

Title	THE PROVISION OF SUSTAINABLE SANITATION SERVICES TO PERI-URBAN AND RURAL COMMUNITIES IN THE ETHEKWINI (DURBAN) MUNICIPALITY
Keywords	
Author(s)	N. A. Macleod
Address	eThekwini Municipality, 3 Prior Road, Durban, 4001
Telephone	+27 (0)31 302 4600
Fax	+27 (0)31 302 4646
Mobile	083 274 6990
E-mail	nam@dmws.durban.gov.za
Short CV for Introduction Purposes (100 words max)	Neil Macleod is Head: Water and Sanitation at the eThekwini Municipality, responsible for the provision of water and sanitation services to a metropolitan area with a population of 3 million.

INTRODUCTION

The eThekwini Municipality is characterised by a densely populated urban core which is largely served by conventional waterborne sewerage, a clear urban edge, and beyond this a sparsely populated area where communities are predominantly poor (with household incomes below R1500.00 a month). At the time of redarmarcation of the boundaries of the Municipality in 2000, there were an estimated 200 000 families without access to adequate sanitation, who lived beyond the urban edge or else within shack settlements located within the urban edge. Some 100 000 pit toilets, mainly VIP-type toilets, had been constructed in these areas and many reports were received from communities that these pits were full and in some cases were causing community health problems.

BASIC SANITATION

In 2000 the Municipality had not formulated a policy as to what defined basic sanitation and also had no policy on the provision of free basic sanitation. Initial experience with the emptying of these pit toilets revealed a number of challenges:

1. Many pits were unlined or the top structures were in a precarious situation and subject to catastrophic collapse whilst the pits were being emptied.
2. The pits were constructed in locations which were inaccessible to conventional vacuum tankers for mechanical plant.
3. The contents of the pits were often not homogenous and included rags, plastic bags and household refuse, which made emptying by pumping difficult, if not impossible, even after the addition of water in an attempt to liquefy the contents.
4. The sizes of the pits varied considerably, with the average volume being approximately 2 cubic meters.
5. The cost of emptying a pit as a consequence of these factors, was unacceptably high and in many cases exceeded R1000 per pit emptied. This should be compared with

the cost of constructing a new VIP-toilet of between R1000 and R3000, depending on the materials used.

In 2003 the Municipality approved a proposal to introduce free basic sanitation. In terms of this policy the Municipality would empty all pit toilets once in five years at no direct cost to residents and subject to certain conditions. Any additional pit emptying would be at the full cost of the household requesting it.

The adoption of this policy made it possible to prepare for the planned emptying of these 100 000 pit toilets, as compared to the demand responsive approach used until that time. The demand responsive approach had the effect of increasing emptying costs as a result of increased transport and set-up costs, as the Municipality responded to demands that were widespread and not concentrated in an appropriately sized location.

One of the conditions to be met prior to the implementation of this free basic sanitation policy was experimentation to reduce the unit cost of emptying pits. Research was carried out in a number of locations so as to uncover all possible conditions that could be encountered. Initial attempts to use mechanised solutions modelled on the Vacutug option, developed in Kenya, proved largely impractical as a result of the terrain to be traversed and the denseness of many settlements, as a consequence of steep slopes, or access limited to narrow foot-paths.

A solution using a labour intensive alternative proved to be the most versatile and cost-effective option. The waste material in the pits is removed manually using buckets and spades and is loaded into 100 litre steel drums which are then manually hauled on customised wheeled trolleys to the nearest road. The drums are then loaded onto conventional vehicular transport and carried to a processing site.

The processing site consists of a modified hopper (See figure 1 below), which is temporarily connected to a sewer by flexible piping. The hopper is modified by the addition of loading platforms and a screen which only allows sewerage and small particles of waste to enter the hopper itself and hence flow to the sewer via the interconnecting piping. Water, which is required to hose the waste material from the pits is provided by a tanker and pump to ensure adequate pressure. The material that is too large to be transported by sewer or treated at the waste water treatment works is washed down on the screen over the hopper and then placed into plastic refuse bags for transportation to a landfill refuse disposal site. This material has to be washed in order for it to be accepted onto the landfill site as conventional waste. This waste is mainly comprised of plastic material and rags. This labour intensive method has proved to be the most practical and cost-effective and has the advantage of creating low skilled employment in communities that have high levels of unemployment. Based on research to date it is estimated that 6400 jobs, each of three months duration, will be created over the five-year period.



Figure 1

Restricting the transportation of the pit contents to the shortest possible distance has environmental benefits.

The Council of the Municipality has agreed to provide R70 million over a five year period to empty the 100 000 pits at an average cost of R700 per pit, commencing on 1 July 2005. This estimate has been inflated to allow for possible unforeseen circumstances. Research has showed that the pits can be emptied for an average cost of R550 per pit at current prices.

