A NEW LOOK AT SANITATION IN A DEVELOPING COUNTRY CITY

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ABSTRACT

Cities in developing countries face challenges that are not common in developed country cities, when it comes to the provision of sanitation. These cities face rapid population growth, high levels of poverty and unemployment and need to balance the financial demands of existing assets while expanding infrastructure coverage and building new assets.

In Durban, the provision of a sanitation service to poor communities, which make up 40% of the population, has been done in a way that has the objectives of ensuring sustainability, creating employment, improving public health, aiding food security through nutrient recovery and in the longer term recovering energy from human excreta. Sanitation technology is evolving rapidly and the innovative approaches to meet the sanitation needs of communities are described.

Research has been the foundation of this innovative approach and has resulted in a new understanding of community needs and the underlying factors behind these needs. Research has also resulted in the development and identification of new technologies necessary to provide affordable, sustainable sanitation solutions. Sanitation is on the verge of a technology revolution that should change our views of how a toilet looks and behaves. This new technology should enable cities in developing countries to leapfrog the current approaches which involve large capital investments in infrastructure – much has been the case with mobile telephone networks replacing fixed line networks – and allowing rapid growth in the coverage of water and sanitation services to poor unserved communities.

INTRODUCTION

The eThekwini municipality, with Durban at its centre, is a metropolitan municipality with a population of 3.5 million people. In 2001 the population was 3 million people but rapid urbanisation and the inward migration of people from neighbouring municipalities has led to this population growth despite the ravages of the HIV Aids pandemic that has affected the region. The municipality is faced with high levels of poverty and unemployment with approximately 40% of the residents earning less than $2 a day and unemployment levels reported to be around 30%, depending on the method of measurement used.

At the formation of the metro as it exists at present in 2000, the region could be described as a city of three one millions;

- one million people were without municipal water and sanitation services
- one million people were supplied through severely run down services with non-revenue water values in excess of 80% being common in certain areas, a backlog of leaks and blocked sewers and consequently low levels of payment for the provision of the services.
- one million people with first world services similar to any large city in the world, with flushing toilets in every home and effective asset management in place and non-revenue water running at approximately 14%.

This rapid migration of people looking for work and services has placed pressure on the ability of the municipality to meet the expectations of communities. The challenge has been compounded by the fact that in tribal land areas owned by the Ingonyama Trust, no property rates are paid by residents living there. This is led to rapid development of these areas and the construction of large houses which are unable to dispose of their sewage effluent effectively. This rapid development has had an adverse impact on the quality of the water in the rivers in the region.

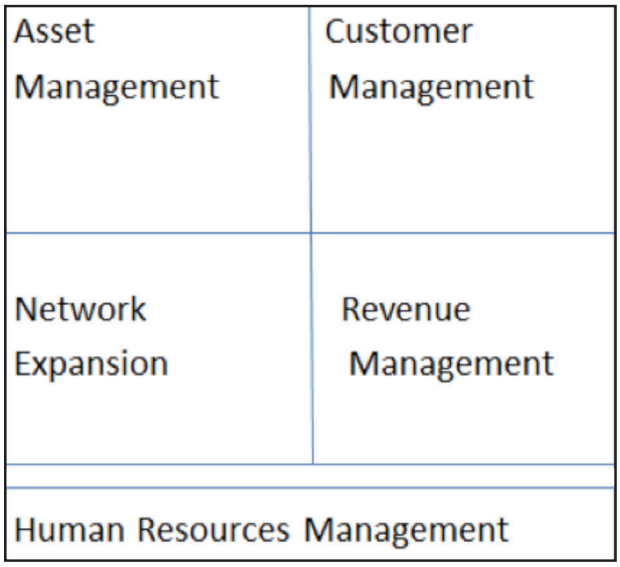
A BUSINESS APPROACH TO MANAGEMENT

eThekwini Water and Sanitation (EWS) has developed a regular annual strategic planning and review process where the senior management team have an opportunity to set the key strategic direction for the ensuing year and agree on the five key strategic focus areas that need the attention of the full management team. Each of these senior managers is set measurable key performance indicators that are reported on and reviewed monthly.

In order to gauge the views of customers and staff, independent market surveys are conducted regularly to measure the perceptions of the public and obtain an independent view of EWS's performance in meeting the expectations of customers.

