

THE LEVEL OF RECYCLING OPERATIONS IN BOTSWANA

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This paper describes a case study that evaluated the level of recycling operations in Botswana. Recycling operations are now recommended as effective waste management strategies for reducing the amount of municipal solid waste disposed at landfill sites. In assessing the level of recycling operations in Botswana, two companies which are effectively involved in the recycling operations were selected as the focus of the evaluation process. The data from the two companies is complemented by the data collected from Gaborone landfill site. Finally, the role of Non-governmental organisations particularly Environment Watch Botswana (Somarelang Tikologo) are discussed.

Key words: Recycling, municipal refuse, Botswana

1 INTRODUCTION

With increasing difficulties in securing suitable landfill sites close to areas of waste generation, the recycling programmes are now recommended as initial strategies for reducing the ever-increasing amounts of waste disposed at landfill sites. In metropolitan and highly populated areas, the shortage of land reserved for landfill is relatively high. For example, in Gaborone City, the waste management authorities have announced the construction of a regional landfill site located approximately 35 km west of the city centre [1]. The announcement was driven by the fact that the existing landfill site, which is located approximately 4 km from the city centre, is due for closure by the year 2004. The fact that the location of the proposed regional landfill site is approximately 35 km from the city centre confirms the increasing difficulty in obtaining suitable land close to areas of waste generation. It is obvious that the location of the existing landfill site helps in reducing the collection and transportation costs of waste material.

The proposed regional landfill site is aimed at accommodating waste originating from Gaborone City and some parts of Kweneng and South East Districts. The approach looks attractive from economic considerations due to the concept of shared responsibility between the three waste management authorities. However, it is clear that the distance from the catchment areas will increase the net environmental burden which resulted from the method of waste disposed by landfill in the region.

In some situations where the landfill site is not located close to areas of waste generation, it is often preferable to use rail for transporting waste from waste depots to landfill sites. For example, Lees [2] noted that municipal solid waste generated from Central London was transported during the

night some 50 miles by rail line to sites in Bedfordshire. Such an approach can be expected to reduce the net environmental burden of landfill method. It needs to be explained here, that such an approach cannot be employed in the proposed arrangement because there is no rail line which links the site in question with any of the three places. In such a scenario, the concept of promoting the development of large-scale recycling operations looks increasingly attractive because it reduces the net environmental burden of waste disposal using landfill method. These practices require the development of effective government policies aimed at stimulating the recycling industry.

2 ENVIRONMENTAL POLICY IN BOTSWANA

The environmental protection system in Botswana is still at a developing stage. In 1997 the introduction of the first Guidelines for the Disposal of Waste by Landfill was introduced. The 1998 Botswana's Strategy for Waste Management introduced the concept of waste management hierarchy and created the Department of Sanitation and Waste Management (DSWM) within the Ministry of Local Government, Lands and Housing to develop Botswana's environmental policies. The first Waste Management Act was introduced in 1998, bringing together the DSWM and the waste regulation functions, which are carried out by local authorities. The most recent policy on environmental issues is Botswana's policy for wastewater and sanitation management aimed at protecting public health.

2.1 Specific Policy Goals on Recycling in Botswana

The basis for Botswana's recycling policy was set out in the Waste Management Act [3] section 10 (1) and (2). The aims of the policy are as follows;

- i. To stimulate the development of recycling operations in Botswana by providing technical support and financial initiatives.
- ii. To create conducive environment to stimulate local market for recycled products particularly recycled paper by printing government reports on them.
- iii. To develop recycling operations as a measure to reduce the volume of waste disposed at landfill sites.

These policy goals are clearly stated in Botswana Government White Paper [4]. Through the white paper, government seeks to place emphasis on economic incentives including deposit refund schemes on packaging, subsidy schemes, eco-labelling, waste charges and voluntary self-commitment by industry. Also through the white paper, government requires local authorities to prepare a waste-recycling plan which indicates the quantity of recyclable materials generated in their catchment areas throughout the year. Furthermore, section 9.4.4 of the white paper [4] requires government reports to be printed on recycled paper as a measure to create market for it. On the basis of the above considerations, the Botswana Government hopes to recycle 50% of waste paper by the year 2006 [5].

