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Household Perceptions on Solid Waste Management Practices in Developing Countries: The Experience of the Northern Part of Botswana, Donga Area

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Abstract: Unsustainable urbanization, population growth and changes in lifestyles contribute to increasing per capita domestic waste generation in Botswana which has resulted in poor environmental conditions in urban centres in the country. Solid waste disposal, in particular has become a daunting task for the local authorities who seem to lack the capacity to tackle the mounting waste situation. The matter of solid waste and its management in Botswana has catapulted itself into the limelight in the past decades during which a number of issues plagued the Solid Waste Management (SWM) sector. This abysmal situation of solid waste is perpetuated by the fact that in some instances hazardous and non hazardous wastes are still handled and disposed together without progressive proper segregation of wastes, thus creating a great health risk to municipal workers, the public and the environment. Despite the magnitude of the problem, practices, capacities and policies in solid waste are inadequate and require intensification in the country. The study investigates the nature of the solid waste problem in the city of Francistown, Donga Area, Botswana. It describes the waste situation in the Donga Area and identifies the causes of the problem from the perspective of the householders. The delivery of solid waste collection services across different socio-economic groups of the urban population is comprehensively examined. For empirical investigation, a qualitative approach was adopted to capture perceptions based on the specific conditions of householders, their awareness and needs together with observational and documentary data in the city of Francistown, Donga Area. The key issues identified by the study include that Botswana urban centres are experiencing worsening solid waste situation but the local authorities lack capacities in terms of logistical arrangements to cope with the situation while several causes of the urban waste crisis can be identified, lack of awareness and public education and political commitment are the root causes of worsening solid waste situation in Botswana towns and the two cities and that social and environmental injustices are being perpetuated against the poor in the delivery of waste collection services. Based on these findings from household perceptions, it has been argued that the solution to the worsening environmental conditions in most of the towns and the two cities in Botswana lies with the prioritization of urban environmental management, creation of awareness and commitment of Botswana's political leadership to sustainable urban settlement development and integrated solid waste management.

Key words: Solid waste management, sustainable urban development and disposal, household perceptions, Donga Area, Botswana

INTRODUCTION

Botswana has several initiatives which are as result of a comprehensive solid waste project that have been undertaken coming from a background where the country had no proper deliberately planned sanitation policies to regulate and guide the disposal and reticulation of waste (Kgathi and Bolaane, 2001). Throughout Botswana there has been an increase in the amount of waste generated at household level yet there has not been the requisite collection and disposal services, let alone an effective waste management strategy to meet the rising challenge. The increasing quantity of solid urban waste is one of the most serious environmental problems. Thus, >70% appear

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Table 1: Waste collected in landfill sites in selected parts of Botswana (CSO, 2001)

Towns/Cities	No. of official landfill sites	Estimated population (1996)	Estimated waste disposed (m^3/a)
Gaborone	1	174,583	75,6750
Lobatse	1	29,172	92,080
Francistown	1	84,074	66,750
Selibe Phikwe	1	44,581	101,400
Orapa	1	10,023	20,620
Jwaneng	1	14,212	2,610
Sowa	1	2,992	10,400

to be disposed at landfills, stored or are dumped indiscriminately into the environment. Table 1 shows that there is a relationship between settlement size and the amount of waste generated.

Solid waste can be defined as rest products, services consumption and processing activities and all other substances people want to do away with (Eberg, 1997). The generation of waste is greatly affected by the country's development. Generally, the more economically prosperous a country is the more waste is generated per capita (Hoorweg and Laura, 1999). It has been noted that while developed countries have generally overcome the problem of waste accumulation and now grapple with finding appropriate methods of treatment and disposal, developing country cities are still grappling with the basic problem of waste accumulation as well as its disposal (Makinde, 2005). The main problems facing developing country cities with regard to waste management are related to the collection of waste from the city environments where segregation of waste is not adequately adhered to while other waste generated in the cities remain uncollected (Gwebu, 2003). Examples abound of inadequacies in the provision of waste collection and other environmental services in developing country cities (Baabereyir, 2009). In the African continent, the problem of waste management has become intractable and threatens to undermine the efforts of most city authorities. In most countries, the city environment is characterised by heaps of garbage, overflowing waste containers, chocked drains, clogged streams and stinking gutters (Kironde, 1999). Hardoy *et al.* (2001) aptly describe the situation environment in the third world urban environment as among the most health and life threatening of all human environment (Hardoy *et al.*, 2001).

