

Private sector involvement in operating a sanitation system with urine diversion dry toilets in Nakuru, Kenya.

This paper describes the implementation of an O&M system for UDD toilets that involves the private sector.

Author: E. Muchiri, B. Mutua, E. Müllegger

Abstract

Benefits of urine diversion dry toilets (UDDTs) can only be achieved when the sanitation facilities operate continuously and to full capacity in conformity with acceptable standards of quantity and quality. However, there is a demonstrated link between long term sustainability of a sanitation system and the effective operation and maintenance (O&M) of the system. Problems with O&M are recognized as a key constraint to sustainability while efficient O&M is identified as a key in enhancing the sustainability of systems. Traditionally, municipalities and utilities are responsible for centralised O&M systems, which apparently have failed in many developing countries. Increasingly, donors, government departments and NGO's working with communities in infrastructure, water and sanitation development projects are encouraging the stakeholders or the service users to take up management responsibility of their systems and ensure they are running and in good condition. This paper demonstrates one such arrangement in Nakuru where a private sector service provider (PSSP) is involved in a holistic service provision and O&M of UDDTs, which is hoped to improve the efficiency, resource recovery, increased acceptance and rise in demand for the UDDTs in Nakuru Municipality.

Introduction and Background

Sanitation coverage in Kenya

The situation of sanitation system throughout Kenya is a source of concern. Most urban and peri-urban areas lack adequate sanitation, while the available facilities are misused, poorly maintained and associated with public health and environmental risks. According to the Ministry of Water and Irrigation (2007), the national sanitation coverage increased from 45% in 1990 to 48% in 2006. This clearly indicates that approximately 50% of the 34 million Kenyan do not have access to adequate sanitation. However Kenya is categorised in the group of sub Saharan countries not on track to meet the Millennium Development Goals (MDGs) sanitation target (WHO/UNICEF, 2006) and therefore the need to intervene in alternative

sanitation options and sustainable operation and maintenance.

Sanitation situation in Nakuru

Nakuru is the 4th-largest town in Kenya with ca. 400,000 inhabitants, located about 150 km north-west of Nairobi. The prevailing sanitation systems in Nakuru are water-borne sewer system and on-site sanitation systems. Sewer system covers 19% of the build area and there are about 9,600 registered sewer connections and the recorded average daily sewage flow is 8,991 m³/day (NAWASCO, 2008). In spite of the low sanitation coverage of sewer network, accessibility to some form of sanitation is as high as 98%. The predominant being the traditional pit latrine that covers 50% while the ventilated pit latrine (VIP) covers 14%. Septic tank system is used by 12% of the population while 6% have pour-flush system. A small fraction (2%) lack sanitation facilities at their

Key factors for successful O&M:

- Partnership approach in O&M is key.
- Stakeholders/partners need clear roles and responsibilities.
- Information on O&M to both the service provider and users must be available.
- Continuous awareness creation on UDDT and O&M is crucial.

households and uses the neighbour's toilet, or practice open defecation and flying toilets at night.

Operation and maintenance (O&M) of the sewerage systems and the two wastewater treatment plants in Nakuru is the responsibility of NAWASSCO. On the other hand, O&M of on-site sanitation is mainly the responsibility of heads of the household, while landlords/landladies and agents are responsible for construction and general management for rental residential plots. For shared excreta disposal facilities where landlords/landladies are not present, the users (tenants) contribute towards the O&M by either making financial contributions wherever required or by maintaining the daily hygienic conditions themselves. The O&M of sanitation facilities in schools, churches and other institutions is the responsibility of the respective institutions.

Recently, the Municipal Council of Nakuru (MCN) involved CBOs (community based organisations) and the private sector in collection, transportation and disposal of solid waste, recycling and composting. MCN also licensed CBOs to vend water in water kiosks and private sector in emptying pit latrines. At present a total of 17 private collectors have been licensed to collect and transport solid waste from designated areas within the 14 zones of operation. The MCN still maintains waste collection services in the more lucrative areas, where the private sector remains with the poorer areas within the town.

The ROSA project

The work described in this paper, is part of the ROSA project (Langergraber et al., 2008), an ongoing EU funded project that proposes resources-oriented concepts as a route to sustainable sanitation. These concepts are being applied in four pilot cities in Eastern Africa, namely Arba Minch (Ethiopia); Nakuru (Kenya); Arusha (Tanzania) and Kitgum (Uganda). In all these cities the local project consortium comprises the municipality administration for implementation working jointly with a local university responsible for the research. In Nakuru, the local university involved is Egerton University.

