Case study of sustainable sanitation projects

Community ablution blocks with sewers or infiltration eThekwini (Durban), South Africa

Figure 1: Project location.

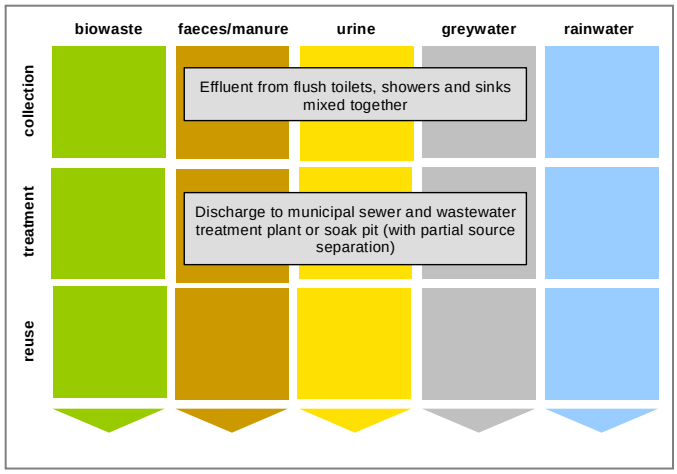

Figure 2: Applied sanitation components in this project (currently no reuse taking place).

1 General data

Type of project:
Ongoing, full-scale project of urban upgrading with community-based water and sanitation.
Project period:
Start of construction:
2004-2007 by eThekwini Health and Housing Departments
2009-2011 by eThekwini Water and Sanitation Department
End of construction: construction still ongoing
Project scale:
Number of ablution blocks:
108 brick blocks built by eThekwini Health, Architecture and Housing Departments
240 container blocks built by eThekwini Water and Sanitation Department
Number of inhabitants covered: Approx. 600,000
Total investment: 280 million Rand (31 million EUR)
Address of project location:
Informal settlements in urban and peri-urban areas of eThekwini municipality, Durban, South Africa.
Planning institution:
eThekwini Housing Department and Water and Sanitation Department, Durban, South Africa.
Executing institutions: EWS and consultancies companies (i.e. Aurecon, SBA); local contractors (i.e. Sanyati, WBHO) and subcontractors (i.e. Emzini Projects)
Supporting agency:
eThekwini municipality of Durban, South Africa.

2 Objective and motivation of the project

The Constitution of South Africa gives responsibility for provision of water and sanitation to the local governments. Other legislative pillars governing the water and sanitation sector in the country can be found in the Water Supply and Sanitation Policy (DWAF, 1994), the Water Services Act of 1997 (RSA, 1997), the National Water Act of 1998 (RSA, 1998), and the White Paper on Basic Household Sanitation (DWAF, 2001).

In Durban, eThekwini Water and Sanitation (EWS) is the authority responsible for providing water and sanitation to the 3.5-million population. Under this mandate EWS has the duty to provide services according to principles of:

- Equity (easily accessible to the population)
- Affordability
- Environmental effectiveness (pollution prevention, health promotion, complain with national and provincial legislation)
- Sustainability (limited cross-subsidy, is maintained and accepted by communities).

Figure 3: Prefabricated container in Durban (source: eThekwini Water and Sanitation, 2010).

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EWS is world leading service authority, providing the population several water and sanitation options, such as roof and ground water tanks, and urine diversion dehydration toilets (see separate SuSanA case study: http://www.susana.org/docs_ccbk/susana_download/2-791-en-susana-cs-south-africa-ethekwini-durban-uddts-2010.pdf).

Among these services, an important initiative is designed to provide communal water and sanitation facilities to un-served informal settlements in the urban and peri-urban areas of Durban, located within the sanitation waterborne edge (Figure 4). The purpose of this intervention is to provide each household with access to basic services, pending the formal housing intervention. The installation of community ablution blocks (CABs), in fact, is linked to a city re-housing programme, which aims to eradicate informal dwellings over the next decades and relocate people in fully serviced houses (eThekwini Municipality, 2006). Thus, CABs are a temporary service for those informal urban settlements that will not be upgraded by the Housing Department in the next 5 to 15 years.
This initiative was started by the eThekwini Health, Architecture and Housing Departments in 2004. Since the end of 2008, the project was taken over by eThekwini Water and Sanitation (EWS).
This case study documents the efforts to serve informal settlements undertaken by EWS.

