Challenges and key lessons in improving sanitation services to the Urban Poor drawing from East and Southern African experience.

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One of the greatest challenges which still face millennium development goals is the improvement of sanitation services for the urban poor. Compared to the rural areas, space is limited and overcrowding common in the urban areas of Africa. Methods which may be supremely successful in the low density rural and medium density peri-urban areas may fail completely in the high density urban areas. The urban poor living in densely populated areas in most parts of Africa rarely have access to sewered or water born sanitation and the facts reveal that most rely on pit sanitation.

There is of course much variation around the region and few generalisations can be made. Most people living in the urban areas of African towns and cities are poor. It is certain that most will live below the poverty datum line. Many may be struggling for their very existence. Many have migrated to the cities and towns in search of work. They may not own their house or property but rent it, often at exorbitant cost. They may have left areas where simple forms of sanitation work well to find themselves using facilities of a much poorer type and heavily used. Such city dwellers live in areas which may be medium density, high density or very high density. The problem of sanitation provision, as well as the supplying of other services, is aggravated by poverty and an inability of the poor to pay for services. And the situation becomes worse and more difficult to solve as the population density increases.

The facts reveal that for most African towns and cities on the continent the pit latrine is the most common sanitary facility in use by the poor. In Dar es Salaam around 74% of dwellers living in informal settlements rely on pit latrines and around 70% in Maputo. Whilst pit latrines and improved pit latrines can work well if there is space, problems occur as the space is reduced. In high density settled areas pit latrines can fill up quickly due to heavy use - many families or families and tenants may use them in combination. Consequently there is a more urgent need to empty or rebuild the latrines. Such exercises require cash which the urban poor may not be able to afford. If the ground water is high and wells are used for domestic use there will almost certainly be underground contamination taking place. This leads directly to health problems in the communities. Ironically such problems do not occur to the same extent if the density of pit latrines is lower and wells separated from them by acceptable distances. Then there is the problem of personal hygiene, principally hand washing – how many toilets have hand washers close by? few. And yet hand washing is a vital component if the health status of users is to be improved.

A paper with this title might chose to target the urban poor living in medium density settlements of perhaps 350 sg. m. or more (approx 18m X 18m). If it chose to do so, there would certainly be a larger number of sanitary options and disposal methods available – on site. If there is space, pits, tanks or vaults can be emptied and processed on site with relative ease. But in very high density settlements inhabited by very poor people, the number of sanitary options and hygienic disposal methods are limited.

Some facts and challenges stand out clearly.

1. The deep pit latrine and is variants are the most commonly used excreta disposal systems used by the urban poor in Africa. This also applies to the rural areas.
2. The pit latrine has merit in that it is relatively cheap to build, simple and easy to use.
3. But pit latrines fill up quickly where a demand for their use is high and must eventually be emptied or replaced. This is particularly true for the high density urban areas.
4. Latrine replacement may be costly and difficult in high density settlements.
5. Pit emptying may also be costly if performed by commercial tanker and beyond the limits of the rural poor. There is always the option of low cost tanker or manual excavation, but this may also be difficult, offensive or costly.
6. Large numbers of deep pit latrines constructed in dense settlements can heavily pollute ground water resulting is disease if the water is used for domestic purposes.
7. Despite these problems it seems inevitable that most of the urban poor will have to rely on some form of pit sanitation for some years to come and certainly within the time span of Millenium Development Goals.
8. Alternatives to deep pit latrines do exist. These include ecological latrines such as shallow pit composting systems and urine diversion systems. Cost is an overriding factor. If alternative answers are to be found, they must be affordable, simple and replicable.
9. Technical problems are easier to solve if there is space. But will space ever be provided for the urban poor?
10. And solving the problem is not just related to latrines and their use. It encompasses developing a perceived need in the target population, backed by sustainable industries of supply and maintenance. But will there be a demand in high density urban areas if the families have no right of tenure?
11. And who will pay – in the end the users or the landlords must pay most, if any form of development can be sustainable in the future.
12. New developments in urban sanitation require the backing of a policy environment that stimulates sustainable demand and supply.
13. A multi-sectorial approach is essential. Policy makers, technocrats, financiers, builders, entrepreneurs and sales people and of course the users themselves must get together in open informal conference
14. People with a sense of salesmanship and entrepreneurship must enter the sector in greater numbers on the ground. People with technical skills are rarely equipped with this ability. This can work for selling affordable latrines, pit emptying services, water purifiers, compost making and marketing etc. Marketing skills are required. People with different skills must join forces in the provision of low cost sanitation.
15. Throughout the continent these problems and possible solutions are being studied and analyzed. Alternative solutions are being found, which may bring relief to the most deserving in the future.