2.2 Effectiveness of Environmental Policy

While the Government has formulated a relatively well-balanced mix of policy instruments to promote rapid development of the recycling industry and to reduce the volume of municipal solid waste disposed at landfill sites, there are serious uncertainties as to whether the government ambition of achieving 50% recycling of paper by the year 2006 will be achieved. This observation is based on the outcome of the interview consulted with waste management personnel at local authority level. The personnel revealed that nothing has been put in place to implement the specific goals on recycling programmes. For example, the preparation of recycling plans has not been implemented mainly because of shortage of qualified personnel and budgetary constraints¹. It was also noted that before 2002 there was no proper control of the record of recyclable materials removed from the municipal solid waste stream. According to the Gaborone Landfill Site Manager, proper record keeping started in September 2002 and ended there. Since then on recording has been carried out due to the breakdown of the weighbridge. The time taken before such problem is attended appears to indicate the shortage of

competent technical personnel in the area of waste management in Botswana.

It should be noted that in the major cities and towns such as Gaborone, Francistown and Lobatse, most waste generated ends up in local authority landfill sites. However, estimates indicate that in village towns about 60% of households waste receives a collection service while in small villages this value falls to 7% [4]. On the basis of these observations, it can be concluded that Government target of 50% recycling paper by the year 2006 may not be feasible.

In Botswana, waste collection, transportation and final disposal are carried out by local authorities, this is unlike in the UK where local authorities are responsible for enforcing the waste management regulations while other waste management activities are carried out by private companies. If waste management authorities in Botswana could adopt the UK approach, environmental policy would be more credible and sustainable. It seems obvious from the foregoing that the current arrangement in the area of waste management has adverse effects on the development of recycling operations in Botswana.

3 CURRENT STATUS OF RECYCLING IN BOTSWANA

This section discusses the current status of the recycling industry in Botswana, with regard to aspects of Botswana Government policy, which is impacting on the development of this industry. To assess the recycling industry and determine whether the government's hopes to achieve the targets mentioned above is feasible, two private companies which collect and recycle some of the packaging materials were selected as case studies for the present work. The two companies that were selected are, the Dumatau Trading Company formally known as Pyramid Holdings and the Botswana Tissue. The reason for selecting the two companies is discussed in section 3.1. However, data on the quantity of recyclable materials removed from the municipal solid waste stream at Gaborone landfill site by few individuals was considered. The purpose of such data was to highlight the level of recyclable materials disposed at the landfill site.

3.1 Levels of Recyclable Waste Removed From Gaborone Landfill Site.

As noted in section 2.2, before September 2002 there was no record on the composition of the waste deposited at Gaborone landfill site. In fact, the only available data was on the quantity of waste generated rather than on the composition. It needs to be explained here that most of the data were estimates

based on a one-month record. For example, in 1996 the total amount of waste deposited at Gaborone landfill site was estimated at 151000 tonnes/year (Botswana's Strategy for Waste Management 1998). This data was based on May 1996 record only. As has been pointed out in section 2.2, the first significant move came in September 2002 when the recording of the composition of recyclable materials removed from municipal solid waste stream by few individuals was initiated. The recording did not continue to the next month because of the reason already stated above. As a result Figure 1 shows quantity of recyclable materials removed from municipal solid waste stream at Gaborone landfill site in September 2002.