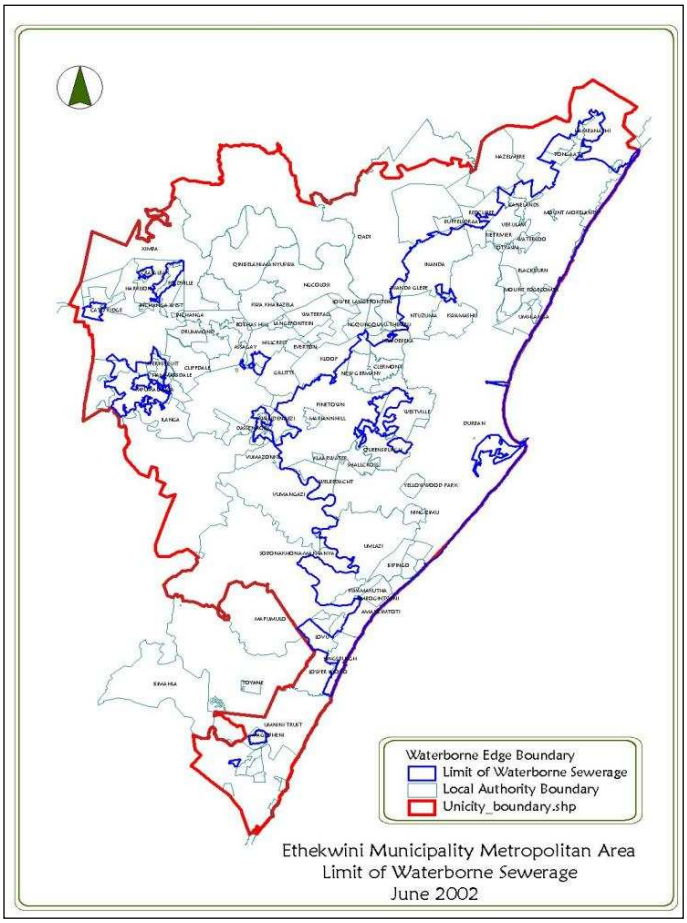

Figure 4: eThekwini waterborne edge (source**:** EWS, 2002).

3 Location and conditions

The achievement of sustained water and sanitation systems in South Africa is a daunting task due to water scarcity, water stress and high urbanisation rate caused by increasing migration from the rural areas (UNEP, 2002).

In the urban and peri-urban areas of Durban, 1 million people live in informal settlements, densely populated areas, characterised by different soil types, generally floodplains and dolomitic lands (Eales, 2008).

At the time this case study was prepared,150,000 families are estimated to occupy 417 informal settlements in eThekwini, living in basic shacks and suffering from poor water and sanitation conditions. Standpipes and water tanks are the main sources of water supply, whilst open defecation, pit latrines or Ventilated Improved Pit (VIP) latrines are the most common sanitation options.

4 Project history

Community Ablution Blocks are shared water and sanitation facilities of brick construction (the old type installed by the Health Department) or prefabricated containers, modified to meet acceptable standards by adding ventilation and appropriate plumbing. Generally, the facilities are characterised by female and male blocks, provided with toilets (and urinals for men), showers, hand wash and laundry basins. A block should serve 100 housing units; in reality, however, a single block may serve up to 200 dwellings (each composed of an average of 5.5 people).

Since 2004, the implementation of CABs was undertaken under the joint responsibility of eThekwini Housing and Architectural Department, with health and hygiene education provided by the Health Department. Under their supervision a total number of 108 ablution blocks of brick construction was built.

From the end of 2008, EWS took over the Health Department in the implementation of the communal systems. EWS role involves the maintenance and repair of old existing blocks and the delivery and installation of new blocks, in the form of prefabricated containers. Since the take over, EWS has installed 240 CABs, which together with the existing 108 accounts for 348 facilities. In 2010 all CABs have a caretaker, cleaning material and toilet papers paid by EWS.