This brief paper brings together a few lessons being learned from the many activities being carried out in East and Southern Africa. Only a small number of the many examples can be cited here.

The Maputo experience

Over 70% of the inhabitants living in the informal settlements of Maputo use pit latrines. A project of improving pit sanitation was started in 1979 and since then over 100 000 simple pit latrines have been built, most based on the sanplat principle (sanitary platform). This project continues to the present day. Many lessons could be sited - a few are sited below.

Lessons 1. Length of operation indicates success

Relatively low cost pit sanitation can provide a long term and satisfactory service to the urban poor. The programme has been operating for 25 years and is still viable. People learn about sanitation by example from one household to another. In this programme the prolonged sales of slabs at cost shows that a demand had been generated within the population without a big media advertising campaign. People learn about sanitation by example.

Lesson 2. Combine provision of pit latrines and pit emptying services

ADASBU, a small community based association in Maputo supported by WaterAid (UK), provides latrines and pit emptying services to the residents of the unplanned area of Urbanizacao . Urbanizacao contains 1,947 houses, a population of 13,800, and has 100% latrine coverage.

The uniqueness of the ADASBU approach in Maputo lies not in the design or cost of the pit latrines, but in the recognition that ***sustainable sanitation is dependent on the provision of both simple pit latrines <u>and</u> affordable pit emptying services developed in combination.***

Lesson 3. Human excreta composts naturally in time and becomes more easily excavated.

Given long enough, the contents of a pit latrine turn into compost and can easily be excavated with a shovel and bucket. Many of the 100 000 pit latrines built in Maputo are lined with concrete blocks, making them permanent sub-structures. The pits take about 5 years to fill up and then a second pit is dug and used. It was found that after 10 years, when both pits were full, the contents of the first pit had fully turned into compost and could be dug out easily by hand (Bjorn Brandberg email communication). The latrine slab and structure could then be reunited with the original pit.

Lesson 4. Line the pits in loose soil.

In loose sandy soils it is best to line the pits and trapezoidal blocks have proved the most effective method. This makes the pits permanent and excavatable after prolonged periods of time.

Lesson 4. Take a long term perspective

The fate of pit latrines should be considered over time. If the pits are well lined they can be excavated and reused many times. The slow rate of conversion in these pits (5 – 10 years) is due to the fact that pits decompose slowly in anaerobic conditions – when only excreta and garbage are added. Where soil and ash are added regularly to the pit contents the rate of composting is rapid by comparison, because of the aerobic conditions generated. 12 months is normally sufficient for composting and a twin alternating shallow pit composting system

may be used with smaller pits being used alternately at 12 month intervals. This method has been used elsewhere with success (see later for Malawi and elsewhere.

Lesson 5. Cost of emptying pits

Householders in unplanned poor urban areas pay only for the removal of one or two trips of waste and not the complete emptying of the pit. This is related to the cash flow problems the urban poor face and the many other pressures they have for the little money they do possess. Poor people cannot pay for adequate services. Emptying pits of compost rather than faecal sludge may overcome this problem, since it can be carried out by the owner.

Lesson 6: Think small and cost effective

There is merit in developing sanitation programmes that promote smaller lower cost pit designs and the development of affordable excreta management businesses, as opposed to the traditional deep pit latrine building programmes where no consideration is given to emptying. Such systems match the cash availability of the urban poor. The commercial viability of the emptying service is imperative if it is going to thrive and grow.

