

Management of Municipal Solid Waste in Gwanda Town

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Abstract: Solid waste disposal and management has been both an urban and rural challenge; however this paper focused on management of solid waste in an urban area. The rate at which solid waste was generated has been far higher than the capacity to responsibly manage the solid waste. Solid waste volumes have increased in urban areas due to growing population, concentration of industries, consumption of residents and inadequate finance and facilities to manage waste collection and disposal (NEMA 2007:276). There has been growing consensus that the immediate generators of waste need to join hands with the authorities in dealing with this problem that had far reaching environmental and human health impact. An urban environmental impact assessment was conducted with the view of solid waste generated, management and disposal. Methods of collecting the data that were used were; observation, interviews and questionnaires. The impact of solid waste was investigated and intervention strategies proposed. The findings were that there are factors that lead to lack of sound solid waste management and among those were the economic situation of the day, lack of proper and well managed infrastructure as well as the negative attitudes by residents towards the management of solid waste. The findings of the study showed that the levels of public participation in solid waste management in Gwanda town need to be improved for the good. The roles played by the public in solid waste management in Gwanda town need to be clearly spelled out. The public thoughts of how the solid waste was managed should be looked into and fresh ideas pulled together for better solid waste management in the future.

Keyword: Municipal; Solid Waste; Management of solid waste; Municipal Solid Waste Management

Introduction

Industrial activities in Gwanda town range from cottage industry to commercial industry. It has been a service center where primary, secondary and tertiary industries can be found. Primary industry like meal processing industry, and automobile industry and some other economic activities are found in the town. The town has a number of small scale retail outlets, large market place which can be described as a mixed market place since there are agro-based products sold as well as electronic goods and clothes in the flea market. Gwanda had a population of about 12325 according to the Central statistics Office results of the 1992 census and covers an area of 460 Hectares. It is estimated that Gwanda town produces an average of 4 977.44 cubic meters of solid waste per annum, according to the Department of Solid Waste Management Gwanda (2006). Gwanda also has a large number of gold mines.

The urban area under study was Gwanda town in Matabeleland South Region. The map of the area is shown below. The map of Gwanda shows the divisions of the urban area notably the town center, high density and low density area. It must be noted

that the locality map does not show the detailed parts of each section; however it gave a conceptual view of the area that was studied. Still on the map, on the western part, the Bulawayo-Beitbridge main road can be seen and even the railway route that runs through West Nicholson connecting Bulawayo and Beitbridge. The town center is on the western part on the map just on the left of the railway line.

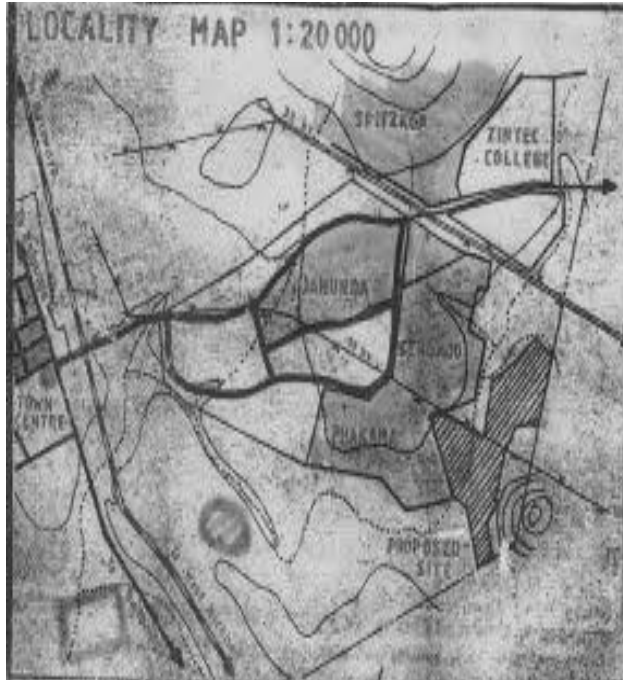


Fig. 1. The Map of Gwanda Urban area

Source: Department of Physical Planning
Matabeleland South Province

The map showing the Municipality of Gwanda and the urban center is on the western part of the map and the low density residential area is on the eastern part. The Gwanda ZINTEC College shown on the map is the old ZINTEC college site. The map is not showing the current developmental changes but it does show the major sites in the town.

Research Contribution

The case study provided valuable lessons about the challenges managing solid waste in Gwanda. It also provided opportunities in promoting and implementing the management of solid waste. It is anticipated that the lessons learned will be important for other municipal governments in Zimbabwe, and for other governments in developing countries who may be experiencing similar challenges in the management of municipal solid wastes.