The inability to provide adequate waste disposal and other environmental services within their jurisdictions is perpetuated by the fact that in most of the developing countries, city authorities tend to concentrate their waste collection efforts in wealthy and official areas while the poorer areas receive unsatisfactory or no service removal even though waste collection operations are usually funded with public resources (Lohse, 2003).

Consequently, inadequate provision of disposal services in the neighbourhoods of the poor and other vulnerable groups implies shifting the environmental burdens on the poor. This situation leads to spatial concentration of environmental problems In the poor enclave cities (Elliot, 2006) thereby helping to create a situation in which the urban poor face multiple burdens, living in unhealthy local environments characterised by a complex of interrelated risks involving overcrowding, sanitary hazards, unsafe or insufficient water, indoor air pollution, accumulation of waste and disease bearing pests (Hardoy *et al.*, 2001; McGranahan and Satterthwaite, 2002; Elliot, 2006). Hence, this presents a mammoth task to the municipalities and the community when the solid waste is not properly managed.

Solid waste management: Solid waste management encompasses the functions of collection, transfer, resource recovery, recycling and treatment (Schubeller *et al.*, 1996). Hence, the primary target of solid waste management is to protect the health of the population, promote environmental quality, develop sustainability and provide support to economic productivity (Schubeller *et al.*, 1996). To meet these goals, sustainable solid waste management systems must be embraced fully by local authorities and adopt a multi-stakeholder approach which inclusively combines partnership between the public and private sector to brazen out the abysmal solid waste situation (Gogra *et al.*, 2010). While in developing countries, the quantity of solid waste generated in urban areas is low compared to industrialized countries (Baabereyir, 2009), the Integrated Solid Waste Management (ISWM) still remains inadequate.

In Botswana, the local authorities are charged with the responsibility of collecting and disposing of solid and liquid municipal wastes within their areas of jurisdiction. Thus, centr alized solid waste management systems are used by most local authorities to collect and dispose of solid waste in the urban centres in the country. Over the years, the Government of Botswana has shown its commitment to proper waste management by establishing the Department of Waste Management and Pollution Control (DWMPC) formerly the Department of Sanitation and Waste Management (DSWM), to facilitate and coordinate waste management issues in the country as well as consolidate the initial achievements by relevant stakeholders in the waste management sector. The mandate of the department is to minimize waste; maximize environmentally sound waste management of refuse and recycling and promote environmentally sound waste disposal and treatment (Republic of Botswana, 1998).

However, the day to day operation of waste management issues which includes collection is the responsibility of each local authority in the urban centres in the country. The DWMPC provides technical advice to the local authorities to enable them to provide services to the nation (Republic of Botswana, 1998).

The final disposal of solid waste is an issue of major concern in Botswana's urban centres. For the past years, traditional means of solid waste disposal in Botswana's urban centres has been the communal dumping ground or waste burials which did not meet environmentally safe Municipal Solid Waste (MSW) disposal levels because of inadequate sanitary landfills (NCSA, 1996). In neighbourhoods such as Donga Area residents usually have communal waste dumps located on the outskirts of the city where householders carry their waste disposal. These unsafe methods of solid waste disposal lack proper environmental pollution control and monitoring (Segosebe and Vanderpost, 1991; Kgosiesele and Zhaohui, 2010; Khupe, 1996). Therefore, with the introduction of modern waste management systems whereby waste can now be transported to landfills far from the points of generation, the city authorities in the country have officially closed the communal waste dumps and major dumping sites (National Co-ordinating Strategy Agency/Deutsche Gesellschaft fur Technische Zusammenarbeit, NSCA/GTZ, 1996). Currently, the waste disposal facilities in most urban centres in Botswana are landfills which are generally poorly maintained (Gwebu, 2003). Hence, the disposal of solid waste in the city of Francistown, Donga Area occurs in a poorly maintained landfill with severe environmental effects in the host communities.