Lesson 7. City planning

The degree of planning in an area is critical. In Maputo the unplanned area are laid out in streets and the width of the street has been maintained and is sufficient enough to allow small vehicle access. In the unplanned areas of parts of Dar es Salaam, Kampala and Nairobi, street width has not been maintained and access with standard vehicles is not possible. These places require more innovation solutions which in turn impacts on the commercial viability of the emptying process. It pays to make space for road access as well as for housing and services. The more space the greater the flexibility of latrine design and disposal of pit material.

The Dar es Salaam experience

The pit latrine is the most commonly used sanitary facility in the unplanned areas of Dar es Salaam (74%) with 13% discharging their effluent into septic tanks and a further 13% discharging into sewers. Several variants of the pit latrine are in use, from simple sanplats to fully concrete block built toilets. The water closet or pour flush latrine is also used and is popular. If no other system is available people resort to using plastic bags which are filled, mainly at night, and then discarded in the most convenient place. This system of desperation is also used in some high density areas of Harare and almost certainly elsewhere.

Lesson 8. Choose the system which is most likely to succeed in the long term

Most poor people use pit toilets in the high density towns and cities of Africa. In the more developed cities waterborne systems have been installed. They work well if properly designed, maintained and with a reliable water supply. But advanced water born systems struggle to perform due to lack of maintenance and lack of water. High tech solutions only work if they are maintained properly and served with adequate and reliable water.

Lesson 9. A variation in design may be required to suit different circumstances

In areas of high water table, which are not uncommon in Dar es Salaam, the local design comprises of a round vault latrine with a superstructure built on top. Concrete blocks are commonly used. In the Keko project a range of products are taught to local masons. These include a range of sanplats and domed concrete slabs for pit toilets and pour flush toilets and also trapezoidal blocks for lining pits. The trapezoidal block system is also used in Maputo

and elsewhere and is a successful method of lining circular pits in unstable areas which are common on the coast of Africa.

Lesson 10. When there is a range of options, the user can choose the one that he can afford.

There may be two reasons why people do not buy latrines in Dar es Salaam - ***cost*** *and* ***space****. The designs offered in Dar es Salaam, for example, are all relatively expensive, had roughly similar life spans of 10 years, and all took up a physically large area of land. Around 40% of the cost of a traditional pit latrine is spent on digging and lining the pit. A small pit requires less digging, fewer cement blocks for lining and is therefore be cheaper. But must be emptied more frequently.*

A range of technical options pays off. There is variation in the environment and the ability of the owners to pay. A choice of technology helps.

Manual emptying of pit toilets

Manual emptying of filled pit toilets has been practiced for years in Dar es Salaam. People who perform this task are called frogmen. They work by first digging a new pit next to the existing pit and tipping or draining the contents into the new pit. Excavated sludge is buried on site which is ***socially acceptable providing that the process of emptying and burial is hygienic and the sludge is covered properly.***

Lesson 11. Build on traditional methods which already take place and upgrade and modernise them.

The concept of entrepreneurship is important to support the sector

Between 1988 and 1992, the Netherlands Government financed a project to develop appropriate pit emptying technologies suitable for low income, unplanned urban areas in Dar es Salaam. At the end of the pilot project in 1992 seven teams were active with equipment in Dar es Salaam, and one team in Morogoro. By March 1994, five teams were still operational. But by 1998 the system had collapsed. Its eventual failure was thought to be due to lack of lack of entrepreneurial knowledge and skills to run a private business on their own. The operators worked as technicians, not entrepreneurs.

Lesson 12*. Clearly there is a need to develop partnerships between those who need latrines and emptying services and the small scale private sector managed by people with a promotional and entrepreneurial skills.*

Businesses should be run by those with entrepreneurial and marketing skills, not by technicians. People with a sense of salesmanship and entrepreneurship must enter the sector. People with technical skills are rarely equipped with this ability. This requires people with different types of outlook to the technocrats. People with different skills must join forces in the promotion of sanitation services. A good idea may collapsed because entrepreneurs are not involved in the process.