Significance of the study

This study was significant for a number of reasons. First, from the empirical viewpoint, this study presented findings regarding solid waste management

in an urban area, Gwanda. This research will bridge the gap between the concepts and the empirical practice of the Gwanda municipal solid waste management in particular. Second, from the methodological point of view, this study will provide insights and experiences concerning data collection in Gwanda town. Third, the findings of the study are likely to benefit the Ministry of Tourism, Policy makers and planners and other bodies such as non-governmental organizations who will be looking for ways to enhance efficiency in solid waste management. Fourth, the findings of the study could be used for evaluative purposes, to benefit individual informal sector entrepreneurs and bolster good health. The report will supplement the existing literature and research on the solid waste management by the informal and formal sector. The study will also be used in the development of solid waste management techniques by both the informal and formal sectors. Lastly, the study may also prompt some other scholars to carry out further research in solid waste management in urban areas.

Aims and Objectives

The aim of the study was to establish the people's understanding of management of solid waste in Gwanda urban, the purpose of solid waste management, and the challenges faced by the Municipality of Gwanda in the management of solid waste and to find out how these challenges can be solved

Research Questions

This paper was guided by the following questions

- What do people understand by management of solid waste in Gwanda town?
- What are the purposes of management of solid waste?
- What are the challenges faced when implementing management of solid waste in Gwanda town?
- How can these challenges be solved?

Assumptions

Human activities create solid waste and it has been the way that the waste was handled, stored, collected

and disposed of which posed a risk to human life and even the environment. In the light of rapid urbanization in Zimbabwe, management of solid waste was essential to avert outbreak of diseases. One to two thirds of waste generated was not collected and as a result the uncollected solid waste which may combine with human and animal excreta was indiscriminately dumped in the streets and in drains. This contributed to flooding, breeding of insects, rodent vectors and the spread of diseases. In Gwanda town the uncollected waste was often dumped in uncontrolled dumpsites or burnt leading to various forms of pollution.

What is solid waste?

Solid waste management encompasses all activities put in place to maximize good health, keeping the surrounding looking good in the absence of solid waste. Solid waste is waste that exists in a solid state and may include garbage, refuse or any other rubbish existing in a solid state. Municipal solid waste is waste that is generated in different social structures such as homes, shops, offices, schools as well as hospitals. While different sectors generated solid waste, it now comes to the regional state to take care and manage the solid waste in the town. Solid waste from industries, however the pollutants found their way into municipal area-polluting mainly the streams surface and underground water.

Classification of solid Waste

About 70% of domestic waste was solid waste. Observation in Gwanda town shows the following solid waste: cardboard boxes, canes (various sizes), plastic containers, chemical containers and these are not biodegradable. Biodegradable waste such as leftover food, that which can decay and has a positive impact to the ecosystem since it leads to the formation of humus and formation of acids and this may also include remains of dead animals and human excreta. Human excreta may be as a result of people who decide not to use toilets and also the disposable nappies used for babies and terminal ill people. The disposable nappies cannot be disposed of by flushing in toilets as they may block the flow of sewer but the question was

how best can they be disposed? Municipality solid waste is difficult to characterize because of the diversity of its components, many of which should not be wasted. The objective of solid waste management was to control, collect, and process, utilize and dispose of solid waste in the most economical way that was consistent with the protection of public health and the natural environment.

Understanding of management of solid waste

Waste as a product of human activities. Webster (1994) defined waste as “needles and excessive consumption; deterioration or decay by use, misuse or lack of use; useless or damaged material produced during or left over from manufacturing processes, superfluous matter.” Haight (1994:2) distinguished waste from garbage. In this regard, waste is meant to be, “any residual materials which arise from human activities and which are not considered to be of immediate use,” while garbage is defined as, “any object which has no possible further use.” In this paper, municipal solid wastes referred to the non-hazardous waste generated in municipality area.

The primary source of municipality solid waste in developing countries are households, commercial establishments, markets, institutions and street cleaning (Bebassari et al, 1998; Rushbrook and Finnecey, 1988), hospitals and manufacturing business (Rushbrook and Finnecey, 1988; Muttamara, 1994). The manufacturing industry creates various type of solid waste (Rushbrook and Finnecey, 1988; Muttamara, 1994). The characteristics of Municipal Solid Waste cited frequently were high density, high moisture content, and largely organic, substantial amount of dust and dirt and small particle size in the waste stream (Cointreau, 1984). Many of the organic constituents originated from kitchen waste, vegetable waste, garden trimmings and paper packaging.

Common activities by households involved handling, separation and storage of wastes including depositing waste into storage bins or plastic bags, separation some of the wastes into recyclables and non-recyclables, and selling the recyclables to itinerant buyers or giving them away free to waste pickers.