Solid waste management in the urban economy of third world cities: The African continent is experiencing tremendous urbanization growth rate, estimated at 4% per annum (De Botero, 1991). Research suggests that there is a positive relationship between urbanization and economic development (Kgahti and Bolaane, 2001; Kgosiesele and Zhaohui, 2010; Khupe, 1996). Hence, this is assumed to translate to the rapid increase in the amount of solid generated as there is a positive correlation between incomes and the generation of municipal solid waste. Moreover, issues of inadequate waste collection and disposal poses serious environmental problems at the neighbourhood level in most third world cities. This refers particularly to the inadequate removal of wastewater and excreta. In most third world cities, the number of houses with sewage connection as well as solid waste collection services is limited (Baabereyir, 2009) and a neighbourhood such as Donga area is no exception. A common environmental problem in neighbourhoods like Donga area is the inadequate collection or non-collection of solid waste. Thus, failure to collect solid waste results from residents disposing of the waste on the streets or in unofficial dumps. This tends to influence the abysmal solid waste situation which threatens environmental quality and quality to life of the inhabitants (Molebatsi *et al*., 1998). In addition, garbage deposited in the streets, produce strong pungent smells which could attract flies and rodents which could in turn help the spread of diseases.

In Botswana the worsening solid waste management leads to deplorable environmental and public health conditions, especially in rapidly expanding urban centres which lack appropriate waste management systems (Gwebu, 2003). Firstly, low institutional capacity for urban management, poor physical planning and the lack of enforcement of regulatory frameworks, poor provision of infrastructure and services for environmental maintenance and low public awareness of environmental hygiene which militate against poor environmental conditions in the urban centres in the country. Secondly, the lack of institutional capacity to plan and manage urban settlements and to confront the challenges that accompany urbanization is also a major contributor to the chaotic urban development and poor environmental conditions in most urban centres in Botswana which will ultimately affect public health and the environment (Gwebu, 2003).

It is evident that the abysmal situation of solid waste is a particularly worrying issue that seems to overwhelm the authorities in the urban centres in Botswana (Toteng, 2001). In fact, the problem appears intractable and threatens public health and the environment. Against this situation of mounting waste production, local authorities in the country seem unable to organise adequate collection and safe disposal of waste within their jurisdictions. As a result, urban centres in the country are saddled with managing domestic solid waste.

In this study, researchers attempt to provide an overview of the solid waste management and the different perceptions on the causes of solid problem in the Northern part of Botswana, city of Francistown, Donga area as well as to evaluate the responsibility of local authorities and civil society in solid waste management.

Solid waste management strategy: Waste management is defined as the systematic control of all unwanted by-products from human activities which can compromise environmental sustainability and sustainable society (Chaerul *et al*., 2008). Thus, policy design and formulation should ultimately reduce the amount of hazardous wastes

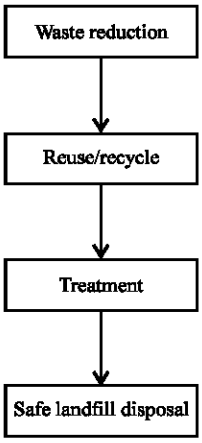

Fig. 1: The 3R's Model

being dumped indiscriminately in open dumps, drains and backyards causing severe environmental consequences and public health implications.

The Environmentally Sound Management (ESM) should encompass the declaration of product content, reduction of consumption of goods and services, increased recycling and re-use, segregation of solid waste at source and optimization of the sorted waste materials (Kgathi and Bolaane, 2001). Clear regulatory measures such as public environmental education and economic instruments of property rates, service levy and sanitation fees could also be adopted as practicable steps to ensure that solid waste or other wastes are managed in a manner which will protect human health and the environment against the adverse effects which may result from such wastes.