The organisation has a culture which encourages innovation and allows mistakes to be made so long as they are learnt from and not repeated. In order to ensure cost reflective tariffing, the financial accounts for water and sanitation are ring-fenced and audited independently with tariffs being set for each of the services to recover operating, interest, depreciation and capital repayment costs.

The following five box matrix is used as a tool to manage the business of providing water and sanitation.



The management framework is built on the basis of sound human resources management to ensure that the organisation has adequately trained and competent staff to perform the functions that are required. Building on this foundation it is then possible to achieve the objectives of the organisation. The key area of focus is the customer. If customers are satisfied with the services provided, then they will pay for these services and as a result sufficient revenue will flow to sustain the business. The right hand two blocks of the matrix therefore generate revenue whereas the left hand two blocks are where this revenue is spent; either on maintaining the condition of existing assets or providing new assets for those who do not yet have access to a service.

In a developed economy, cities are able to focus most of their capital expenditure on asset management, replacing existing assets with new assets at the optimal time. Cities in developing countries or under-developed countries face the challenge of balancing the demand on limited capital resources for both expansions of the network and asset management.

PROVISION OF NEW INFRASTRUCTURE ON EXPANSION OF SERVICES COVERAGE

EWS has extended basic water services to more than 1.3 million people in the past ten years and basic sanitation services to more than 700 000

people in the past seven years. The provision of sanitation lags that of water because the initial emphasis on and demand from communities was for the provision of potable water. Sanitation did not receive the same attention and was not marketed as effectively as the need for a clean water supply. The work of Lutchminarayan on the health impacts on the provision of urine-diverting toilets in the eThekwini municipal area showed the positive health impacts of sanitation with marked reductions in visits to local clinics for the treatment of illnesses relating to poor sanitation. Infrastructure solutions have to be affordable and sustainable. Affordability implies that the municipality or water services provider is able to operate and maintain the levels of service chosen and equally the customers must be able to afford the ongoing cost associated with the level of service that they have chosen. Infrastructure solutions also have to be provided in a sustainable way.

They must be financially sustainable as indicated above, environmentally sustainable in that the sanitation solution chosen does not pollute the environment and specifically ground and surface water and socially sustainable in that the solutions offered are acceptable to communities and are therefore used as intended. A key element of the provision of new infrastructure is that of ensuring its acceptance by the community. An important tool in this regard is the use of local labour to construct and possibly maintain the services provided.

This leads to the local community having a stake in the investment made and the level of vandalism and abuse has been seen to reduce compared to other externally focussed delivery options that do not benefit communities directly. In providing services, customers need to be given options from which to choose with a range of costs associated with a variety of options. Communication of the benefits and disadvantages of these options, together with the associated costs, both capital and operating, underpins the success of any community based sanitation project. It is also important to ensure that the levels of service selected for water and sanitation are balanced, in that the amount of water delivered to a site can safely be disposed of, either on the site or through a piped network leading to an appropriate sewerage treatment facility.

The eThekwini municipality offers four levels of water service which are intended to be matched by an equal number of sanitation levels of service. The water levels of service are as follows:

1. Standpipes provided within 200 meters of any house.
2. An onsite supply delivering 300 litres per family per day.
3. A semi-pressure, unrestricted supply where all the water to a family is supplied through a 170 tank located on the roof of the house.
4. A full-pressure, unrestricted supply of water.

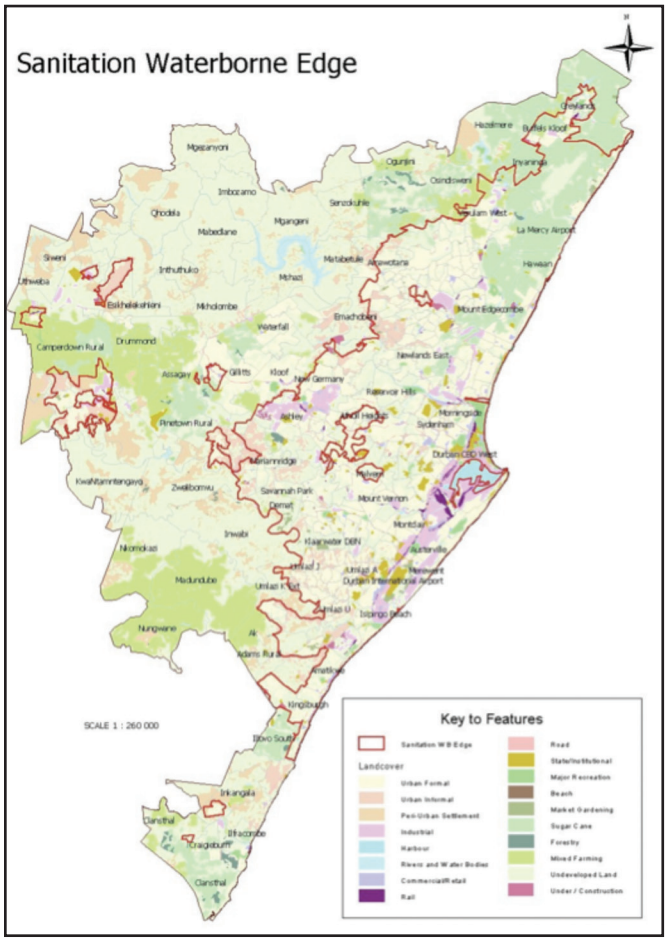
To match these levels of service for water, the following levels of service of sanitation are offered:

