



Waste management in a region of South Africa

C.H.A. Ratnam, Department of Local Government and Housing, Mmabatho, South Africa.

DURING THE APARTHEID era the South African government created 'independent states' and self-governing areas within South Africa. One of these Homelands or 'independent states' was Bophuthatswana. Bophuthatswana was made up of seven pieces of land scattered across South Africa (fig 1). The South African government declared Bophuthatswana independent on 6th December 1977. However, their independence was not recognised internationally.

The 'Government' of Bophuthatswana strongly believed that they were independent and should be recognised internationally. As a result they set about improving the country as they saw fit.

Historically the indigenous black South Africans' environmental ethics were based on a non destructive use of natural resources, as well as a perception of the individual as an integral part of the environment. However, this concept started to change with the advent of Dutch and other colonialists. With the passage of time the grip of the colonialists tightened around the way of life of the black people. They were forcibly removed from their ancestral homes. Unable to use the areas into which they were forced to settle viably, they moved en masse to the edges of the cities where white people lived in affluence, in search of jobs. These people who had no land rights, no political rights and who were deprived of their human dignity lived in squalor with no regard to the environment.

The apartheid system prevented black people from settling in or too close to the City by forcing them to reside

in specially created black townships. These townships provided cheap labour. All the towns in the newly created Bophuthatswana, except the capital, Mmabatho, were originally established as black townships in South Africa. These townships, developed by the South African government, had very little or no infrastructure. The most neglected areas were education and health which includes waste management. When Bophuthatswana became 'independent' in 1977 the administration took steps to improve the existing conditions in the region.

Initially the Bophuthatswana administration could not shake off the shackles of the past, the indifference to the environment. Waste management was given low priority throughout the 1980's. This was characterized by a lack of proper infrastructure. However, in 1991 the government took positive steps to stimulate a better understanding of the environment.

The Department of Local Government and Housing acted as the Town Engineer's department in 15 towns which were to become Municipalities or Urban Councils in the future. The department carried out the construction and maintenance of all municipal related infrastructure including street cleaning, collection of household refuse and the management of solid waste.

The Bophuthatswana administration allocated funds for street cleaning in 1991 and in 1992 for refuse management. As proper refuse management was considered to be very specialised field the department appointed waste management consultants to assist in the complex process of the collection, transportation and disposal of solid waste.

The towns of Kudube, Mabopane, Ga-Rankuwa, Mothutlung and Winterveld, in the eastern areas of Bophuthatswana, were developed to house black people who provided the work force to service one of the most industrialised areas in South Africa. These towns are the most densely populated in Bophuthatswana. The Bophuthatswana administration opened the industrial estates of Babelegi and Ga-Rankuwa in the area. There are five solid waste disposal sites in this area, none of which receives any toxic or hazardous waste. Although the department was responsible for waste management in the towns, due to lack of funds no proper management was done. Investigations showed the following, the Bosplass site catering for Babelegi is well managed. It is a relatively small site where daily covering and compaction is carried out, however, it is nearing the end of its life. There is no spreading, covering, compaction, fencing or access control at the other sites.

Figure 1. Map Showing Bophuthatswana/South Africa.

The Kudube site is located in an old borrow pit. The waste to this site comes from predominantly low income households, shops, hospitals, local industry and a five-star hotel. A second borrow pit 0.5km north of this site has and is been exclusively used for disposal of building waste. Waste was dumped around the periphery of the site. The whole site was open to salvagers who dictated the tipping of waste brought to the site. This was the situation before upgrading the site.

The Mabopane site covers 10-15 hectares and lies across the head of a stream. The cost of importing cover material prohibited the covering of the waste. The uncovered waste attracted many salvagers who have set up camp in the vicinity, creating a health and social problem. Fencing the site has been unsuccessful as the fencing is removed as fast as it is erected by the people of the town. This meant an unfenced site and unabated access until the site was closed.

The Ga-Rankuwa site is a large quarry which is 15m deep and covers 15-20 hectares. The worked out area of this active borrow pit is used to receive the solid waste of the town and industries. However, the waste received has been far below the estimated amount; this was due to extensive illegal dumping by residents, and contractors collecting waste from the industrial site and small businessmen.

Table 1 below shows the origin of waste received at the sites in Ga-Rankuwa, Mabopane and Kudube.

Whilst no analysis on the domestic waste has been carried out yet, since the total waste produced does not reach the disposal sites, the following ratio's have been estimated (table 2).

The high ash content with little or no putrescible in the waste and the absence of flies and odour is apparent in the disposal sites of the towns with high percentage of low income households. Table 3 shows the estimated quantities of domestic waste generated in the town.