Therefore, in many developing countries where there is lax enforcement of environmental standards and regulations, the throw away syndrome contributes significantly to the abysmal situation of solid waste (Baabereyir, 2009). As a result, internationally accepted conceptual framework of the 3R's Model for solid management should be adopted in the form of the following hierarchy (Rankokwane and Gwebu, 2006). These controls of the 3R's Model are the principal foundation through which other solid waste management tools are constructed (Fig. 1).

MATERIALS AND METHODS

This study is an outcome of the study conducted in the Northern part of Botswana, city of Francistown, Donga area. Households played a key role in the context of this study. In this study, the area was stratified into two blocks, Donga North and Donga South as representative samples to promulgate the solid waste situation, the perceptions of the causes of solid waste problem and future waste management challenges in the country. The survey requested householders who participated in the study to indicate their waste disposal arrangements and mainly through quantitative research. On the other hand, qualitative research was used to derive information on: waste disposal collection and disposal status and problems; perceptions on the causes of solid waste problem and ways to alleviate the abysmal solid waste situation. Additionally, photographs were captured during field observations to demonstrate the abysmal solid waste situation in the area such as overfilling dustbins and skips. They were taken to buttress the primary data collected from the residents.

RESULTS AND DISCUSSION

Rapid urbanisation over the past decades has resulted in population concentration and high densities localities in the city, thereby increasing pressure on urban infrastructure and services. Thus, the demand for environmental services such as waste collection and disposal has increased tremendously (Kgosiesele and Zhaohui, 2010; Khupe, 1996). Against this situation, city authorities in the city of Francistown have not been able to keep pace with the growing waste disposal needs of the population especially in high density areas such as Donga area.

Household waste disposal arrangements: The question of collection and disposal services was posed to the householders to gather information on the waste disposal arrangements in the study area which include house to house collection, roadside collection, truck visits and central container collection. In both Donga North and Donga South, twelve households representing a little >24% of the sample of 50 indicated that they had home collection while 8 households (16%) had roadside collection. Respondents from 9 households (nearly 18%) also indicated that they kept their waste in the home until a waste truck visited their neighbourhood or employed the services of informal private collectors whenever the waste trucks failed to come for a long time. Of the remaining 17 households in the survey, a further 34% disposed of their waste in central containers located within their communities (Table 2). Therefore, in the developing country city context, there is a call for authorities to increase their capacities for waste collection and disposal to avoid large quantities being dumped in open drains, sewers, street corners, etc. Thus, this increased capacity can effectively remedy situation.

Table 2: Waste collection and disposal arrangement

How waste is removed	Number	Percentage
Home collection	12	24
Roadside collection	8	16
Central container	17	34
Waste dump	6	12
Other	9	18

Fig. 2: Waste dumped on the backyard and an overflowing skip

Existing waste situation: This suburban area is mainly characterized by dense population which requires appropriate and safe Solid Waste Management (SWM) to create a healthy environment for the population. But the municipality in the area is hardly capable of providing adequate collection and disposal services, especially for the poor. Due to inadequate collection and disposal services, focus has shifted towards the Central Business Districts (CBDs) and the more affluent communities. The local residents were agitated by the irregular collection and disposal and failure to provide prompt collection services in their locality. This confirms the unfairness in the provision of waste disposal services in different residential communities. From Fig. 2, it is evident that the local authorities are not operating at full capacity in providing adequate collection services of solid waste in the area.

Uncollected solid waste tends to be dumped at any convenient location including roadside, bushes and drains in open dumps in the backyard as shown in Fig. 2. The situation in this low income suburban area is worsened by irregular collection of solid waste. A survey of road infrastructure in this location showed that most of the disposal facilities are overflowing. To emphasise this, local residents indicated that the low waste collection levels have triggered widespread illegal open dumping and backyard incineration, communal dumps, indiscriminate dumping on the streets or in drains, burying waste thus causing chaotic waste management situation in the area. Moreover, fumes from burning waste causes acute plumes of smoke and the odours that make the environment uninhabitable. This situation below succinctly captures the worsening solid waste management in this area.