Historically, itinerant buyers have often bought the recyclables from the householders or battered these materials for food or other consumable products. Itinerant buyers were able to gather cleaner materials than the mixed waste sorted by waste pickers. In Indonesia, for example, itinerant buyers collected materials to dealers, distributors, or small business (Sicular, 1992). Waste pickers in Indonesia regularly visited residents and picked whatever they could find of value as long as the householders allowed them to do so. In some places, however, residents were reluctant to allow waste pickers to enter their premises because of security concerns. Waste pickers used some recovered materials directly and traded the remainder to dealers (Sicular, 1992). In Thailand, as reported by Muttara (1994), waste pickers sometimes sell recovered materials to junk shops. Theoretically, waste handling, separation and storage at source were the chief responsibilities of each waste generator. Separation of waste at the source has been intended to support and promote recycling efforts.

Collection of Solid Waste

Flintoff (1984) described four types of collection systems in developing countries: communal bin, block collection, curbside collection and door to door collection. Communal bin meant that households delivered their waste into a bin located within walking distance. Waste workers then transported the waste to a recycling center or the final disposal sites. With block collection, the collectors or waste workers had a regular schedule of visiting residents. The vehicle came at scheduled times, householders were asked to take their waste to the vehicle. In curbside collection, collectors decided the time of collecting and householders were asked to put their waste outside their houses so that waste workers can retrieve it. In door-to-door, householders were not involved in the collection process since the collectors or waste workers entered the premises and picked up the waste. According to UNCHS (1984), the use of these collection schemes in developing countries have been aired from one city to another.

In Zimbabwe, although schemes of collecting waste varied from one city to another, there were two kinds

of collection: primary and secondary (Indrayana and Silas, 1995). Primary collection involved waste generators collecting their own waste and took it to the nearest temporary disposal site. Secondary collection has been the main responsibility of the municipal cleaning or sanitation department whose primary task was to collect and transport wastes from communal bins or to containers to the final disposal site. The work of waste pickers in Zimbabwe has been unhealthy and is often conducted in hazardous conditions (Maniatis et al, 1987) waste pickers sorted materials with their bare hands and moved from one place in the dump to another with bare feet, making them prone to injuries. They appeared to neglect their own safety. Some suggested that waste picker's activities should be recognized and conducted in a more organized manner (Maniatis et al, 1987). Indrayana and Silas (1995) reported that many non-government organizations had been working in Jakarta and Surabaya and assisted waste pickers so to conduct their activities more effectively and safely.

Methods of collecting data

The study used a descriptive survey design drawing on the cross-sectional study design as explained by Bryman (2004) and also the phonological design as discussed by Blanche et al (2006). Matabeleland South has a number of towns but purposive sampling was used in selecting Gwanda town as it is the capital of Matabeleland South Region. The sampled populations, was one thousand and two hundred and were interviewed using a structured interview instrument. Two hundred other participants were interviewed using a semi-structured interview guide and observation method was also used by the researcher. The observation method used, enabled the researcher to collect data from a natural setting as the environmental audit was conducted, behavior of Gwanda residents regarding solid waste management was captured on a natural setting. Two focus group discussions were held with aspiring private-individual solid waste service providers and three officials from the Gwanda town Solid Waste Management Department were interviewed using a semi-structured interview guide.

Research Contribution

The case study contributed valuable lessons about the challenges and opportunities that promoted the implementation of solid waste management. It is anticipated that the lessons learned will be important to other municipal governments in Zimbabwe, and for other governments in developing countries that experience similar challenges. The study was significant for a number of reasons. First, this paper presented findings on solid waste management in an urban center Gwanda town. The researcher bridged the gap between the concepts and empirical practices of the Gwanda municipal solid waste management. Second, this study provided insights and experiences concerning data collection and waste disposal in Gwanda town. Third, findings of the study were likely to benefit different ministries, policy makers and planners and other bodies such as the non-government organization who would be looking for ways to enhance efficiency in solid waste management. The findings of the study can be used for evaluative purposes, to benefit individuals, inform entrepreneurs and bolster good health in the town. The report supplemented the existing literature in the area of solid waste management.

A model below, was developed that can be used in management of solid was in Gwanda town.

