



Breaking Barriers in Water and Sanitation Service Delivery to Informal Settlements

Case Study of the Mukuru Model

PRACTICAL ACTION
Technology challenging poverty



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Abbreviations

- CBO Community Based Organisation
- CSB Community Sanitation Block
- DIC Development Impact Consulting
- EU European Union
- GI Galvanised iron
- IARP Integrated Approaches to Reducing Poverty
- KShs Kenya Shillings (KShs 105 = Euro 1.0 (April 2010))
- NCWSC Nairobi City Water and Sewerage Company
- NGO Non-government organisation
- NRW Non-revenue water
- PPR Polypropylene co-polymer pipe
- SACCO Savings and Credit Co-operative Society
- SAT Stand-alone Toilet
- SHG Self Help Group
- SWE Small Water Enterprise

Definitions

Informal settlements refer to dense settlements comprising communities living in self constructed shelters under traditional or formal land tenure and where housing is not in compliance with the planning and building regulations. The term is used interchangeably with 'slums' in this document.

Sanitation in this case study refers only to the disposal of excreta. In its widest sense it can be used to cover excreta disposal, waste water drainage, solid waste management, housing conditions and also hygiene.

Slum will be used as defined by UN-HABITAT as a run-down area of a city characterized by substandard housing and squalor and lacking security of tenure.

Hygiene in this case study refers to practices such as hand washing, food handling, cooking and storage, cleaning utensils and the disposal of children's stools.

Small Water Enterprises (SWE), also known as water vendors, are private entrepreneurs who sell water to customers. Some have legal connections and buy their water from a local water utility while others make illegal connections and steal the water. SWE extend water services to informal settlements that have little prospect of being supplied with piped water from the local utility.

The standard currency for incomes and expenses in this document is Kenya Shillings (KES). The applicable exchange rate at the time was €1 = KES 105 and USD\$ 1 = KES 76.

Executive Summary

Mukuru is one of the largest slums in Nairobi, Kenya with a population of over 250,000. For many years residents of Mukuru, amongst the poorest people in Nairobi, were forced to pay high prices for low-quality intermittent water supplies. Residents sometimes paid as much as KES 500 per cubic meter, over five times the average price paid by official customers of Nairobi City Water and Sewerage Company (NCWSC). Water was supplied by hundreds of water vendors or small water enterprises (SWE) most of whom accessed NCWSC supplies through illegal connections. While the residents of Mukuru endured long queues and frequent disconnections, NCWSC was also losing water and urgently-needed revenue. At the same time sanitation provision in Mukuru was almost non-existent. The sanitary conditions were appalling.

In 2007 the Integrated Approach to Reducing Poverty (IARP) project was launched, with the aim of improving services in three Mukuru villages; Donholm, Centre and Riverside which have a combined population of 67,000. Funding was provided by the European Union (75%), and the 25% raised from donations to Practical Action and NCWSC. Technical support and implementation was the responsibility of Practical Action. The aim of the project was to break the barriers that prevent delivery of water and sanitation services to informal settlements. At the core of these barriers was an adversarial relationship between the water Company and the Mukuru residents.

In water supply, the project has created a strong tri-sector partnership between NCWSC, the SWEs and Mukuru community with Practical Action acting as the facilitator. Under the project NCWSC constructed ten new water chambers in the heart of the settlement. The chambers are spaced at intervals of between 200 and 400 metres along the main water supply pipeline and each contains between 26 and 30 water connections. SWEs purchase water from NCWSC through a meter at the chamber and provide an on-sale service to households. In the new model the NCWSC remains responsible for the supply, installation and connection of the water chambers and all the secondary level pipework leading to them. SWEs are responsible for the pipework from the water chamber to their water selling points. NCWSC supervises all construction and maintains technical standards.

Two types of sanitation hardware were supported under the project; communal sanitation blocks (CSBs) which provide toilet and washing facilities and stand-alone toilets (SATs). The communal sanitation blocks provide separate toilet and washing facilities for men and women. Water tanks on the roof serve the toilets, bathroom and a water kiosk. The project constructed three blocks at a cost of KES 4,368,158.58 (€41,000) an average cost of KES 1,456,052 each. A Clerk of Works was employed to supervise a local contractor to construct the blocks. At each of the blocks a Self Help Group (SHG) was established to identify the best location for the block and to run it once it was completed. Land was critical since each block occupies about 54 square metres, enough space for four Mukuru houses. It was provided by the community.

Stand-alone Toilets (SAT) are smaller than the CSBs and occupy only a single house plot. They serve small groups of between five and 29 households and have two to four toilet seats and a hand-washing basin outside. The SATs were built by local artisans from the Mukuru settlement who received training from the project. Their work was overseen by the project's Clerk of Works who also helped select appropriate sites. Because of lack of space in the settlement, landlords who agreed to build a SAT would give up one house plot; each toilet is then shared by the remaining households on the block, or between households in two or three adjacent blocks.

The project funded the construction of 15 SATs in Mukuru. Each block has been built with a contribution from the beneficiaries of 12.5% of the construction cost; the construction cost being dependent upon the number of 'toilet seats' or cubicles in the block. The SATs have been identified by the community as a popular and affordable solution and four landlords have gone ahead, independently, and built their own SATs; a further eight landlords have applied to the project for permission to build a SAT using their own funds.

In addition to establishing a new model for water supply and sanitation, the project supported the formation of a water vendor Savings and Credit Co-operative Society (SACCO) as a legal entity with a bank account. The SACCO provides financial security for its members; enabling them to pay their water bills in times of difficulty and meet other household needs.

