Residents view of the location of the dumpsite and their surroundings

The majority of the people, especially those who are located closer to the dumpsite, are not happy about the location of the dumpsite. Residents have complained that the dumpsite is too close to their houses, causing them sickness. They argued that the place is smelly and dirty, which they are against very much. They also argued that the waste from the dumpsite over laps to their house while polluting the environment.

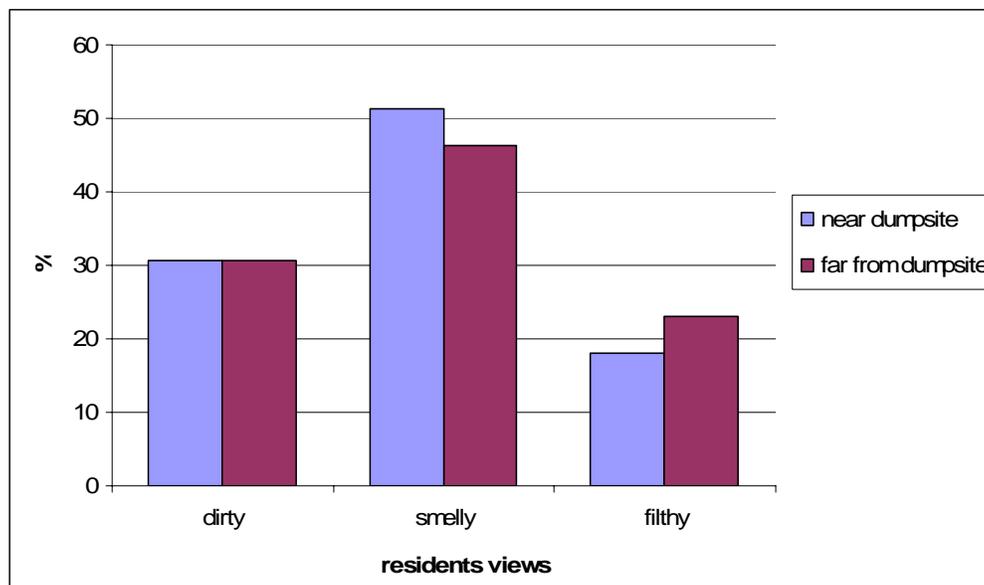


Figure 2: What residents think about the surroundings of their community

Source: Fieldwork

Figure 2 shows that 32%, both near and far, indicated that their environment is dirty, while 52% near dumpsite and 46% far from dumpsite indicated that their environment is smelly, while only 18% near dumpsite and 22% far from dumpsite indicated that the environment is filthy.

Disposal method used by the residents and implications

Table 2 shows that only 5.1% near dumpsite and 20.5% far from dumpsite use skips from city council. 51.3% near dumpsite and 28.2% far from dumpsite use the dumpsite. Finally, 43.6% near dumpsite and 51.3% far from dumpsite use pits in their backyards. Table 3 indicates that 46.2% nearby residents and 41% far away residents are aware of the implications of having a dumpsite nearby their community, while 71.8% nearby residents and 59% of far away residents are not aware of the implications.

Table 2: Disposal methods used by the residents

Disposal method	Near dumpsite		Far from dumpsite	
	Frequency	Percentage	Frequency	Percentage
Skip from city council	2	5.1	8	20.5
The dumpsite	20	51.3	11	28.2
Pit in the backyard	17	43.6	20	51.3
Total	39	100	39	100

Source: Fieldwork

Table 3: Implication of having a dumpsite nearby community

Implication dumpsite	Near dumpsite		Far from dumpsite	
	Frequency	Percentage	Frequency	Percentage
Yes	18	46.2	16	41
No	21	71.8	23	59
Total	39	100	39	100

Source: Fieldwork

The figure 3 shows, that 59% of the responders indicated that the dumpsite is the breeding place for disease vectors, while 29% indicated that the dumpsite causes diseases, and only 12% indicated that the dumpsite makes the place dirty.