Contamination of ground water

Seepage from on-site sanitation systems such as pit latrines and septic tanks probably present the most widespread and serious diffuse pollution source in many high density urban areas. This is particularly serious if the aquifer is shallow and used as source of domestic water from wells. Water abstraction from the unconfined aquifer in Dar es Salaam poses a serious risk to public health. Over 60% of the health complaints in the high density areas are

thought to be related to groundwater contamination, although this may also be due to poor hygiene.

Lesson 12: *Where large numbers of pit latrines are used in areas where the ground water is high and also used for domestic use (via wells), the risk of disease transmission through contaminated water is inevitable. This problem may persist for years.*

The answer lies in either bringing in uncontaminated water from elsewhere through a piped supply and stand-post system with taps.

Alternatively to take steps to ensure that each family/household is in a position and has the knowledge to protect itself using a simple system of water purification which is contained within the household kitchen. Many simple and relatively low cost methods are available for use at the household level. These include small sand filters, candle filters, use of chlorine, use of fabrics, solar sterilisation, etc (see reference). Personal hygiene should also be promoted and methods of making and using a range of no cost or low cost hand washing devices These should be used near toilet facilities, in kitchens and bathrooms.

The Durban (eThekwini) experience in South Africa

A very different picture is seen in the far more wealthy country of South Africa where water and sanitation services are being provided in a very different way to the rest of the continent. Here many services are being provided free of charge and large subsidies provided to equip households with water and sanitation services. eThekwini is used as an example.

High density settlements

Communal latrines and washrooms are used in very high density settlements in eThekwini within the Municipality of Durban, South Africa. These are emptied by municipality tankers when necessary without charge to the users.

Medium density settlements

Where the plot size is 350 sq.m. or more urine diverting toilets are being installed in large numbers. So far 35 000 urine diverting toilets have been installed in eThekwini with plans to install another 175 000 units. In this system urine and faeces are separated in a specially designed pedestal unit. A twin vault system is used and the vaults are filled up alternately. Once the first vault is full the urine diverting pedestal is moved over the second vault. When the second vault is full the first vault is emptied. The system attempts to dehydrate the solids so they are easy to handle. Lime or ash is added to the faeces to help dry them out. The owners are responsible to emptying urine diversion toilet vaults. Entrepreneurs are also available to do the emptying for the users at a charge. The dehydrated excreta is buried in shallow pits on site as a form of disposal. Urine seeps into the ground. Where VIP latrines are used, these are excavated at 5 yearly intervals at no cost to the house owner by the municipality.

In South Africa considerable material subsidies are used to provide sanitation services in both rural and peri-urban areas. The urine diverting systems are provided free of charge together with water tanks (value R4000 total). The VIP latrine is used extensively in South Africa. In recent years the urine diverting concept has been introduced into South Africa and may slowly replace the VIP latrine. VIP latrines require emptying every 5 – 10 years.

Lesson 13. *In South Africa the appropriate technical solution as far as sanitation provision is concerned is based on the space available. If little space is available the option is to provide a communal sanitation facility which is serviced by the municipality. Communal facilities do not look after themselves and there is no sense of communal ownership or a willingness to keep clean. This only occurs in family owned facilities. The success of the South African programme is based on huge subsidies being provided to families, which are not possible in other African countries. Such methods of providing large subsidies are not usually sustainable in the medium to long term. The Zimbabwe programme of providing generous material hand outs in the form of cement to rural families to build VIP latrines virtually collapsed when donors moved away. Only the better off were able to afford to build the replacement units themselves. The rest either turned back to the bush or built standard pit latrines. Had a choice been made and a range of options which included low, medium and higher cost improved pit latrines from the start, a greater knowledge would have been retained in the community. As the Malawi programme has shown (below) effective pit latrines can be built at very low cost with the importation of cement being held at a very low level indeed (around USD2 – 3 per toilet slab).*

The Malawi experience

A small development of ecological sanitation was started in Lilongwe by WaterAid in Lilongwe in 2003. It used the concept of the alternating shallow pit compost latrine (known as the *Fossa alterna)*. In this concept, two pits 1.5m deep are used and housed within the same superstructure. As the pits are used, soil and ash are added to the pit contents as well as excreta. No garbage is added. Once the first pit is full after 6 – 12 months, the second pit is used and the first covered with soil to compost. After 6 – 12 months, the first pit is excavated and the contents held in bags or applied to the land as a form of fertiliser.