Materials and Methods

Research Overview

One of the major research topics within the project focuses on O&M of resources-oriented sanitation concepts, with the main goal to develop sustainable O&M management strategies for urine diversion dry toilets (UDDTs) in Nakuru. In order to

develop these strategies, a three-step approach was chosen:

1. Baseline study
2. Demonstration of UDDT systems
3. Development / Implementation of O&M strategies

The data collection tools for the baseline study included document review, interviews, stakeholders/focus group meetings, participant observations, seminars and workshops. A survey was also conducted where 215 structured questionnaires were administered to participants to determine the knowledge and willingness to adopt and to use the products from UDDTs to fertilize crops and whether the participants were willing to eat food grown using the products. Most importantly the study sought to find out whether use and up-scaling of UDDTs would be influenced by the responsibility for operation and maintenance of the toilets. Furthermore, meetings with different stakeholders including MCN's Department of Environment, landlords/landladies, tenants, CBOs and private sector service providers were conducted to identify the most suitable method for O&M of UDDTs and also to lay out key roles and responsibilities of each stakeholder.

The demonstration of UDDT systems included a first screening of potential pilot sites, various meetings with stakeholders (resulting in memorandum of understandings), awareness rising campaigns, workshops with artisans, construction and monitoring.

The implementation of O&M strategies was mainly based on a detailed survey on O&M requirements (literature and experiences from other countries), intensive discussions with potential stakeholders and finally implementation of the strategies.

Results and Discussion

Base line study

The responsibility of operation and maintenance of the existing sanitation facilities was undertaken by various players. The survey (ROSA project, 2007) identified responsibility of the players as follows: landlords/landladies (35%), own household (38%), housing agents (7%), MCN (2%) and tenants (18%). This outcome showed that although O&M has a partnership approach, the landlords/landladies and household owners are the main stakeholders to target for any meaningful responsibility. The study pointed out where landlords/landladies provide adequate and improved sanitation facilities, tenants tend to stay longer and hence



Figure 1: Sanitation facility constructed for the Crater View Secondary School.

landlords/landladies benefit from rent fees charged.

One of the crucial outcomes of the study was that 86% of respondents answered, that they are interested in using an UDDT if they are not responsible for O&M. Another important result was that 61% of the respondents were willing to use urine and treated faecal matter in their gardens.

A specific study was conducted to identify CBOs and service providers who are currently involved in solid waste management within the municipality and who may be interested in providing service for the households with UDDTs. Detailed awareness creation and discussion on UDDT systems and their required O&M were held to engage interest in offering the service.

Demonstration of UDDT systems

Pilot 1 - Church and nursery school

The first pilot UDDT was constructed at a church and nursery compound to serve the church congregation of about 50 members and a pre-primary nursery school with an enrolment of 25 children handled by three teachers. The facility consists of two single vault UDDTs, one urinal cubicle with five waterless urinal bowls (three of them are especially designed for children) and one double vault UDDT with solar drying at the back.

The faeces are collected directly in the vault underneath the toilet chamber. The material is stored in 50 litres open containers. The space is enough to allow up to three 50 litre containers to fit in. Once a container fills, it is pushed aside to allow an empty bucket to be placed below the hole and the full one to dry. Urine is collected in a 30 litres plastic container. Provision is made for

discharging the excess urine through an over flow pipe into a soak away pit, with the possibility to collect the urine for a later use.

Furthermore roof water is harvested into a 250 litre tank which is connected to ceramic hand washing basins in both the male and female unit.

Pilot 2 - Residential plot

The UDDT is constructed of masonry and consists of three stance single vaults UDDTs to serve a plot with 28 tenants. One is for female users, one for children while the third, which is also fitted with a urinal bowl, is allocated for male. The construction is similar to church toilets.

Pilot 3 - Crater View Secondary School

The facility caters for 200 students and consists of eight single vaults UDDTs, five for girls and 3 for boys and a urinal with ten urinal bowls (Figure 1). Each vault holds three 50 litre containers for faecal matter. The girls section is fitted with 4 girl's urinal chambers each with a urine channel. The urine is collected and stored into a 2000 litre underground tank constructed of masonry urine storage. When the urine fills in the container it overflows to a soak away pit. Rainwater is harvested from the corrugated iron roof into two 250 litre plastic water tanks.

Drying shed

Two drying sheds were constructed in the project area. The first - to close the loop within the school's compound - at Crater View Secondary School with an area of 22m². The school utilizes both the urine and the dried faecal matter as fertilizer to grow trees, nippier grass and food crop in their farm. Rain water is harvested from the drying shed roof for hand washing.

The second drying shed is bigger in size (40m²) and is located at the dump site (Figure 2) next to MEWAREMA's composting shed. The group members of MEWAREMA (Menengai Waste Recycling Management Group) were involved in site selection, setting up and construction. The MEWAREMA group will dispose the dry faeces in this shed for further drying and treatment into compost. The group will be fully in charge of the drying and its management.



Figure 2: Drying shed at the dump site for centralised composting.

Operation and maintenance strategy

MEWAREMA

MEWAREMA is a community based organised group licensed to collect solid waste from Hilton area, where the pilot UDDTs are located. The group is also involved in making compost at the dump site. After consultancy meetings with the group, they took over the responsibility to provide holistic service including collection, transportation and treatment of faecal matter from UDDTs.