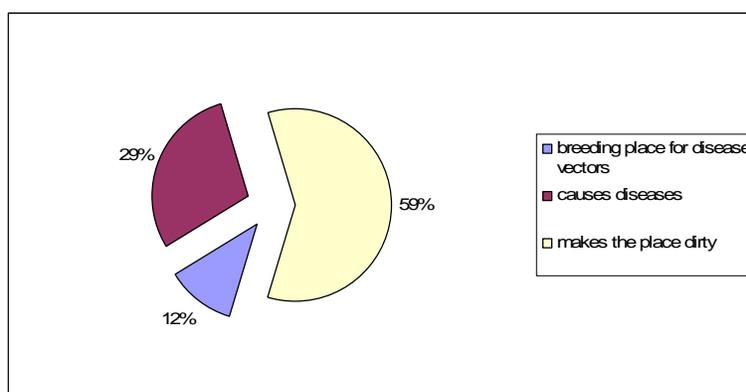


Figure 3: Implications of the dumpsite

Source: Fieldwork

Effect of the location of dumpsite on the health of the community

Figure 4 indicates that 82% of nearby residents and 58% of far away resident's health is affected by the location of the dumpsite. While only 18% of nearby residents and 43% of far away residents think their health is not affected by the location of the dumpsite.

Figure 5 indicates that 36% of nearby residents and 13% of far away residents have suffered from malaria. Also 13% of nearby residents and 26% of far away residents have suffered from chest pains, while 16% of nearby residents and 5% of far away residents have suffered from diarrhea, and 18% of nearby residents and 16% of far away residents have suffered from cholera

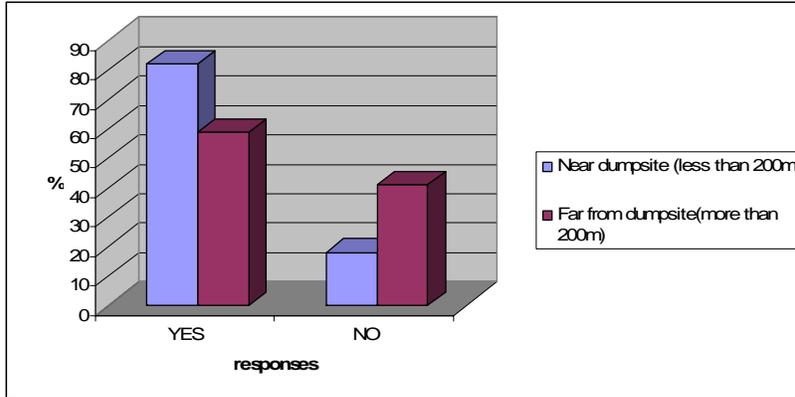


Figure 4: Effect of the location of dumpsite on the health of the community

Source: Fieldwork

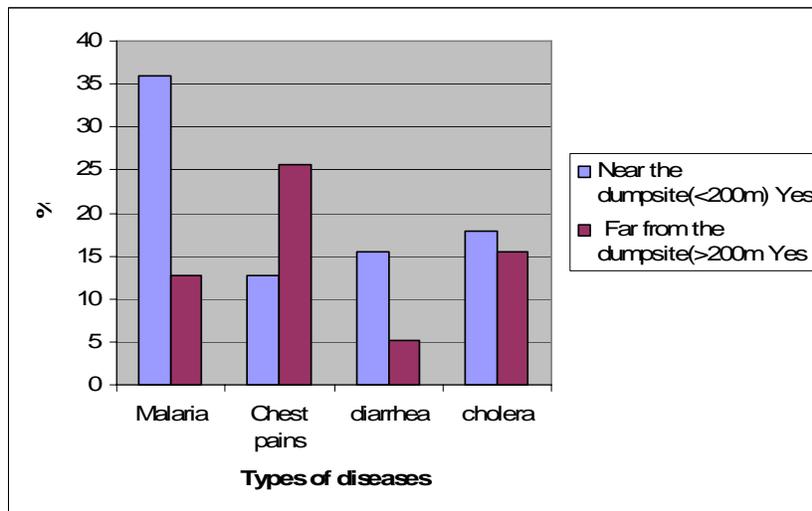


Figure 5: Diseases which have affected the people

Source: Fieldwork

The table 4 indicates that, 71.8% nearby residents and 59% far away residents indicated that they were once hospitalized, while 28.2% nearby of residents and 41% far away residents indicated that they were not hospitalized

Table 4: Incidence of dumpsite related diseases

Response	Near dumpsite		Far from dumpsite	
	Frequency	Percentage	Frequency	Percentage
Yes	28	71.8	23	59
No	11	28.2	16	41
Total	39	100	39	100

Source: Fieldwork

Figure 6 shows that, 44% of nearby residents and 18% of far away residents were hospitalized for malaria, 21% of nearby residents and 50% of far away residents were hospitalized for chest pains, while 16% of nearby residents and 26% of far away residents were hospitalized for diarrhea and only 12% of nearby residents were hospitalized for cholera.