The volume and density of domestic waste are functions of economic wealth, lower income groups produce low volumes but a higher density waste. This is due to the use of solid fuel for cooking. A daily per capita waste production in the low income area can be up to 1kg and half of this weight in high income areas. In terms of volumes the two figures are around 35 and 70 litres

Town	Residential Units	Industrial Unit	Schools	Shops	Hotel Units
Ga-Rankuwa	11000	96	49	177	-
Mabopane	11300	-	38	27	1
Kudube	4900	-	14	43	-
Babelegi (Ind Town)	-	80	-	-	-

Putrescible	20% to 40% by mass
Cardboard	1% to 6% by mass
Newsprint	1% to 2% by mass
Common paper	1% to 2% by mass
Plastics	5% to 9% by mass
Glass	2% to 4% by mass
Tins	2% to 4% by mass
Other Metals	0% to 1% by mass
Fabric	2% to 8% by mass
Ash/Dirt	20% to 50% by mass

Towns	No of Bins	Tonnes per annum
Mothutlung	1987	2548
Ga-Rankuwa	12400	15808
Mabopane	17825	22724
Winterveld	2520	3224
Industrial Waste		39360
Kudube	5264	6798

Disposal Options	Unit Cost
Sanitary Land Fill	1
Transfer to Land Fill	2.3
Baling to transfer to Land Fill	3.5
Incineration	4.5

respectively. An average per capita figure of 3.5 kg/50 litre for high income areas and 7 kg/25 litre for low income area/week is assumed.

The Bophuthatswana administration committed itself to effective pollution control and Waste Management formed an integral part of this. Because funds were limited, low level technology was considered as it was important to keep the cost of disposal as low as possible. Table 4 below shows the cost comparison of different disposal options.

From the above comparison it is apparent that the most economical method of waste disposal is the sanitary fill. As land is freely available at present it was recommended that the disposal sites at Kudube and Ga-Rankuwa be converted into well-managed sites by carrying out geotechnical and hydrological assessments of these sites.

The investigations showed that the Kudube site was suitable but that the Ga-Rankuwa site had to be lined with clay in certain areas before use.

After determining the volume, frequency and types of waste, designs were prepared for proper disposal at Kudube. Three cells were constructed to receive the projected volume for a period of 5 years from 1994. These cells will be supplemented by a further three cells. The cells are made of earth berm 5m high with fencing on top of it, with an access road into the site and a control gate. Trees, 4-5m high and 75-100mm dia., are planted round the site to improve the visual impact of the disposal site. It was considered politically unwise to attempt to keep the salvagers out of the site as they are unable to find an alternative source of income in these hard economic times. Consequently, salvagers are allowed entry to salvage at set times, they are also given an area to store their collection. In 1991 when the initial survey was done in the area, there was no five star hotel (Table 1). Since a hotel has been built, food has been dumped at the site. The hotel management was approached and asked to separate food from other waste, they responded positively. This gave the people direct access to the discarded food instead of picking it from the waste.

The Mabopane site was closed by levelling and covering it with 200mm of soil. This has now been converted into a park and sports field. The whole area was grassed and trees planted. A permanent transfer station has been constructed. A 700m cut of trench has been constructed to prevent water collected on the surface of the disposal site before closure reaching the stream as leachate. The transfer station receives waste from Winterveld and Mabopane. This waste is transferred to the Ga-Rankuwa site 10km away daily. Salvagers who lived at the site before upgrading were encouraged to move out of this site; this has been partially successful. They have been allowed to collect as before. To discourage children who accompany their parents into the waste area, a playground with swings and see-saws has been provided.

The Ga-Rankuwa site has been designed to take solid waste from the towns of Mabopane, Winterveld, Ga-Rankuwa, Mothutlung including waste from the industries. The site receives many tyres which are used to build a berm wall around the site.

The department felt they were not able to manage the disposal sites in these towns as they lacked expertise and capacity. In order to effectively manage these sites the department would have had to employ solid waste management experts and make huge capital investments. This was considered to be economically unviable. The two other options were considered; privatised management and contract management. Privatisation was rejected as there would be no control over management decisions and the level and cost of service. Contracting was considered to be the best option as the level of standards and the cost of the operation could be controlled. This was important as the intention was to offer free

waste disposal initially to encourage all waste to reach the disposal site which are now dumped illegally.

The original waste disposal sites in the other towns were environmentally in the wrong position and poorly managed. To identify suitable site the procedure was to find the suitability of the existing site in terms of pollution. Adequacy in terms of present and future needs. Climatic and environmental influences. Health and safety hazards, land factors, land ownership, growth rate. Types of waste and classification of the waste site, littering, volume of refuse, collection methods, handling of disposal at site, pollution of groundwater and air.

In the small town of Pudimoe the existing site was positioned on the northern side of a river which isolated it from areas identified for development of residential and business sites. The waste brought to this site consisted mostly of tins, paper, plastic, cardboard, ash and small portions of food which originated from a Teacher Training College. The site was on the windward side of the prevailing wind and smoke from burning plastic, paper by the salvagers was blown in the direction of the town. The site in Pudimoe presented several other problems and it was decided that a new site should be developed. This was constructed after a thorough investigation as to its suitability in respect of hydrology, topography, effect on flora and fauna, wind, soil excavability, availability of cover material, accessibility, site capacity, future expansion and the procedures mentioned previously.