5 Technologies applied

There are several technology options for CABs depending on the characteristics of the areas where they are installed (Buckley, 2005). These are the following:

Sewer discharge
In densely populated areas located in close proximity to a sewer line, the toilet block is connected to a sewer system. Each block has two separate areas: the male part is characterised by 2 or more flush toilets and 2 urinals, 2 wash hand basins and 2 showers. The female part presents 4 or more flush toilets, 2 wash hand basins and 2 showers.

Laundry facilities are generally present. The dwellings should be within a radius of 150 to 200 m from the toilet block.

Lighting at night is provided via translucent roof sheeting and external mast mounted floodlighting. Provision is made for a storeroom and washstand. In some areas a fencing system is provided.

Wastewater is reticulated to the nearest wastewater treatment plant (WWTP). There are 27 WWTPs serving eThekwini municipality, which treat 500 ML/d and serve 498,341 people approximately. The WWTPs produce approximately 95 tons (dry) sludge per day. By 2020 this quantity is expected to increase to 120 ton/d. Of the sludge currently produced, 50% is disposed together with pre-treated effluent through the two sea outfalls, 20% is incinerated and 30% is stockpiled at treatment works sites.
The South African Department of Water Affairs (DWA) has established the Green Drop initiative to assess the performance of wastewater treatment plants in the country.

The WWTS performance is measured against a set of criteria:
- Process control maintenance and management skill
- Monitoring programme efficiency
- Credibility of waste water sample analysis
- Regular submission of Waste Water quality results to DWA
- Waste water quality compliance
- Waste water failure response management
- Waste water treatment works capacity

According to this programme the overall management and performance of Waste water treatment plants in eThekwini is deemed very good, producing an Average Green Drop score of 80% (DWA, 2009).

Ablution block to storage tank or VIP pit

Where no local connection to the sewerage system is feasible, the toilet Block is connected to a storage tank or to VIP pits. Generally an effluent minimization strategy (diversion of grey and urinal effluent, low flush) is adopted to reduce the cost of transporting the effluent. The effluent is reticulated into a storage tank (or individual pits) and emptied at regular intervals by the municipality. Adequate space and road access must be available for a vehicle to pump the effluent out of the tank.

In the municipality, there are 8 toilet facilities with VIP latrines. Generally, a single block serves 50 informal housing units (composed of 4 people per dwelling, on average). The block structure has a separate part for males and females but, in this case, no showers are provided. Only faeces and urine may enter the pit.

Water Provision

In those CABs connected to the sewerage systems, water is reticulated to the facility. Typically, blocks are supplied with water meters and water consumption per person is estimated to be around 35-40 litres per day.

In the VIP block, water is supplied through standpipes located at a reasonable distance from the ablution block and drained to a soak away. Laundry activities take place around the standpipe and not drain into the pits.

6 Design information

A series of criteria must be met to implement a CAB project (Gounden, 2008). These are the following:

- Land acquisition: informal settlements are located in private plots; hence a formal permission from the landowner to build in his/her land must be obtained by the municipality.
- Space consideration: Sites or plots must be greater than 250 m^2.
- The average slope of the ground must be less than 1:3.
- Environmental consideration: there must be low risk of groundwater pollution, or if present, this must be can be mitigated.
- Site must have basic level of water supply.

Design parameters vary among different areas, as different local contractors tender to design, construct and deliver the facilities. While under the management of the Health Department, containers of brick material were built, EWS opted for prefabricated containers that can be easily moved and substituted (see Figure 3).

Containers are designed, built and implemented by consultancies, local contractors and sub-contractors, which are appointed by EWS by means a tender process.
Containers dimensions and design specification may vary among suppliers. Typically, male and females units are separated in different blocks. A male block generally contains:
- 2 urinals
- 2 or more flush toilets
- 2 showers
- 2 washbasins

A female block includes:
- 4 or more toilets
- 2 or more showers
- Hand wash basins
- Laundry basins outside the facility

Figure 5 below illustrates the typical layout of a toilet block.