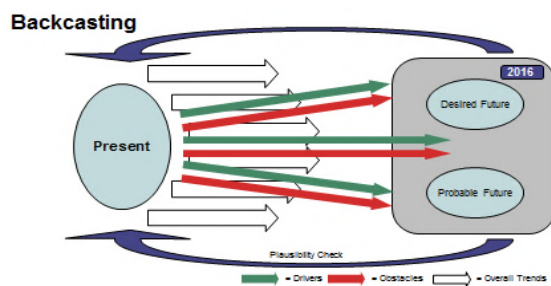


Fig.2. Backcasting model

Source: Dreborg (1996) Backcasting model of sustainable management of solid waste in Gwanda town

Justification of the model

The Backcasting model was ideal in attending to complex and persistent challenges of solid waste management in Gwanda town. It made the powers that be, to look at the dominant trends that contributed to the management of solid waste. In this regard external and internal factors that contributed to the challenge, informed the changes that needed to be adopted. The environmental health was of paramount importance in any town and as a result the Backcasting model looked at the present challenges of managing the solid waste and then focused on what they would want to see in the area of managing the solid waste in Gwanda town. The idea was that the present situation needed to be changed to the state desired, hence the notion of Backcasting. The time frame (2016) made the town council to work towards realizing a goal. The goal reminded the Department of waste management to have a target to achieve and monitor the management of solid in the town.

An audit of the environment was conducted. The current state of the environmental condition as an evaluation feature was likely to inform the town council authorities on what was supposed to be done. The researcher conducted an audit of the environment and observed that the Gwanda urban environment was dirty and likely to contribute towards disease outbreaks. The municipality solid waste was found on undesignated points both in town and in residential areas. The photo next page, showed an undesignated waste dumping sight in Sptzkop residential area in Gwanda. On the background is the Old Gwanda Zintec College This site was now a breeding place for houseflies, mosquitoes as well as cockroaches



Plate 1: Illegal Dumpsite in Spitzkop residential area (Gwanda, April 2015)

Results

The presentation, analysis and discussions were done according to the research questions and objectives of the study. The data was collected from the municipality of Gwanda officers, residents and students through interviews, questionnaires and analysis of documents. Open ended questionnaires and interviews were administered to a sample of one thousand and two hundred respondents as shown on Table 1.

Category	No. of respondents
Health workers	50
Waste collectors	100
Residents	1000
Students	50
Total	1200

Table 1. Nature of sample/Respondents

A total of one thousand questionnaires (1000) were administered to the categories of respondents as shown in Table 1, two hundred respondents, were served with open ended questionnaires to work on and submit for analysis.

The study wanted to find out if the respondents understood what was meant by management of solid waste. From the findings it was therefore clear that the respondents understood the concept of management of solid waste. For instance, one environmentalist pointed out that; proper management of solid waste, lead to a clear and healthy environment which will not put the health of the people in danger. Management of solid waste provided an efficiency in public places cleaning standards because a clean environment was the basis of a health living and can even attract potential investors.

A waste collector described management of solid waste a process that included solid waste reduction, minimizing and an efficient collection and disposal of waste. While the other described management of solid waste as the removal of solid that litters in the town and the residential areas.

A public health officer said, a modern, efficient economically, environmentally and social sustainable solid waste management system was beyond the reach of some developing countries. Yet another respondent emphasized that the highest level of service and maximum benefit was gained when the municipality sees its solid waste management was mandatory realized as well as their responsibilities.

This was further emphasis by another respondent who declared that solid waste management was an act of removing solid waste from the environment rendering it to be clinically clean. The need for proper waste management cannot be over emphasized given the amount of waste generated in Gwanda town. Problems associated with waste in Gwanda's urban included waste collection and waste disposal. It was found that waste disposal was a challenge in most residential areas in Gwanda such as in Spitzkop North Extension and Hlalanikahle housing units because people have already occupied the incomplete houses. This was evident in the remarks made by a head of public works department who pointed out that in most of these residential areas there is no system of waste collection in place. In other residential areas such as Senondo, Phakama and Spitzkop, although refuse bins can be found at certain places within the settlement, refuse collection was

irregular. A resident pointed out that irregular collection of refuse was also experienced in some other residential areas in the town.

The other resident noted that, the method of solid waste collection and disposal in Gwanda town was crude. The crude methods of solid waste collection and disposal referred to by the respondent were the land tipping and burning. A resident in one residential area within the sample claimed that solid waste management challenge stemmed from what has been identified as indiscriminate waste disposal, particularly littering, mostly cans and plastic bags. It was found out that indiscriminate dumping and unsightly stock piling of solid waste seriously polluted the environment in and around residential areas in the town.

A student pointed that indiscriminate littering resulted from what has been dubbed the 'throw away syndrome' where by some perpetrators even cynically claim that they are creating jobs for litter pickers. Another student indicated that, the solid waste was not collected on time because at times in some areas solid waste is collected after a month. By a period of a month the bins will be overflowing and some waste decomposing as a result bad smell produced. Such a long period before collection of solid waste created a suitable breeding ground for houseflies and cockroaches. The delay in the removal of waste from residential areas as well as from commercial sectors contributed towards the disposal of solid waste on undesignated land.