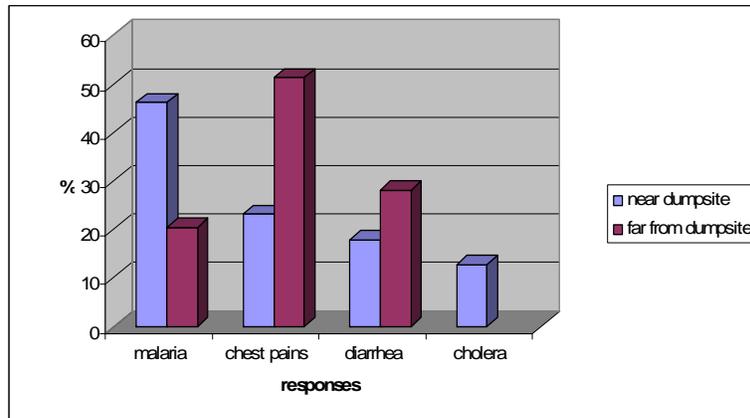


Figure 6: What respondents were hospitalized for

Source: Fieldwork

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

All the respondents indicated that no measures are taken up to make sure that the community, at large, is protected from the dumpsite. Figure 7 indicates that 28% of respondents indicated that pollution is making the environment dirty, while 20% indicated that it adds waste load to the environment. Also, 15% indicated that it causes sickness to people and 37% of the respondents knew nothing.

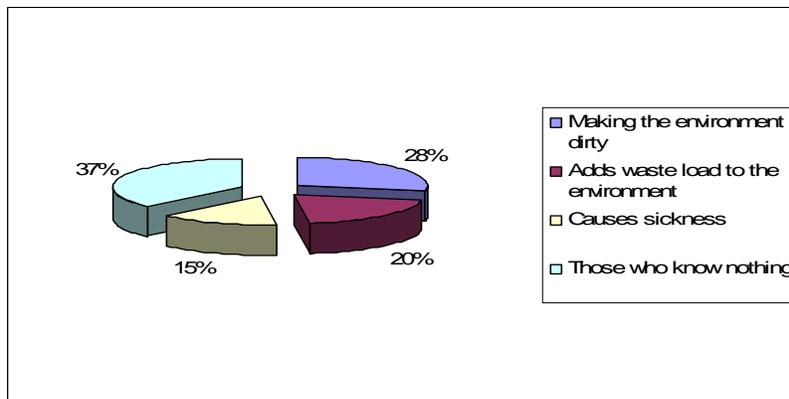


Figure 7: People’s knowledge on pollution

Source: Fieldwork

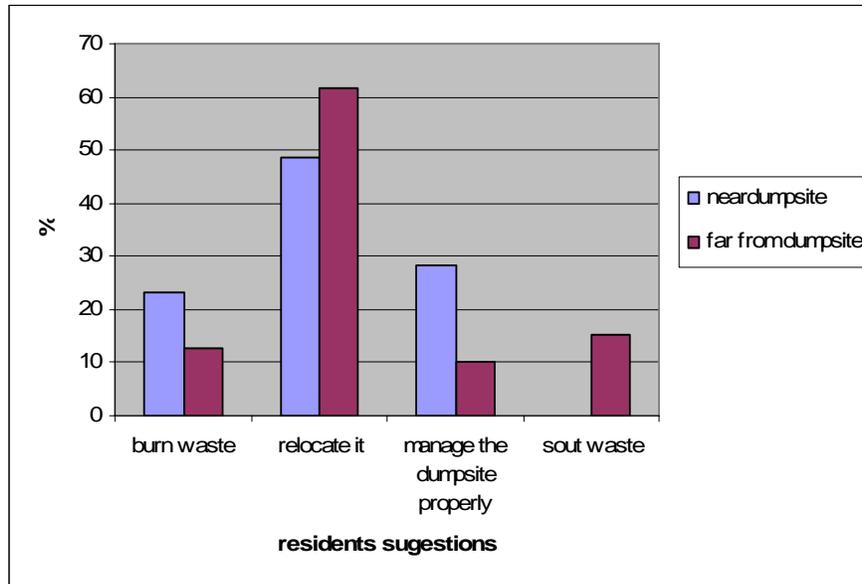


Figure 8: What people think should be done

Source: Fieldwork

Figure 8 indicates that, 24% of nearby residents and 12% of faraway residents indicated that the waste should be burned, 48% of nearby residents and 62% of faraway residents responded that the dumpsite should be relocated, 28% of nearby residents and 10% of faraway residents indicated that the dumpsite should be managed properly and only 16% of faraway residents indicated that waste must be sorted.