1. A urine-diverting toilet at each house.
2. An on-site septic tank system provided by the home owner.
3. Piped waterborne sanitation for properties within the sanitation edge.
4. A communal toilet block facility which provides both water and sanitation services to families living in dense shack areas.
   These communal toilet blocks are maintained by toilet attendants paid by the municipality.

Within the municipality there are approximately 40 000 VIP type toilets which were provided by previous local authorities before their incorporation into the metropolitan area. In terms of the Council's basic sanitation policy, these toilets are emptied once every 5 years at no charge to the property owner.

THE SANITATION EDGE CONCEPT

In Durban, where housing densities permit, piped waterborne sanitation is provided using conventional or in some cases, shallow sewers. These sewers connect to 28 sewage treatment works. Beyond this edge, dry sanitation in the form of urine-diverting toilets is generally offered. These toilets are constructed using subsidy funding from the national



government, topped up by capital secured from the Council's capital budget. These toilets have two compartments and a facility to divert urine either to a soak-away or to a storage container. Research is currently underway to determine the most effective way to collect this urine and process it to recover the plant nutrients such as phosphorus and nitrogen which are contained within the urine.

At present more than 10 000 litres of urine is collected weekly as part of a research initiative to determine the most cost effective way to collect and process urine. The two compartments of the UD toilet are used alternatively. When one compartment is full, the faecal matter is allowed to dry for approximately 2 years while the second compartment is used. Before the toilet bowl is returned to the original compartment, the dry faecal matter is removed and usually buried on site. It is intended that this dry faecal matter will also ultimately be collected and processed along with the urine to produce fertilizer pellets that are suitable for use in agriculture. The reality that EWS faces though is that most people see the flushing toilet as the "gold" standard and regard any other alternative as being of lesser quality.

ASSET MANAGEMENT

Asset management relates to the maintenance of the condition of assets which already exist. Most water services organisations in developed countries spend more than 90% of their capital budget on asset management, generally replacing existing assets before they reach the end of their useful life. Many cities in developing countries have poor asset records – Durban is no exception where the records that were

consolidated on the creation of the metropolitan authority were found to be often inaccurate or deficient in that not every asset was recorded accurately. The condition of assets is also largely an unknown quantity and this makes asset management a more complex task.

Thankfully tools exist today such as Geographic Information Systems (GIS) which allow for the storage of large volumes of data in an easily retrievable form. The GIS database in the municipality contains information which makes it possible to record the condition of assets over time as well as details of the assets such as the construction cost, the condition of the asset, the maintenance expenditure incurred against the asset as well as design drawings related to the asset.

CUSTOMER MANAGEMENT

The eThekwini municipality has a toll-free call centre that enables poor families to make contact with it at no charge. These calls are toll-free from any fixed line telephone as well as from one of the cell-phone operators in South Africa. Regrettably two of the major cell-phone companies are unable to provide such a service. The call centre works 24 hours a day for 365 days a year and processes approximately 1.2 million calls each year.

In cases where poor customers, or customers who are unwell, are unable to visit any of the district offices in this municipal area, customer service agents are available to visit these families and attend to their queries. The computer system that operates in the call centre is designed to be used by staff who are not technically skilled and the system dispatches calls to the relevant field teams for their attention. Regular updates are received from the field crews which make it possible for staff in the call centre to provide feedback to customers as the repair work unfolds. Customers are also randomly selected for return calls to verify that the fault has been resolved to the satisfaction of the customers phoned.