Sicular (1982) pointed out that management of solid waste seek to reduce the problem of waste burning and in some instances it was linked with the problem of bad smells which emanated from the decomposition of waste dumped at those places which ranged from dead animals such as donkeys, dogs and food remains. Furthermore, **Cointreau (1984)** concurred with **Sicular, (1982)** that organic material from households decayed creating bad smell in the residential area. This was supported by **Ghotoh, (1989)** who had the view that management of solid waste was essential because the objective was the creation of a health environment.

The other findings about the Gwanda community was that most traders used containers for throwing in the

generated waste during their business time but was also observed that most households had no dust bins.

Lack of dust bin was a contributing factor regarding the dumping of waste along the streets and in bushes nearby. The dumping of solid waste was observed in most wards in the town. The residents of Gwanda confessed that they do not sort waste as they did not see the need for that. There was no significant **coloration** between location they stay in and waste sorting. Most items that constituted the solid waste in Gwanda were not re-used in any were. They could not even realize that remains of fruits such as banana peelings, remains of cabbages and remains of crops can be re-used as manure. Organic material that can form manure can be encouraged save for those that may fuel the breeding of disease causing vectors, for example houseflies and cockroaches. From the findings, it was clear that the respondents were aware of the purposes of management of solid waste. Two major purposes were identified as creating a health environment and creating employment.

Creating a health environment

From the research findings, one of the purposes identified was that management of solid waste contributed to a clean environment and also created employment to different categories of people. For instance, an environmentalist pointed out that the science in the management of solid waste enabled the local authority to handle refuse collection better than in the past by putting in place the new technologies in the management of solid waste. Exposure to these pollutants has a debilitating effect on the health of the residents which ranged from eye irritation to the infection of the respiratory systems.

The integration of the management of solid waste into all aspects of life was seen as the total involvement of all stakeholders as they all generated waste. Management of solid waste was seen as an inseparable because of the different stakeholders complemented each other in the collection and disposal of solid waste

A common environmental challenge in Gwanda town was that of in adequate collection or non-collection of solid waste. It was estimated that the garbage in urban Gwanda remained uncollected for a long time.

In the case of Gwanda, two thirds of waste from residential and commercial areas remains uncollected (Haight, 1994). Failure to collect solid waste results in residents disposing of the garbage on the streets or on unofficial dumps. The picture below shows solid waste that was not collected in time during the 2015 Easter Holidays. Lack of proper management of solid waste was also observed in Gwanda town. A bin is full and the authorities took long to attend to it. The photo was taken around 09:00 hours (6 April 2015), the time we expected the town council department of solid waste management to have emptied most bins in the town.



Plate 2: An overflowing bin that has been like this throughout Easter holidays, opposite Caltex filling station in Gwanda. This is along the Bulawayo-Beitbridge main road, Gwanda 2015

Where garbage was deposited in the streets, strong smells are usually generated and this attracted flies and rodents which could in turn help to spread infectious diseases. The other environmental challenge that occurred at the neighborhood level related to the location of low income residential areas. In most cases, the only land available to these groups is at the margin of the town, dubbed marginal urban environments. Marginal urban environments are susceptible to negative externalities. Negative externalities included natural or man-made features that made the area unattractive to live in. For

example, Jacaranda high income residential area is serviced with sewer pipes, roads and even water while Hlalanikahle low income residential area has no such facilities which made the waste collectors to have difficulties in providing a service to the area even if they had a will.

An official from Ministry of Health pointed out that, solid waste should not contain faecal matter and urine and the mixing of these materials with household waste should be prohibited by law as these make a significant contribution towards outbreak of infectious diseases. A health worker declared that, the organic fraction of MSW was in an important component at most it was found that because it constituted a sizable fraction of the solid waste in the town collects on the street and has a potential adverse impact upon public health. The other health worker declared that, a major adverse impact uncollected waste, attracted rodents and other vector insects as the waste became food and shelter. The negative impact on environmental quality was the foul odors and unsightliness.

These impacts were not confined merely to the disposal site as they pervaded the area surrounding the site and wherever the wastes were generated, spread or accumulated. Unless an organic waste was properly managed, it resulted in a negative effect to the surrounding until it has completely decomposed the material which was not biodegradable remain on the environment creating a bad site. Uncontrolled or poorly managed intermediate decomposition products polluted the air, soil and finally find its way into bodies of water.

Some respondents declared that, management of solid waste was a move designed to create employment for rapidly increasing population and also a tool to fight the spread of infectious diseases in the towns. Management of solid waste programs were of great importance to any country was created for the development of the whole society and upheld the acceptable health standards. The findings of the study indicated that the purpose of management of solid waste, basically created employment and maintained good health to the residents, in line with MDG 7. A resident was expected to manage solid waste at home

and even in society because homes as they complemented.