Sources and application of cleanliness and waste management

Figure 9 indicates that, 10% of nearby residents and 24% of far away residents got information from school, 56% nearby residents and 50% far away residents got information from the media, and 22% nearby residents and 18% far away residents got information from both the media and the school.

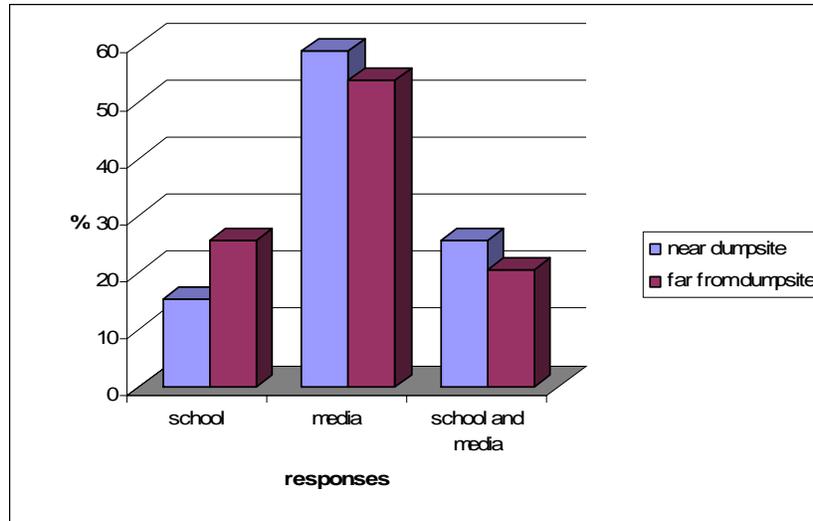


Figure 9: Where respondents get information

Source: Fieldwork

CONCLUSION

The focus of the study was on three factors, which were health, location, and the environment. In order to achieve its objectives, a comparison between the nearby residents and far away residents was very essential. As a result of the comparison, it was noted that both the nearby and far away residents were affected by the location of the dumpsite closer to their settlements. Results obtained proved that as you move away from the dumpsite the impact is not as severely affected as those who are closer to the dumpsite. It was also discovered that residents located less than 200 meters from the dumpsite are most affected by the dumpsite. As a result of the dumpsite, they are victims of malaria, chest pains, cholera, and diarrhoea. However, it was also noted that those who are located more than 200 meters within the dumpsite are also affected by bad smells from the dumpsite, mainly when wind is blowing on their direction. As a result, they complained about chest pains. Modernization and progress has had its share of disadvantages and one of the main aspects of concern is the pollution it is causing to the earth – be it land, air, and water. With increase in the global population and the rising demand for food and other essentials, there has been a rise in the amount of waste being generated daily by each household. This waste is ultimately thrown into municipal waste collection centers from where it is collected by the area municipalities to be further thrown into the landfills and dumps. However, either due to resource crunch or inefficient infrastructure, not all of this waste gets collected and transported to the final dumpsites. If at this stage the management and disposal is improperly done, it can cause serious impacts on health problems to the surrounding environment. Waste that is not properly managed, especially excreta and other liquid and solid waste from households and the community, are a serious health hazard and lead to the spread of infectious diseases.

RECOMMENDATIONS

Dumpsites should be properly located and managed to minimize its effects on the environment. The government and municipalities should revise laws regarding the locations of dumpsites. These laws should include properly managed sites, which are well fenced in and away from human settlements. The government should annex laws which see to it that dumpsites are located properly and if it is not then action should be taken according to the law. There should be a follow up in the functioning of the dumpsites to avoid pollution on the environment and health hazards.

Municipalities should open dumpsites on remote areas with no residents closer to them to avoid the effect of the dumpsite on the nearby residents and monitor the dumpsite properly. They also have to control the litter and monitor their volume. People need to be educated by health motivators about the effects of dumpsites on their health. This will limit the effect of the dumpsite on the residents. There should also be a follow-up to make sure that what they teach the residents is applied.

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