Collection and transportation

After awareness creation and training on the business opportunities arising from the UDDTs in terms of collection and composting, MEWAREMA agreed to undertake the activity of collecting and transporting dry faecal matter from households within London and Hilton to the drying shed at the dump site at a cost of between 100 and 200 Kshs (Kenyan Shillings) per household per trip.

Landlords/landladies interviewed on the fee were positive and indicated they were willing to pay between 100 and 200 Kshs per collection.

Method of transportation

Currently only two pilot UDDT facilities are in use and therefore only small quantities of faecal matter are produced and available for transportation. However, six landlords/landladies are in the process of constructing UDDTs in the area and it's expected the up scaling to increase in time.

Considering the low quantity of faecal matter, the most appropriate and affordable method of transportation is a donkey drawn cart. The cost of investment on the initial transport system is calculated at 55,000 Kshs. The system will include a towing cart of a capacity of 500-600 kg and two donkeys.

MEWAREMA is in the process of applying for a 50,000 Kshs loan from the Family Bank for acquiring the donkeys and the cart.

Treatment and Reuse

The collected faecal material is further co-composted together with organic waste at the dump site and afterwards sold to NAWACOM. NAWACOM is an NGO based in NAKURU that has a joint venture with MEWAREMA and is responsible for marketing and compost selling.

Financial point of view

The collection fee suggested by MEWAREMA (100-200 Kshs) is moderate considering that emptying will be done once per 3 to 6 months depending on the number of users. Furthermore landlords/landladies interviewed were willing to pay up to 100 Kshs per month for collection service. For MEWAREMA the O&M service is anyhow a win-win situation: they are getting paid for collection and transport and are earning further income from selling the compost to NAWACOM.

Up-scaling

MCN, NAWASSCO and ITDG are in the process of developing a five year business plan to facilitate up-scaling of on-site sanitation in peri-urban areas. The bankable business plan is aimed to be funded by the Dutch SPA (Sanitation Program Africa) program on a fifty-fifty basis (50% loan and 50% grant). The loan part will go in operating accessible revolving loaning scheme in partnership with a local bank for landlords/landladies and institutions who aim to construct appropriate sanitation facilities in selected peri-urban areas. Despite a mix of appropriate sanitation options being promoted, UDDTs will be given priority.

Up-scaling of UDDT implementation is already on progress and approximately 15 landlords/landladies have benefited the loan and constructed improved sanitation (Figure 3); 10 landlords/landladies decided to construct UDDTs.



Figure 3: Two examples of privately constructed UDDTs.

Conclusion

This paper demonstrates that sustainable O&M for a sanitation system based on UDDTs and consequently well maintained sanitation facilities can be achieved by involving private sector service providers to collect and transport the dry faeces to a centralised shed for further treatment into compost. The service providers shall also be fully in charge of selling the compost and its management. The potential for up scaling UDDTs in the future is very high due to the ongoing SPA programme where so far 75% of loan beneficiaries opted for UDDTs. The main challenge for the future will be the capacity to operate and maintain the increased number of UDDTs and to increase the demand of compost.

Acknowledgement

The work is carried out within the Resource-Oriented Sanitation concepts for peri-urban areas in Africa (ROSA) project; Contract No. 037025-GOCE; duration: 1.10.2006 – 30.9.2009), a Specific Target Research Project (STREP) funded within the EU 6th Framework Programme, Sub-priority "Global Change and Ecosystems". The ROSA team is grateful for the support.

References

- Langergraber, G., Meininger, F., Lechner, M., de Brujne, G., Sugden, S., Niwagaba, C.B., Mashauri, D., Mutua, B.M., Teklemariam, A., Achiro, I., Kiarie, S.C., Laizer, J.T., Ayele, W. (2008): The ROSA project – A new approach to sustainable sanitation in Eastern African cities. In: *Proceedings of the 6th IWA World Water Congress*, 8-12 September 2008, Vienna, Austria. (CD-ROM, paper 664279).
- Ministry of Water and Irrigation (2007): *The National Water Services Strategy (NWSS), 2007-2015*. Republic of Kenya, Nairobi, Kenya
- NAWASSCO (2008): *Corporate Plan: 2008-2012*. Nakuru Water and Sanitation Services Ltd., Nakuru, Kenya.
- ROSA Project (2007): *Baseline Study on Water and Sanitation for Nakuru Town, Kenya*, Nakuru, Kenya
- WHO/UNICEF (2006): *Meeting the MDG Drinking Water and Sanitation Target – The Urban and Rural Challenge of the Decade*. WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation, Geneva, Switzerland.

Name: Edward Muchiri
Organisation: ROSA Project, Egerton University
Country: Kenya
e-mail: edmuchiri@yahoo.com

Name: Benedict Mutua
Organisation: ROSA Project, Egerton University
Country: Kenya
e-mail: bmmutua@yahoo.com

Name: Elke Müllegger
Organisation: EcoSan Club
Town, Country: Vienna, Austria
e-mail: elke.muellegger@ecosan.at