In Malawi today some 5 500 alternating shallow pit systems are in use, mainly in the rural areas, where the composted material is excavated at between 6 and 12 month intervals and used to fertilise the gardens. This makes the latrines almost everlasting with the owners excavating the pits themselves. This is possible because soil and ash are added regularly to the pit, which not only reduce smells and odours but also accelerate the composting process. Excavation is assisted by using the latrines as disposal sites for excreta only and not garbage. This method offers potential for poor communities living in medium density urban sites where the compost can be put to use. If local traditional building materials are available, input costs (cement) can be as little as USD3.00 per unit. But some space is required however. A functional *Fossa alterna* can be built within a space of 2.7m X 1.2m. But the driving force behind its uptake in Malawi is the value of the compost for use on gardens. Small gardens may abound in medium density settlements but not in high density settlements, where there may be no garden at all. There are plans to fund a programme of twin pit composting toilets in Blantyre. The alternating shallow pit compost pit system has also been used in Harare, Zimbabwe and Lichinga, Mozambique.

Lesson 14. New methods in the wings

A number of solutions are on trial in various projects around the region. Adequate monitoring and evaluation is required. Some solutions were designed for rural areas, but may have application for medium density urban areas. Experimentation is required. Methods which allow the owners to deal with their own maintenance including excavation of pits are becoming more well known as time passes. But there must be some incentive to do so (eg replacing fertiliser or sale of compost etc). Methods should be relatively low cost and

replicable. If material assistance is required it should be low, so that available funds can be used to serve many people. Unless this is the case any attempts to solve millennium development goals will fail.

Conclusions

Half the population of the developing world still lacks adequate sanitation. The problem in high density urban settlements is particularly serious and getting worse. However many innovative attempts are being made to find solutions to the problem. To solve millennium goals sanitation options must be simple and affordable and replicable. There must be perceived benefits at the end of the day from the user's point of view. Maintenance costs must also be low. It is likely that improved pit sanitation must be used to answer this call. If domestic water sources are contaminated the sanitation programmes must be used in conjunction with family based water purification systems. A skilled marketing approach is required to sell the most suitable product to a range of potential customers. If material incentives are offered they should be small, so as to avoid the problem of donor dependency which can halt programmes when the donors pull out. Clearly a compromise is required on these various issues. Ecological methods show promise for future development. Technical and disposal problems are reduced as the density of the settlement is reduced. The marketing skills of the private sector are required together with the skills of entrepreneurs, promoters, masons, policy makers and users. If the problem is solved, it will need to be solved by uniting a range of people with different talents and skills with a common goal in site.

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References

Cairncross, S. (2003) Sanitation in the developing world: current status and future solutions. International Journal of Environmental Health Research. 13, S123 – S131.

Pete Kolsky (2004) Demand and supply in Sanitation and hygiene. Power Point Presentation. WSP. Washington. D:C:

Sugden, S. (2005). An analysis and plan for the city wide approach to excreta disposal in the unplanned areas of Dar es Salaam, Tanzania. London School of Hygiene and Tropical Medicine.

Sugden, S (2005). An assessment of mechanical pit emptying services in Maputo. London School of Hygiene and Tropical Medicine.

Well Fact Sheet (2006). Household water treatment. Waterlines, Vol.24. No.4. April 2006.

WIN-SA Water Information Network – South Africa. Lesson Series 2. eThekwin municipality sanitation and water project. 491, 18th Avenue, Reitfontein, Pretoria. South Africa.