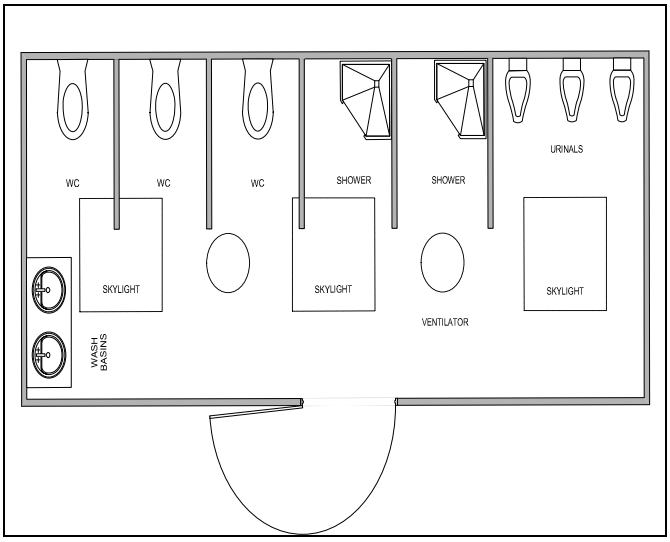

Figure 5: Typical design of a CAB (source: EWS, 2009).

7 Type and level of reuse

Currently, no reuse options are in place in the CABs. Wastewater reuse would be a beneficial option, for water scarcity represents a severe problem in eThekwini municipality and in most areas of South Africa. Where compliance with national law and regulations is met, wastewater reuse could be employed for agricultural purposes and/or groundwater recharge. Furthermore, the reuse option would be economically beneficial if compared with the costs generated from operation and maintenance of centralised conventional treatment systems and the environmental and health negative effects derived from using simple sanitation options such as VIP latrine.

The EWS department has welcomed several research projects looking into possibility of reusing human waste. Among these, EWS is exploring future opportunities to increase the sustainability of CAB by introducing Decentralised Wastewater Treatment systems (DEWATS) to new and existing blocks. The DEWATS systems, based on anaerobic baffle reactor treatment technology, can minimise water pollution and guarantee an economic and sustainable reuse of treated effluent for agricultural purpose. Biogas production will also be generated in the facilities.

Figure 6: Examples of washbasins and laundry facilities at CABs (source: EWS, 2008).

8 Further project components

The implementation of community sanitation by EWS has been accompanied by the provision of educational and training to the communities. EWS is involved in a wide range of programmes focusing on promoting water conservation, water demand management, sanitation, health and hygiene awareness in informal settlements. Educational material, such as posters, explanatory leaflets, are provided in both English and isiZulu and distributed to communities by EWS officers.

Further educational initiatives take the form of street theatre performances, which reach out broad spectrum of users, particularly the poorest and illiterate communities. Community participation is enhanced further through a competition, run in conjunction with the street theatre, with a lucky draw and prizes as incentives.

More specific training activities are addressed to the caretakers of communal facilities. Caretakers are trained by EWS staff on technical, environmental, hygiene and management aspects related to the facilities. Furthermore, the caretaker is encouraged to report leakages, pipes breakdown to the EWS costumer care help line.

Besides training and education initiatives, the municipality has encouraged the implementation of Community Health Club (CHC) pilot project by Africa Ahead (www.africaahead.com). In the Community ablution block of Johanna road, Africa Ahead trains facilitators from the communities to promote health and behavioral change by means of PHAST (Public Health Action Support Team) participatory activities. Similar approaches have been adopted by the organization in several other African countries (Waterkeyn, 2010).

A final component of the CABs project under EWS management, is the creation of several local jobs as labour for the construction of the facilities is sourced from local communities and the stimulation of small business development for the provision of blocks and products by use of local resources.

9 Costs and economics

The total investment costs for EWS - from January 2009 to December 2011 - was 280 million South African Rand (ZAR) (31 million EUR). The actual cost of prefabricated containers is 65,000 ZAR (7,200 EUR). The total costs for a pair of CABs, including transport, site preparation, O&M, hardware and software is approximately of 200,000 ZAR (22,100 EUR).