Attitudes towards management of solid waste

Respondents had varying attitudes and these were more like perceptions which were positive or negative. However the positive favored the desired outcome while the negative were against the planned action. A waste collector declared that, 'waste collection job was not thought of and was despised and looked down upon.' This impacted negatively on the implementation of waste management policy because it became difficult to convince residents that management of solid waste was important while those who did the job were looked down upon. This was also revealed by an environmentalist who declared that, it was disheartening that a good number of people including those in authority seemed not to take management of solid waste seriously as evidenced by late collection of solid waste from residential areas and even around the town. The supervision of waste collectors and provision of resources for use in the management of solid waste was not effectively put in place by the town authorities.

The health of waste collectors

A medical doctor interviewed pointed out that, studies have shown that a high percentage of workers who handled refuse and individuals who live near or on the disposal sites are infected with diarrhea and other infections of the digestive system. Infections of this kind were likely, at all points where waste was handled and poorly disposed. A waste management officer had the view that, modern ways of managing solid waste have been tried in Gwanda. Most urban areas in the world have resorted to contracting private companies in the management of solid waste and Gwanda town should also do the same if she was concerned about the public health and the quality of the environment.

One responded went on to say, 'a modern solid waste management program can be implemented without having to increase the cost to the public. This was

important as there were known cases where solid waste management costs in some developing countries were high while the quality of the service was low. But if the underlying reasons for these situations were analyzed, then one could have seen that in cases where the waste generators were involved in the management of solid waste, the cost may not be that huge. The other resident pointed out that, the salaries or remunerations associated with solid waste collectors are often lower than those associated with office orderlies. The job seekers are also discouraged from joining the department of waste management because from the look of things there was no reward and the society did not motivate those doing such a job.

Shortage of competent Environmentalist

Many qualified environmentalist left the Gwanda Town Council to escape the worsening economic situation. This brain drain was a major challenge to Gwanda town council as a result the department of solid waste management lack qualified manpower to manage it well. The Department of solid waste management was not the only one affected. Skilled workers left the local authority leaving it operating with inexperienced workers. The other factor leading to ineffectiveness was under-funding from the state budget; high inflation which topped 525.6 percent continued to impact negatively on the quality of service expected. To add on to ineffectiveness was lack of motivation of the staff also contributed to low quality standards being implemented in managing of solid waste.

Solid waste collection was regarded as an area of work for those who cannot cope with traditional academic work. In another study, **Bartone (1991)** suggested that most people associated waste collection with people of low academic achievement. Therefore the attitudes of both officers and residents have to change first before they can ask learners and workers to change. This was illustrated when **Webster (1994)** and **Indrayana and Silaas (1993)** indicated that environmental workers with both theoretical and practical skills were hard to find. The education programs may then need to increase their output with regards to environmental protection. Resistance to management of solid waste at all levels

had a lot to do with lack of ideological orientation to both officers and residents since their task was to implement environmental policy. An executive officer declared that, the economic situation in

Zimbabwe was not conducive for effective management of solid waste because the situation was such that budgets were drawn on daily basis because of the rate at which prizes changed. The town council would needed fuel for the waste collection vehicles as well as spare parts and the prices of these changed overnight which rendered planning difficult. There was lack of support for the management of solid waste; most people seemed not to realize that solid waste management was everyone's responsible.

Shortage of material for collection of solid waste

The shortage of materials was prevalent in the collection of solid waste. For instance, the research found that:

- Material and resources for use were inadequate leading to poor standards in managing solid waste.
- Low morale among officers as a result of poor salaries because of poor amenities in Gwanda Town council has had a negative impact in solid waste management

This was further emphasized by another respondent who declared that, she often ran into problems supervising waste collection. Too often there was a shortage of equipment. The other officer pointed that, a serious shortage of resources for use by both residents and waste collectors was also a factor on low quality service. Consequently waste collectors were reluctant to experiment without any guidelines. They lack confidence in handling an approach and methodology which had not been approved by the superiors, namely the town clerk. A public officer pointed that waste collectors encountered difficulties because of lack of industrial equipment and also lack of basic material which were always be out of stock most of the times and when available they would be expensive for the town council to buy.

The policy formulation process of the first decade after independence was hurried through and also

highly centralized in that, the town council relied on budgets drawn in Harare. The town councils cannot actively plan and execute their plans without approval from central government. Zimbabwe needed to adopt a regional state philosophy so that regions may come up with ways of raising funds to run their projects without having to collect revenue for the central government and in turn request for funding from the central government.