In order to provide the necessary capital equipment, which is beyond the means of most small businesses, it has been decided to launch this project based on a franchising approach. One or more large contractors with access to capital and the ability to provide the necessary training and management guidance, will be appointed to franchise out the work to a large number of small businesses. The small businesses will be contracted directly to the Municipality to undertake the pit emptying work.

ALTERNATIVES TO CONVENTIONAL VIP-TYPE TOILETS

Investigations into how to respond to the sanitation challenges inherited as a result of the formation of the Metropolitan Municipality and the condition of the pit toilets which had been constructed in the rural and peri-urban areas, led to the decision to look for alternative sanitation solutions for these areas beyond the urban edge.

A decision was taken to provide waterborne sanitation to all communities living within the urban edge. Many of the informal, shack settlements, within the urban edge were planned to be upgraded and formalised through dedensification and the construction of proper housing together with the provision of roads, piped water and waterborne sanitation services.

As an interim arrangement, communal toilets and shower blocks are being constructed to serve communities living within the 100 meters of these blocks in the dense informal

settlements. High levels of vandalism limits the expansion potential of this option.

For communities living beyond the urban edge, a solution was required that :

1. Is cost competitive to construct and maintain.
2. Could be emptied by the households themselves or by others at an affordable cost.
3. Is environmentally sustainable.
4. Matched the available water supply and preferably required no water at all to operate effectively.
5. Is acceptable to the communities who would use these toilets.

Prior to the finalisation of the choice of solution, extensive community education and awareness took place in the peri-urban and rural communities. A number of different options of toilet design were constructed and demonstrated to communities. In addition the education and awareness programme highlighted to communities the advantages and disadvantages of the various solutions as well as the relationship between water supply, good hygiene practices and the provision of effective sanitation.

As a result of this series of engagements, the double pit urine diversion option was selected as the preferred option. This choice was viewed as the option which best met the five criteria listed above. The design of this toilet is as shown in figure 2.



Figure 2

Over 20 000 of these double pit toilets have been constructed and some have been in use for a sufficiently long period of time to require emptying. Despite the fact that the implementation of this option is still in its early phases, it has been found that certain individuals have created small businesses and are offering to empty these toilets for R25 per vault. This is a considerable reduction compared to the price paid to empty a conventional VIP-type toilet.

In promoting this alternative, certain environmental issues have required research and this research work is being done in partnership with the University of Kwazulu Natal. The research areas include :

1. The impact of the urine diversion toilet dry waste and urine on the environment and on any crops or vegetables which come into contact with the waste material in the soil.
2. The environmental impact of the use of grey water for urban agriculture as well as any potential adverse health impacts, particularly on vegetables grown in the soil.
3. The microbiology of the dessication process of the faecal matter in the drying vaults.
4. The impact of double pit dry sanitation on community health, in areas where inadequate sanitation existed previously.

THE WAY FORWARD

Conventional waterborne sanitation is not a viable short or medium term option for those communities that are still without access to acceptable sanitation (presently estimated to be 140 000 households). However there are certain dense settlements where ventilated single or double pit type sanitation is also not viable, given the small effective plot sizes which limit the ability to dispose of greywater as well as human waste material.

The use of anaerobic baffled reactor technology together with wetlands to treat sewerage from compact rural settlements is being researched and shows promise. However, this alternative needs to be linked to an adequate yet affordable water supply, given the extensive poverty in many of these communities, where consumption is generally restricted to the free basic quantity of 6kl per month. On larger sites, septic tank and soakaway sanitation options are only affordable to families who have sufficient capital to finance the costs of installing this type of service and also pay the monthly water charges. Research has shown that this type of onsite sanitation is not technically feasible if the size of the plot is less than 500 square meters in size.

The ventilated double pit urine diversion alternative is now the preferred option for sanitation in less dense communities. In order to emphasise the fact that the management of these toilets is the responsibility of households, regular return visits by the education officers is required to reinforce this message and to remind households of the correct usage of these toilets, to ensure they continue operating in a manner that maintains community health.

In time the single pits in informal settlements in urban areas will be replaced by waterborne, piped systems. The single pits in rural areas which are inaccessible or difficult to empty will have to be replaced by double pit urine diversion type toilets to reduce the total operating costs in the Municipality.

In terms of the 'ladder' concept of ever improving levels of service as contemplated by the Minister of Water Affairs and Forestry, it is inevitable that over time the level of service available to all communities will change. However in many communities this will have to be coupled with a densification process in order to make waterborne sanitation options viable.

CONCLUSION

Sanitation options being provided in the eThekweni Municipality are proving to be affordable, both to the Municipality and to communities. Initial indications are that the choices available are acceptable to communities and that the end result is a sustainable set of solutions which

improve overall community health.