Perceptions on the causes of urban solid waste problem

Inadequate solid waste collection: The waste situation in the city of Francistown, Donga area was found to be similar to the situation in other cities in the African continent such as Accra and Sekondi-Takoradi, Ghana (Baabereyir, 2009). The lack of waste disposal services has resulted in waste accumulation and unsanitary environmental conditions in Donga area which leaves much to be desired. The local authorities in the city of Francistown are unable to organise adequate collection and safe disposal of the solid waste generated by the residents in the area. The root causes of the poor solid waste situation in Donga area are insufficient and inadequate solid waste management strategies. This is shown by the fact that in spite of the magnitude of the solid waste problem in the area and its impact on public health and the environment, the local authorities accords it very low priority and there is generally low collection rates. The residents argued that it is environmentally unsafe for the council to fall short in frequent collection of their solid waste. Their argument is/was that the council have not invested much on waste collection services, more especially in their area. Thus, even though there has been a lot of public outcry about the worsening waste situation in terms of waste collection, insufficient frequency of waste collection, insufficient skips and dustbins, the local authorities have not taken serious steps towards the solutions of this abysmal solid waste situation in the area.

Government apathy: The residents argued that over the years successive governments have demonstrated low intent in comprehensive solid waste management strategies. They view the current government as too unenthusiastic to demonstrate commitment in solid waste management. Thus, without adequately addressing the important subject of solid waste and its management this creates the potential for waste pollution of water bodies and contamination of the environment. It became evident from discussions with the residents of Donga area that the lack of intent of the government exhibit non-committal of adequate funds for solid waste management capacity. Moreover, the situation also makes it difficult for the residents to actively participate in solid waste management and also creates difficulties for municipal authorities to enforce standards, regulations and penalties on waste disposal to bring offenders to book and promote a positive environmental attitude among the citizenry. Currently, the local government by laws on solid waste disposal are scant and fragmented.

Due to the lack of systematic analytical framework adopted in urban environmental analyses in Botswana as

one critical factor to guide policy formulation, its implementation and evaluating its effectiveness on improving overall urban environmental management it becomes too trivial to merit the residents' active participation in the organization of waste management activities in the area. In part, the solid waste disposal challenges in Botswana, therefore can be attributed to the failure of successive governments of the country to commit their efforts to provide a framework for the organisation of comprehensive waste management activities.

Inadequate public education and awareness: The low level of awareness and the negative attitude of the residents towards waste management contribute to indiscriminate disposal of household waste and littering which compromise environmental sanitation in general and waste disposal in particular. This is shown by the throw it where you like attitude in which people indiscriminately discard waste, a situation which greatly contributes to waste accumulation and chaotic waste disposal in the area. Householders do not manage their waste properly and as a result they shift towards initiatives of burning and burial of waste materials when the city council delays the collection of their waste materials. Hence, this worsens the abysmal solid waste collection and disposal services in the area. However, some residents believed that when the waste is lying around, collection of such items create employment for the city council.

The resident argued that the lack of environmental awareness among Botswana can in turn be attributed to the government's low intent to environmental issues. Moreover, they argued that there is no visible evidence of government's effort to sensitise them on the need for sound waste disposal practices and living in harmony with the environment. Therefore, enormous opportunities exist for the government to sensitize the people by sponsoring programmes on environmental sanitation and waste handling. However, this has not been the case due to the government's lack of commitment to the issue of waste management.

Inadequate institutional infrastructure: Inadequate institutional infrastructure, particularly road networks and waste collection points, transfer stations mostly in new residences, impacts negatively on the service delivery of solid waste management in Donga area which is dominated by low-income population. The quality of infrastructure generally deteriorates with housing income types: the lower the income the worse the quality of infrastructure (Toteng, 2001). Information gathered from householders in the study area indicated that the helpless solid waste situation is affected by failure by the authorities to provide adequate infrastructure in terms of reliable road networks and waste collection points. This situation is often compounded by the claim that the authorities have an acute shortage of funds and logistics which seriously constrain the organisation of solid waste management activities. Many types of vicinity in Donga area are therefore, engulfed with solid waste. At the same time, the central government makes very limited funds available to the local authorities to finance their infrastructure and services including solid waste management.