Through a tender process, EWS selects programme consultancies, local contractors and sub-contractors dealing with the project implementation. Specifically their duties are the following (EWS, 2010):

- Local consultants provide design services for each informal settlement and monitor the quality of the construction works.
- Contractors and sub-contractors have the purpose to lay new water and sewer lines including connections to existing infrastructure, as well as constructing the platforms for the toilet blocks/containers. Sub-contractors receive 20% of contractors' budget, whilst local labour receives 10% of contractors' budget (EWS, 2010).

The project is entirely funded by EWS: CABs users do not pay for the services provided. In terms of the Water Service Act (1997), all municipality customers, irrespective of the level of service, receive the first 6 kL of water per month at no cost (EWS, 2004). As of 1 July 2010, this amount of free water provided has been increased to 9 kL of water per month. Thus, any customer who limits their monthly usage to below this figure receives a free water supply. Similarly, there are no charges for the disposal of use of the first 9 kL of water per month (EWS, 2010b).

10 Operation and maintenance

Health practitioners and community education officers employed by the municipality are in charge for the facilitation and monitoring of the communities served by the CABs. The

municipality provides maintenance of the systems, supplies cleaning materials and toilet paper.

A caretaker, appointed by the municipality, is in charge of the daily management of the facility, providing cleaning and communicating with health practitioners and education officers in case of problems in the facility. Caretakers' responsibilities are:

- Management and cleaning of the facility,
- Ensuring availability of toilet paper and cleaning products, (provided by the municipality),
- Reporting to EWS about structural problems with the facility (i.e. leakages),
- Supervising the facility during duty, to ensure access to user.

Under management of the Health Department caretakers have worked on a voluntary basis, deriving their salary from collection of voluntary contributions from users. Since EWS' takeover, caretakers are appointed and paid by the municipality to maintain the systems.

Figure 7: Caretakers and external part of a CAB in Durban (source: EWS, 2008).

11 Practical experience and lessons learnt

Surveys and assessment of experiences with CABs are routinely undertaken in the areas by EWS and by external research projects (Roma et al., 2010). These activities are extremely important as users' feedback on the services provided enables the municipality to adapt new interventions to identified problems.
Table 1 illustrates some of the lessons learnt from past experience and the related interventions undertaken.

Table 1: Lessons learnt from past experience and related interventions.

Past experience	Interventions made
Major maintenance problems have been identified in areas where there was no caretaker supervision.	Local caretakers are appointed and paid a regular salary by eThekwini municipality.
Users did not purchase toilet paper and used newspapers instead causing blockages of the systems.	Toilet paper and washing material are provided by the Municipality and freely distributed by caretaker.
In some CAB areas crime and anti-social behaviours occur at night, making it difficult for women and children to use the facilities.	The provision of lights and fences, as well as constant presence of a caretaker provides a safer environment.
Copper pipes and other material used for taps and shower has been stolen.	Materials have been replaced by plastic pipes and taps.

Experience with CABs has proved that building a facility alone does not systematically eradicate the problem with poor water and sanitation, rather a more holistic approach is required to cover all aspects.

Generally, acceptance of the systems is mixed: dwellers living in close proximity to the block are more satisfied with the services provided by the facility. This is because they do not have to walk long distance to use the systems carrying clothes or water buckets.

Further interventions to improve the liveability of the facilities and infuse a sense of ownership in the community will be taking place from mid 2010. This will involve the introduction of micro-finance schemes with the construction of kiosks and shops inside or next to the blocks to generate employment in the communities and encourage social gathering at the facilities.

12 Sustainability assessment and long-term impacts

A basic assessment (Table 1) was carried out to indicate in which of the five sustainability criteria for sanitation (according to the SuSanA Vision Document 1) this project has its strengths and which aspects were not emphasized (weaknesses).