81.9% of the participants' view was that it was not possible for them to reduce the amount of waste they generate. Some felt that by reducing the waste generated that meant reduction in their productivity. A small percent acknowledged that some items that are discarded off as waste can be reused such as metals, empty sacks, plastic containers, polythene bags, empty plastic mineral water containers, paper boxes and empty cooking oil containers and oil jerry cans. The philosophy of re-using can reduce the quantity of the solid waste to be removed to dump site. It was also found out that respondents were divided as some saw the need to sort solid waste before disposal. It was indicated that sorted solid waste would make it easy for those who wanted to reuse or recycle. It was also noted that some participants were willing to face the challenges in implementation of Solid Waste Management policy.

There are several challenges facing the management of solid waste in developing countries included Zimbabwe and they included among others: Service coverage for solid waste collection, technical systems, technical challenges, financial challenges institutional challenges and economic challenges.

Service coverage of Solid Waste Collection

Municipal solid waste collections, in developing countries generally serve only a limited part of the urban population. "the people remaining without waste collection services were usually the low-income population living in per-urban areas," (Flintoff, 1984) one the main reasons was lack of financial resources to cope with increasing amount of waste generated, Sicular (1992:23) says, "inadequate fees charged and insufficient funds from a central municipal budget cannot finance adequate levels of service." however not only financial challenges

affected the availability or sustainability of waste collection service. Operational inefficiency of Management of solid waste services operated by municipalities can be done by contracted companies. "Inefficient organizational procedures or deficient management capacity of the institutions involved as well as the use of inappropriate technologies," (Muttamara 1994)

Technical systems to Solid Waste Management

With regard to technical systems, often the conventional collection approach as developed and used in the industrialized countries was applied in developing countries. As such Haight (1994) says, "The used vehicles were sophisticated, expensive and difficult to operate and maintain thereby often inadequate for the conditions in developing countries." After a short time of operation usually only a small part of the vehicle fleet remains in operation.

Technical Challenges to Solid Waste Management

In most developing countries, there is lack of human resources at both the national and local levels with technical expertise necessary for solid waste management. Many officers in charge of solid waste management, particularly at local level, have little or no technical background or training in environmental engineering or management. Without adequately trained personnel, a project initiated by external consultants could not be continued. Therefore, the development of human resources in the recipient country of external support is essential for the sustainability of the collaborative project.

Another technical challenge in developing countries is lack of overall plans for solid waste management at the local and national levels. As a result, a solid waste technology is often selected without due consideration to its appropriateness in the overall solid waste management system. In some cases, foreign assistance is given to a component of a solid waste management system for which the use of resources may not be most cost-effective. For

instance, Webster (1994) observed that an external support agency provided its support to improve a general disposal site. However, the coverage of solid waste collection service was so low that solid waste generated is dumped at many undesignated sites for example open areas, water channels, streets and so on. As a result, improving the disposal site, although it was not a bad project, had little impact on the overall solid waste management effectiveness. In such a case, the low collection coverage was a bottleneck in the overall solid waste management system in the town.

Research and development activities in solid waste management are often a low priority in developing countries. Indrayana and Silas(1993) "The lack of research and development activities in developing countries leads to the selection of inappropriate technology in terms of the local climate and physical conditions, financial and human resource capabilities and social or cultural acceptability." As a result, the technology selected can never be used, wasting the resources spent and making the project unsustainable.

Several guides in inappropriate solid waste management technologies in developing countries were available in the literature and the selection of technology was based on these guidelines. According to Bebassari, (1998), "...in most cases, these guides must be modified to the local conditions prevailing in the country and therefore local studies are normal still needed." Such studies can be relatively easily incorporated into a collaborative project and to the extent possible should involve local research intuitions.

Possible solutions

From the findings it was clear that the respondents suggested possible solutions to the challenges in implementing management of solid waste. The management of solid waste was given the first opportunity since the health of residents was important.

The Gwanda town council should:

- Revive and build infrastructure suitable for management of solid waste
- Secure equipment and material for the system
- Educate the people to develop correct and positive attitudes towards management of solid waste
- Train manpower for management of solid waste and to provide incentives for waste collectors by categorizing it as a 'scarce skills area'

A respondent declared that, 'the key issue was how society rewards different occupations.' If a waste collector was getting two to three times the minimum wage, everyone will get the message that it was much better to be in that sector, rather than to be an office orderly. This was supported by a senior officer in the mayor's office who pointed out that, 'most developing countries, public sources of finance for management of solid waste usually dominate. Public funding was utilized to finance waste collection and suffers usually from being inadequate especially in countries with limited resources, where solid waste collection has not been considered a priority in national budgets.' It was further emphasized by one respondent who declared that matters related to cost, efficiency and effectiveness of management of solid waste. The second factor was concerning the economies of such scheme, which posed a big challenge in most developing countries. The priorities of town authorities were elsewhere, not in the provision of services to the residents. Collection and final disposal of solid waste was a service that should be provided by the town authorities but what has happened in the town of Gwanda, appeared as if the authorities were not keen to provide the service to the residents.