As in many other areas, people were forcibly settled in Mothibistad many years ago. This town has a unique problem which has not been experienced elsewhere. Investigations conducted prior to the expansion of the town revealed that the town has a sink hole potential as it was built on a dolomite rock formation. There is a large underground reservoir under the town and its surrounds; this underground reservoir supplies water to about twelve large settlements and was in danger of being polluted by the waste site. It was therefore necessary to find a new site. The characteristic of dolomite, was used to identify a site. Dolomites usually divide into discrete hydrological compartments by dykes. This creates largely impermeable barriers which restricts the movement of groundwater between adjacent compartments. The new site was over a relatively small compartment of groundwater which was not a significant source of water and was in an uninhabited area. The old site had to be closed but this could not be done by covering the site with material as the site was positioned over the regional groundwater supply with a pollution potential. The ideal solution would have been to transfer the waste to another site but this option was rejected as it was too costly. As the waste site contained little or no organic matter it was decided to suitably contain the site by covering with impermeable material and compact it. Further monitor the quality of groundwater in the vicinity of the site at 6 monthly intervals.

Household refuse collection was carried out even before Bophuthatswana was formed which was ineffective. In

1986, to encourage local entrepreneurs quotations were invited for collection of refuse twice weekly in the towns. This resulted in a questionable waste collection system. Since efficient waste collection is the beginning of an effective waste management process, the department put out proper tender documents. From 1990 tenders were allocated for a period of three years. There was no specifications as to the plant and machinery needed for the job as the department wanted local contractors to tender with whatever simple equipment they had at their disposal. Problems, such as understanding the contractual obligations due to the contractors poor knowledge of English, were further compounded by cash flow and lack of managerial skills. In 1993 tenders were called. The prospective tenderers were individually explained the document, how to price, and their contract obligations in the local language.

Some towns were overpopulated. In the town of Thlabane a plot for a family was occupied by many as eight families. Each plot had only one bin. The refuse from each plot was in excess of one bin. The excess refuse was dumped on the road corners or open spaces. This created problems with the street cleaning budget. To cut street cleaning expenditure, free plastic bags were issued two per household/week rather than two to each plot. This did not stop the dumping on street corners. Inquiries revealed that the people believed that the street cleaners would lose their jobs if dumping is not done at the road corners and open spaces. The situation has improved after the people were told that they would be employed on other jobs.

Due to the presence of salvagers in the disposal sites in the bigger towns, no efforts were made to enter the recycling market. However, in one particular small town, the man left to monitor the incoming vehicle was also asked to collect all the cardboard that came in. The money from the sale of the cardboard was used to encourage the people to keep their gardens and surroundings clean by offering a prize for the best plot.

Re-cycling has its advantages, however before starting a re-cycling project, the following should be looked into: Cost of collection - Marketability - Reduction in Waste in the Waste stream - Continuous work for the people.

The town of Madikwe has been picked to start recycling in a small scale as the waste collected contained high percentage of glass, cardboard, paper and plastic, which has a market in the region. The slogan that is being used is "TURN YOUR TRASH INTO CASH".

The department in conjunction with the "Women for the Environment"; organised a seminar titled "Think Tank on Waste Management". The theme was "Stop the litter, it is your responsibility". The objective being to create awareness among citizens about pollution so that littering could be stopped. To encourage re-cycling and reduce pollution by positive behaviour and attitudes towards the environment. Halt depletion of natural resources and planting trees in large numbers. Foster gen-

eral cleanliness. Some of the resolutions that came out of the seminar were; Legislation must be introduced by 1995/1996 to discourage non-degradable packing; Importance of Waste Management must be brought to the politicians and policy makers to ensure sufficient funds are available for efficient and adequate Waste Management. Reducing the waste stream by 20% by 1996/97. Encourage the public to save kitchen waste for composting to enrich the garden soil. The "Keep Bophuthatswana Beautiful" organisation should become the litter abatement authority.

The government appointed a committee called the National Environment Management Council with two sub-committees. One of which is the solid Waste Management Working Group. Its task was to work out policies, regulations, minimum requirements and guidelines in the selection, design, operation and closure of general and hazardous waste landfills. Minimum requirements were necessary. Due to Population growth and increasing urbanisation resulting in growing waste both in quantity and quality. The department being responsible for solid waste management implemented a pro-active pollution prevention programme. The approach followed is that of Best Practical Environmental Option, an acceptable approach towards attaining affordable environmental protection. The objectives of the minimum requirements are - To improve the standard of Waste Disposal and to provide a framework or minimum waste disposal standards within which to work and upon which to build. In conclusion, I would say that the following has been achieved in respect of Solid Waste Management. The dumping of refuse in street corners and open spaces has been curtailed. Burning of refuse at the disposal sites has been stopped. All official Solid Waste disposal sites are well managed. The industrialist and the average citizen are now made aware of their responsibilities.

Glossary

Apartheid - esp. in S. Africa a policy or system of segregation or discrimination on grounds of race.

Township - S. Africa - an Urban Area situated some distance from the city where black people were required to live.

Homeland - An area to which black S. Africans were forcibly removed.

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