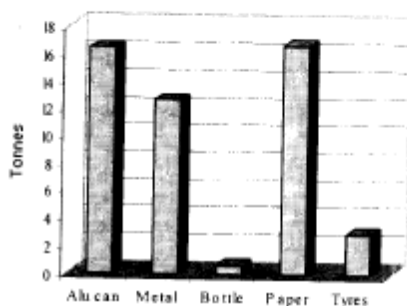


Figure 1: Quantity of recyclable materials removed from municipal solid waste at Gaborone landfill site during September 2002

It should be stressed that metal, aluminium cans, bottle and tyre recycling operations will not receive so much emphasis in the present study. This is because these types of waste do not pose serious environmental problems when compared to waste such as paper and plastic.

Figure 1 shows that paper, aluminium cans and scrap metal are subject to a relatively high proportion of removal rate from municipal solid waste stream. Although the investigation could not be extended to other 127 official landfill sites [4] due to financial constraints, it can be assumed that the results in Figure 1 reflect the practical situation found in the rest of the landfill sites in Botswana. Based on this assumption and particularly on the results in Figure 1, it may be concluded that there is a considerable amount of recyclable waste is deposited in landfill sites in Botswana. In fact, the total amount of recyclable materials removed from municipal solid waste stream at Gaborone landfill site during September 2002 alone, was approximately 53 tonnes. This suggests that if waste management authorities could develop proper guidance notes on removal of recyclable materials at landfill sites the approach could boost

the development of recycling industry on a large-scale in Botswana.

There are currently individuals who have been given permission by the local authority to remove recyclable materials from municipal solid waste stream. These individuals will then sell the recyclable materials to local companies. Depending on the condition of the weighbridge, recyclable materials are then weighed before being transported to local depots (companies) by the individuals.

There are seven private companies which are registered for recycling operations. Of these one is effectively involved in recycling beverage cans. Beverage cans are collected, bailed and transported to a recycling plant in South Africa. Two of these companies have registered for the recycling of plastic materials. However, their recycling operations have been suspended due to economic factors. It needs to be stressed that most of these companies have also been registered for other economic activities. For example, T&T Industry Botswana has registered for recycling plastic, but it is effectively involved in the manufacturing of plastic pipes and cottage tents. When the recycling operations are not economically viable, such companies may suspend their operations on recycling and concentrate on other economic activities. With particular reference to the recycling of waste paper, Dumatau Trading and Botswana Tissue are the only two companies which are well established. As a result, these were selected to form the major part of the case study of the present investigation

3.1.1 Dumatau Trading Company (Pty) Ltd

This section considers the situation at Dumatau Trading Company. This company is located in Gaborone City and started collecting recyclable materials in 1983 under the trade name Pyramid Holdings. The present investigation revealed that this company collects waste material such as paper, clear plastic and polystyrene. However, all the paper and clear plastic waste are transported to Zimbabwe and the Republic of South Africa for recycling processes. It was found that in 2000 and 2002 this company collected 4880 and 5400 tonnes of recyclable waste respectively. In view of the fact that the total amount of plastic waste generated alone is estimated at 10800 tonnes/year [6], it can be concluded that a considerable amount of recyclable materials does not reach waste recycling depots.

In support of this assumption, the authors found that there is a serious illegal dumping of waste containing significant recyclable material in the catchment area of Gaborone City. Figure 2 presents a photograph of waste containing considerable amount of clear plastics, glass bottles and milk bottles illegally dumped in the outskirts of the city, thus approximately 10 km from the

existing landfill site. Figure 2 should be viewed in parallel with Figure 3, which shows one of the illegal dumping sites on the north of the city.



Figure 2: Recyclable material found at illegal dumping site North of Gaborone City



Figure 3: Illegal dumping site located North of Gaborone City

Based on the volume of waste shown in Figure 2, it was safe to conclude that such waste originated from commercial areas, suggesting that there is little concept of sustainability in some of the economic activities carried out by some commercial organisations in the city. On the basis of the above observations, it is concluded that there is a link between low level of recyclable material collected for recycling programmes at Dumatau Trading Company between 2000 and 2002 and the illegal dumping of waste in the city.