Water is a basic need but some residential areas in Spitzkop residential area in Gwanda are not connected to water, with those connected some do not have running water more often. Such a situation contributed to faecal solid waste deposited behind bushes. The faecal solid waste becomes a breeding place for houseflies and pathogenic organisms. The non-collection of waste in time lead to the breeding

of insects, rodents and other vectors that may contribute to the outbreak of diseases such as **cholera**, and **malaria**. Waste was often disposed of in uncontrolled dumpsites and at times burnt, polluting the air and the quality of physical space deteriorated. The land, water and air loaded with pollutants.

Resource Recovery and Recycling

The philosophy of resource recovery and recycling was impacted negatively by the high cost of separating the material, the purity of what has been separated, the quantity and location.

Advantages of resource Recovery and Recycling

- Reduced costs of disposal facilities
- Prolonged the land fill site's life span
- Reduced the negative environmental impact that may be caused by the solid waste.

Indiscriminate disposal of solid waste

Indiscriminate disposal of waste was an uneconomical use of space. It allowed free access to waste pickers. Animals, flies and often the production of unpleasant and hazardous smoke from slow burning refuse. Financial and institutional constraints were the main reasons for inadequate disposal of solid waste.

People were not concerned with solid waste disposal; 'out of sight out of mind' principle was used by people. Rapid urbanization, settlements and housing encircled the existing dumps. Sitting landfills at greater distances to the central collection areas implied higher transfer cost, additional investments in the infrastructure of roads. Factors that influenced management of solid waste in Gwanda were the waste amount, composition of solid waste, awareness, attitudes of the residents, institutions and the legislature. In some cases solid waste was found to be loaded with sand, ash, dust stones and even human excreta. The human excreta were contributed by use of disposable nappies on babies and adults, who due to illness may no-longer, are able to control their excretory systems. What made these to be part of the

solid waste in the municipality area was because they cannot be flushed in type of toilets in urban areas as they blocked the flow of the sewer. The challenge was likely to emanate from the nature of solid waste with high density which may call for a suitable mode of transportation. It was also observed that solid waste that had high moisture content could not be incinerated because of its low ability to burn.

The attitude of the residents towards management of solid waste was found to impact negatively of the management of solid waste. Willingness to take part in waste management was not supported by the residents. The community had a culture of littering that also militated against the municipality efforts. It was observed that the Gwanda town council had not engaged the private sector in the management of solid waste however it was noted that in other countries private companies are involved in the management solid waste. The integrated model of solid waste management was recommended for the town of Gwanda as it could influence the change in attitude of residents towards the management of solid waste. The general principle that could effectively be used in Gwanda town was based on the principle of reduce, reuse, recycle, recover process and land fill. The outlined methods were also used in other countries with the land fill system being the most common method of managing the solid waste.

Recommendations

The paper made the following suggestions to the Gwanda Town Council:

- Sensitization of the public on solid waste reduction, reuse, recycling and composting before disposing the waste.
- Privatization of the service to start with dialoguing between the public and the authorities may show positive outcomes in the town
- Initiations and promoters of MSW should approach the municipality of Gwanda and establish a cooperative network of partnerships of stakeholders.
- The government needs to have a clear-cut policy on management of solid waste. A policy which will define the role of administrators and town authority in the implementation of management of solid waste.

- Proper funding by government should be put in place so to reduce the current shortages in provision of services and resources.
- It is imperative that there be an acceptable degree of decentralization of administrative roles. This process will ensure that decisions are taken promptly on the spot in the town and at regional level hence speeding up the implementation of management of solid waste.

Conclusion

The implementation of management of solid waste has been constrained in Gwanda town by inadequate expertise, inadequate funds, inadequate equipment, and lack of political will, limited public support and participation. Institutional weakness was especially acute at the level of local authority and agencies that were responsible for monitoring and enforcement. These agencies usually had low status in the bureaucracy; had adequate powers and lack staff with appropriate skills and technology.

A multiplicity of actors at national and regional sector agencies, state or provincial governments and local governments with overlapping, uncoordinated or poorly defined responsibilities aggravated institutional weaknesses. As such that hampered the development and implementation of a broader management of solid waste. To design and implement effective solid waste management, strategies, national, state and local institutions in most, if not all towns in developing countries required substantial institutional strengthening in terms of human resources, organization structure and financial resources. The findings of the study reflected that local authority lacked in resources that can be used in the management of solid waste in Gwanda town.

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