There are no separate funds for waste management. This was confirmed by one householder who explained that the way things are it is difficult for us to have the dustbins emptied because during rains these roads are impassable to enable the council to collect the trash and garbage. He further explained that (in this area most of the waste collection points are in dilapidated conditions). Furthermore, the solid waste management system has virtually collapsed leaving a large number of householders in deteriorating state. This situation makes it very difficult for the householders to organise effective waste management. The current solid waste management situation in Donga area, therefore has deteriorated and there are hardly any indications that the future situation would be better. The rate of solid waste generation and the nature of solid waste seemingly overburden the capacities of the local authorities causing environmental effects on the landscape and the community that depend very much on it.

Inadequate logistical arrangements: The organization of solid waste management in any city requires an adequate supply of logistics including vehicles and tools for collection and transportation as well as treatment facilities and management of disposal facilities. However, this is one area where the solid waste management sector in the city of Francistown, Donga area is constrained. Among other things, discussions with the householders indicate that inadequate supply of logistics hamper solid waste management in their area. Moreover, they indicated that the council and the contracted private companies lack logistics required for the collection and transportation of their solid waste to the disposal sites and maintenance of the disposal sites. In an interview, one householder noted that sometimes it takes long for the solid waste to be collected because we are told the fleet vehicles have break-downs, this makes it difficult to frequently discard and transport the waste. According to her the waste collection and disposal service had fallen greatly due to break-down of council vehicles. To a greater extent

therefore, inadequate supply of logistics for collection and transportation is a major factor that contributes to the abysmal solid waste management in the city of Francistown, Donga area and this might apply to other areas in Botswana as well.

CONCLUSION

The government has demonstrated very low level of commitment in solid waste management issues in the country in general and Donga area in particular. This is reflected by the low intent of the government to resource the local authorities to deal with the rather complex issue of waste management. Moreover, the frustrating waste problem has also been caused by poor governance practices in the organisation of waste collection and disposal services.

Therefore, the solution to the growing waste problem in the urban centres will be for both the central and local government to commit themselves to the issue of integrated waste management. Thus, improving the capacities of municipal governments in the areas of logistics arrangements, sensitize the public about waste management to infuse waste management producers and other aspects of urban environmental management. Therefore, collaboration among stakeholders including government, corporate institutions and the public and good governance should be adopted as vital elements of the waste management process.

RECOMMENDATIONS

Based on the findings of this study, it has been shown that the government have demonstrated low intent on solid waste management and this is the root cause of the waste problem in the area. Therefore, to address the waste problem, the lackadaisical manner in which the local and central government currently approach waste management must give way to a firm commitment to waste management.

A major part of the solution to the abysmal solid waste lies in the adoption of an Integrated Solid Waste Management (ISWM) as a guiding framework within which to conduct the business of waste management in the country. In this regard, local authorities in Botswana should ensure that waste generators such as householders, businesses and institutions should be enlightened on the merits of and encouraged to practice waste prevention, waste reduction, waste substitution, waste segregation and re-use and also institute measures to promote recycling, composting and incineration for energy with waste disposal being the last option. In particular, a successful composting project should be implemented since the bulk of the waste produced in the country consists of compostable organic materials. Also the establishment of waste management centre and transfer stations should be established.

Composting can greatly reduce the amount of solid waste destined for land filling and reduce the need for landfill space especially organic which contribute most of the solid waste generated by householders. Besides, political commitment to waste management should also include active public education on waste disposal and the inclusion of environmental education in the country's educational curriculum. Public education should be accompanied by provision of adequate facilities such as litter bins and skips that encourage the public to handle waste responsibly. These measures can be helpful to address the worsening solid waste situation in the country in general and urban centres in particular. Therefore, if these measures are actively implemented by the authorities, the worsening solid waste situation in the country would be improved, thereby aiding the achievement of the primary objectives of waste management which is to protect public health and the environment.

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