3.1.2 Botswana Tissue Company (Pty) Ltd

Botswana Tissue Company also located in the same city started operating in 2000. Its activities include collection of recyclable materials such as paper/cardboard and clear plastics. This company also transports all its recyclable material to South Africa where a proportion of it is processed into raw material for tissue. The processed tissue raw material is then transported back into the country and used by Botswana Tissue Company for manufacturing soft paper.

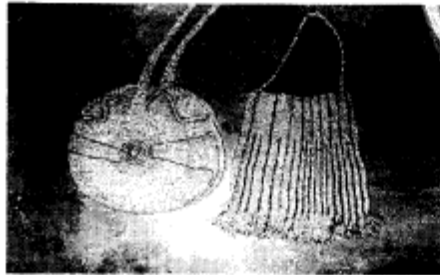
It should be emphasised that the percentage increase in recyclable material collected by Botswana Tissue Company between 2000 and 2002 could not be considered in this study. This is because the company started operating in 2000 and during that year it collected only 400 tonnes of waste. For this reason, it was felt that such comparison would not be appropriate. However, in 2002, the company collected 5000 tonnes of recyclable waste, which is 8.8% below the value recorded by Dumatau Trading Company. This low quantity of material collected for recycling reflects the fact that local authorities have failed to comply with section 10 as mentioned earlier, and that there is a serious lack of public awareness with regard to recycling industry.

4 THE ROLE OF NON-GOVERNMENTAL ORGANISATION

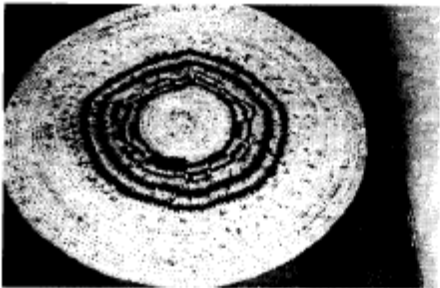
Several Non-Governmental Organisations (NGOs) including Forestry Association of Botswana, Environmental Heritage Foundation of Botswana, Permaculture Trust of Botswana, Somarelang Tikologo (Environment Watch Botswana), among others, are involved with environmental issues in the country. Although most of the NGOs are actively involved in issues of concerns to the environment and utilisation of natural resources in a sustainable manner, it needs to be pointed out that Environment Watch Botswana is the only NGO which is effectively involved in waste management issues such as recycling operations. As a result, Environment Watch Botswana was selected as part of the case study of the present investigation. Since its founding in 1993, the Environment Watch Botswana has been operating a recycling drop-off centre at its office in Gaborone. Labelled containers for glass, paper, plastics and cans are provided for the public to drop-in their recyclables which are in turn collected by the respective recycling companies. The main obstacle to the utilisation of such facilities appears to be the long distance involved between the communities and the said facilities. However, the organisation also intends to introduce these facilities in shopping centres². It is expected that such an approach can increase the amount of recyclable materials removed from municipal solid waste stream. Thus, such an approach may boost the economic base for the development of large-scale recycling operations in Botswana.

As a measure to stimulate the levels of recycling in Botswana, this organisation is operating a "green shop" which sells products manufactured from waste materials particularly plastics. This is an indication that Environment Watch Botswana is providing secure and stable market for small groups and individuals who are

currently involved in recycling activities. Figure 4 shows some of the products offered at their green shop.



Bags of various designs



Typical floor carpet

Figure 4. Some of the products manufactured from waste plastics by small groups or individuals

It can be observed in Figure 4 that a pool of creativity exists which can be harnessed to benefit both the environment and the individuals who are involved in recycling operations. Photographs of products, manufactured from waste materials as shown in Figure 4 reflect the potential of large-scale development of recycling operations in Botswana. All these lead to the conclusion that the recycling programmes are capable of stimulating rapid development of new business enterprises which will boost Government revenue and create more opportunities for self employment.