Happy customers are customers who pay their accounts so everything is done to make customers happy. It has been found that customers who feel that their views are listened to and taken into account in the formulation of policy feel more satisfied with their service provider. As a result, use is made of focus groups and user platforms where representatives of communities meet with EWS to discuss matters of general concern and propose amendments to policy. The use of phone and radio programmes has proved to be a success where once a week, staff of EWS have gone on air to speak about a topic and take questions from the listeners. This improves customers' understanding of the policies of the Council and also allows customers to raise matters of interest to them. Research has shown that few customers read newspapers and many only listen to the radio or television at particular times of the day. Given that these are peak listening times, securing advertising slots has proved to be very expensive. As a result, the use of street theatre has been found to be a suitable alternative. Initially it was found that retention of messages conveyed through street theatre was very poor but once prizes were offered for the correct answers to questions related to the presentation, the retention rate increased markedly. EWS has a service level standards booklet which describes every service that is offered together with the expected response time. The customer service charter sets out the performance standards of EWS and advises customers who they may escalate any complaints or compliments to with respect to the service they have received.

Communication is not a uni-directional process. It is necessary for the service provider to understand its customers as much as customers need to understand the policies and processes of the service provider. Considerable effort is therefore made to ensure that customers and community leaders understand the policies of the Council. This means that communities can hold EWS to account based on a common understanding of policy and any criticism will be based on a correct understanding of the policy.

A NEW SANITATION PARADIGM

In engaging with communities about their expectations from a toilet, a large sample of residents living in informal areas were asked what their relationship was with their toilet and what came to mind when the word "toilet" was mentioned. The participants in the survey said that they saw the toilet as a place of refuge and contemplation, a place to be private, where they could escape from their partner or children and where they could sing, read, cry, pray, etc. They also expected the toilet to be a clean place that did not smell and a place that was safe to use without any fear of being attacked or abused. This means that customers need a toilet that is clean, well-lit and safe to use. It is therefore no surprise that pit toilets or communal toilets that are not well maintained are not acceptable to communities as they do not meet the abovementioned criteria. Initial attempts by EWS at communal sanitation were unsuccessful in that these toilets were vandalised within months. Once adequate lighting was installed so that the facilities were well-lit both internally and externally and once caretakers were employed and provided with the cleaning materials and toilet paper, the levels of vandalism of communal toilets dropped noticeably and the level of acceptance rose to above 80%.

Taking this research further and in co-operation with others, EWS are now working on solutions that will allow small decentralised waterborne sewerage systems to become a reality. The ultimate aim is to design a toilet that does not require any water to flush but meets the expectations of communities, rich and poor alike, and which can ultimately substitute the flushing toilet. Technologies already exist to recover nutrients from faecal sludge and also produce energy. These technologies are showing promising results but still need refinement.

If it is possible to process domestic sewerage at its source and recover the nutrients and produce energy, this would mean that the residual effluent flowing to sewers would really be a small quantity of liquid with little or no nutrient content. This effluent could be conveyed to sewerage treatment works in sewers of far smaller diameter than those currently needed and the sewerage works could be simplified considerably as the nutrient loading would be dramatically reduced. This in turn would have the benefit of reduced environmental pollution. Given that 30% of water consumed within a typical urban South African household is used to flush the toilet, water consumption would be reduced with a waterless toilet.

Provided that the logistics can be made to work, the recovered nutrients could be collected by small businesses and resold as plant fertilizers if they are not required by the household where the nutrients are recovered. The initiative would therefore lead to job creation as well as increased food security.

CONCLUDING REMARKS

The provision of sanitation to meet the needs of people living in South Africa requires a combination of innovations in technology, policy and finance if it is to become a sustainable reality. These innovations need to meet the expectations of the communities that do not have sanitation and who have been conditioned to think that the only acceptable sanitation option is a flushing toilet. A paradigm shift is required to position sanitation solutions which require no water as the desired and preferred option.

Investments in sanitation should be made with this changing paradigm in mind (much as was the case with fixed line telephone companies facing the challenge of mobile phone operators). In making investments for the future, infrastructure must be installed in a way that it does not become obsolete within its useful life and furthermore does not limit one's ability to benefit from any future technology changes.

REFERENCE

Lutchminarayan R D 2007. Sanitation, Water and Hygiene in eThekwini Municipality, Durban, South Africa.