Table 2: Qualitative indication of sustainability of system. A cross in the respective column shows assessment of the relative sustainability of project (+ means: strong point of project; o means: average strength for this aspect and – means: no emphasis on this aspect for this project).

	collection and transport			treatment			transport and reuse[1]		
Sustainability criteria	+	o	-	+	o	-	+	o	-
• health and hygiene	X			X					
• environmental and natural resources			X		X				
• technology and operation		X			X				
• finance and economics		X		X					
• socio-cultural and institutional	X			X					

[1] not part of the project

Sustainability criteria for sanitation:
Health and hygiene include the risk of exposure to pathogens and hazardous substances and improvement of livelihood achieved by the application of a certain sanitation system.
Environment and natural resources involve the resources needed in the project as well as the degree of recycling and reuse practiced and the effects of these.
Technology and operation relate to the functionality and ease of constructing, operating and monitoring the entire system as well as its robustness and adaptability to existing systems.
Financial and economic issues include the capacity of households and communities to cover the costs for sanitation as well as the benefit, e.g. from fertilizer and the external impact on the economy.
Socio-cultural and institutional aspects refer to the socio-cultural acceptance and appropriateness of the system, perceptions, gender issues and compliance with legal and institutional frameworks.

For details on these criteria, please see the SuSanA Vision document "Towards more sustainable solutions" (www.susana.org).

The impacts of EWS intervention in informal settlements are several. From a health perspective, the systems provide a solution to the urgent water and sanitation situation faced by informal settlements of Durban. The interim provision of basic water and sanitation can tackle waterborne and water related diseases widespread in the areas, as well as help mitigate the impelling HIV problem in informal settlements, providing the hygienic services necessary for people suffering from AIDS.

Financially, the construction of CABs can generate new job opportunities for people in informal settlements, alleviating the high unemployment in the areas. On a greater scale, CAB projects can stimulate the development of local entrepreneurship by sub-contracting construction works to local enterprises. From a social point of view, the introduction of water and sanitation services will infuse a sense of dignity onto local communities and allow for people's privacy as well as increase security for women.
Although communal blocks are conceived as temporary solutions, EWS is striving to enhance the project sustainability by encouraging initiatives that stimulate users' ownership of the facilities, their involvement in O&M.

Only few external research investigations on the social impacts of CABs have been conducted (Roma et al., 2010). EWS is planning to undertake impact assessment studies of the sustainability of the implemented toilet blocks and investigate their impacts from health, socio-economic, technical and environmental perspectives.

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Further Readings

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Websites
eThekwini municipality: www.durban.gov.za
Department of Water Affairs and Forestry: www.dwaf.gov.za

14 Institutions, organisations and contact persons

Main Author: Elisa Roma (roma@ukzn.ac.za)
Contact Persons: Chris Buckley, Elisa Roma

Project owner:
eThekwini Municipality, Water and Sanitation Department
Teddy Gounden
3 Prior Road
Durban, South Africa
T: 031 311 8603
E: TeddyGo@dmws.durban.gov.za
I: www.durban.gov.za

Research Support:
Chris Buckley
Pollution Research Group,
University of KwaZulu-Natal
Durban
South Africa
T: +27 31 260-3131
E: Buckley@ukzn.ac.za

Elisa Roma
Research Fellow
Pollution Research Group,
University of KwaZulu-Natal
Durban, South Africa
E: roma@ukzn.ac.za

Consultant/supplier/private company:
Subdivided by operational areas
Consultancies:
Northern area: SBA (Pty) Ltd
Central area: Aurecon
Western area: BKS (Pty) Ltd
Southern area: CBI Consulting Engineers (Pty) Ltd
Contractors:
North area: Icon Construction (Pty) Ltd
Central area: Sanyati (Pty) Ltd
Western Area: WBHO/IN-SITU PIPELINES JV
Sothern area: WK Construction (Pty) Ltd

Subcontractors:
Northern area:
- Nomangisi Construction
- Abangani Projects

Central area:
- Emzini Projects
- Madondo-Hughs

Western area:
- Royal Africa Trading
- Sbonisiwe Investments

Southern area:
- Old Town Investments
- Ekuhawukeni Trading Enterprise

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Authors:
Elisa Roma, Chris Buckley, Sandile Mbatha, Lucky Sibiya and Teddy Gounden

Editing and reviewing:
Elisabeth von Münch, Stefanie Holzwarth (GTZ, contact: ecosan@gtz.de)

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