5 EFFECTS OF THE PROPOSED REGIONAL LANDFILL SITE

The use of the proposed regional landfill site looks attractive because of the concept of shared responsibility between the three local authorities mentioned earlier. However, the location of the proposed site will increase hourly mean volume of traffic and the percentage of heavy vehicles along the Gaborone-Molepolole road. As a direct result of this, the global emissions of CO, NOx and volatile organic compounds (VOC) will increase. This assumption is based on the traffic model

developed by the Spanish Ministry of Transport for evaluation of pollutants emission rate [7]. According to this model, the emission of pollutant (E_x) in each road link is

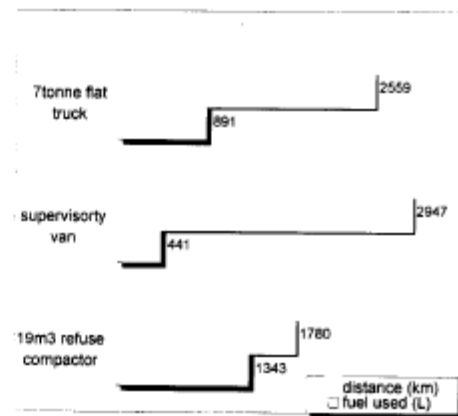
$$E_x = D [m p k_x + m(100 - p) k_l] / 100$$

where:

D = distance of the road link

m = hourly mean volume of traffic

p = percentage of heavy vehicles



k_x = pollutant emission factor (gr/km) for heavy vehicles

k_l = pollutant emission factor (gr/km) for light vehicles

Figure 5: The relationship between fuel used and distance covered per month for various trucks used in the area of waste management.

According to this traffic model, the emission factors of CO, NOx and VOC (gr/km) for heavy vehicles are 18.8, 8.7, and 2.75 respectively. Based on this observation, it appears that the proposed arrangement in the area of waste management within Gaborone City, Kweneng and South East Districts will increase the global emissions of CO, NOx and VOC because of the expected increased volume of heavy traffic along the Gaborone-Molepolole road.

It can be concluded, on the basis of the fact that the proposed regional landfill site will be located approximately 35 km from Gaborone City and more than 40km from the South East District Council, that the use of regional landfill site will require a lot of expenditure from the budget of the local authority. For example, it can be seen that refuse compactor represents the main use of fuel energy with regard to the collection and transportation costs of municipal solid waste (see figure 5 below). The data in Figure 5 was collected for one month only because the waste management authority did not have such data. Based

on the location of the proposed landfill site and that a refuse compactor will make three journeys per day, it is reasonable to conclude that the distance covered by only one refuse compactor will increase from approximately 1780 km to 6000 km per month. This will represent significant use of fuel energy and generation of pollutants derived from the combustion of diesel fuel. Therefore, to reduce the use of fuel energy and the environmental burden, it is proposed that waste management authorities should consider involving the following three related actions:

- i. Segregation of waste at waste depots and trade premises.
- ii. Balling of recyclable materials at waste depots and trade premises.
- iii. Compacting of non-recyclable materials and transport to the regional site.

Such an approach is expected to reduce the environmental impact of waste disposal using the proposed regional landfill site. It can be concluded that the proposed approach will stimulate rapid development of recycling industry in Botswana.

6 CONCLUSION AND RECOMMENDATIONS

6.1 Conclusions

This paper has examined the level of recycling operations in Botswana. In particular, study identified the main obstacles to the rapid development of this industry that result in low level of recycling as:

- i. Failure to implement Government policies on environmental issues.
- ii. Illegal dumping of recyclable materials.

- iii. The current arrangement in the area of waste management.

6.1 Recommendations

It is recommended that:

- Waste management authorities should seek to improve the quality of data.
- Authorities which are considering using the proposed regional landfill site should construct waste depots.
- Transportation of non-recyclable materials from waste depots to the proposed regional landfill site should be done during the night.

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