The project included a campaign to raise awareness of hygiene and sanitation issues which targeted young mothers and school children in the project area. It reached over 2,500 mothers and focused on household water storage, hand-washing, proper use of toilets and disposal of sanitary materials. The project worked in eight schools, reaching 4,000 children and providing training to 22 teachers on hygiene and sanitation; how to promote it and how to communicate the messages to children.

The Mukuru model resulted in significant benefits; SWEs now have status and can rely on a steady income without risk of being penalised by the water company. NCWSC has reduced both its physical and revenue water losses, and has better control over the 'downstream' portion of its network within Mukuru. The people of Mukuru have benefited most, enjoying a reliable safe water supply and decent convenient sanitation at affordable prices for the first time.

Further, where there was once a confrontational, adversarial relationship between the water company and the residents of Mukuru there is now a formalised working agreement built upon understanding and trust. Practical Action has provided the catalyst that has enabled NCWSC to change its approach to the water vendors with whom they are now willing and able to engage. Consequently, the NCWSC now works with the SWEs rather than against them and has grown not only in its understanding of the community but also in its ability to serve them with water and sanitation services.

Background

Context

Mukuru is one of the largest slums in Nairobi, Kenya with a population of over 250,000 people. Like more than 100 informal settlements in the city, the living conditions in Mukuru are challenging and the residents are very poor, with an average monthly income of just KES 3,200 (NCWSC 2009). The streets are unpaved, there is no official electricity supply and no sanitation system. Water is mainly supplied by water vendors. Those who are employed work as daily labourers at factories in the large industrial area that borders the settlement.

Every day life in Mukuru is Precarious



Source: Practical Action, 2007

Photograph 1: Aerial view of the Project Area

The Mukuru settlement comprises thousands of one-room houses constructed from corrugated iron sheets on a wooden frame. The average house size is shockingly small; measuring just 3 X 3 m in plan. Typically the houses are built in blocks of six, eight or ten single rooms on a plot of land with shared walls and a single pitched roof covering all the rooms. Each room has a door, a single small window and is home to on average five family members (Practical Action, 2007). There is no private outdoor space.

The plots are owned by predominantly absentee landlords who rent out the individual rooms (or houses) to a family. Ninety two percent of the residents in Nairobi's slums are rent-paying tenants who currently pay an average of KES 1000 per month for

the privilege of living in such conditions. The houses afford little privacy and have no legal services of any kind. In common with other slums in Nairobi, Mukuru is unplanned, resulting in inadequate infrastructure (roads, water, sanitation, sewerage, drainage and electricity), temporary and haphazard building solutions, poor housing, high population density and very low levels of public services. Water, sanitation and hygiene are visibly sub-standard and the lives of the slum-dwellers' residing in these conditions are at best precarious.

Water Supply

Disputes, Conflicts and Disconnections

Within this environment, Small Water Enterprises (SWE) have stepped in to provide an essential service-water. The on-selling of water by vendors in Nairobi slums has been well-documented elsewhere and much of the vendor water-selling activity in Mukuru was (and outside of the project area is still) typical of the scenarios described in these documents. The vast majority of SWE had illegal connections that they made by breaking into the NCWSC pipelines from which they stole the water with impunity and then sold it from their water points (also known as water kiosks), sometimes from their pushcarts.

The relationship between the SWE and the staff of the NCWSC was confrontational and characterised by mutual distrust and dislike. The NCWSC regarded the vendors as thieves who were damaging the company's property, stealing its assets and wasting its time and resources. The theft was reflected in the company's ever increasing unaccounted for - or non-revenue water (NRW) figures. The vendors meanwhile, realised that the NCWSC was a threat to their business operation and had the power to limit, disrupt or disconnect the water supply and severely affect their income base. The SWE even argued and fought between themselves over connections and customers, rarely seeing eye-to-eye with each other let alone the NCWSC. The situation developed

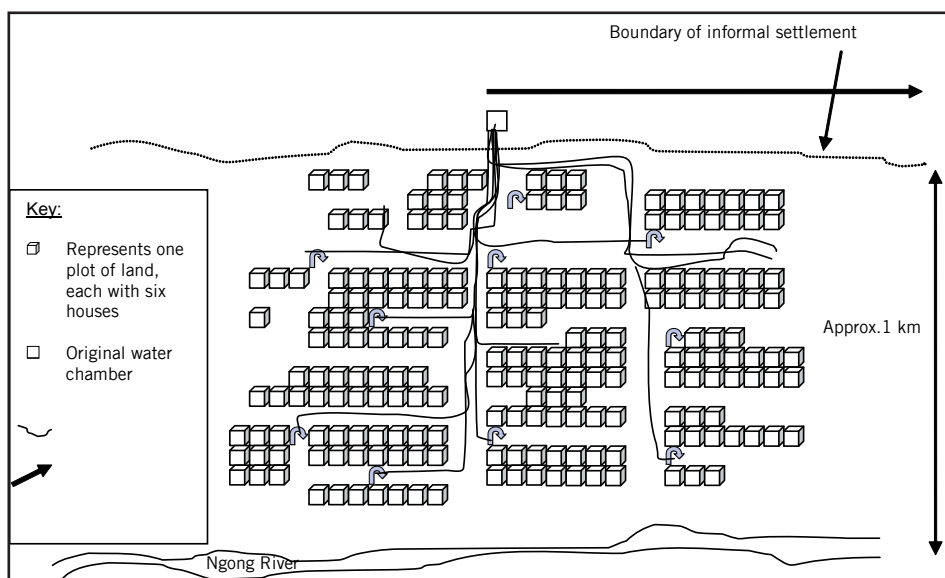


Fig 1: Schematic layout of original water supply arrangement showing plethora of long plastic supply pipes

into a continuous battle with frequent disputes and conflicts which often ended in threats, acts of violence and complete disconnection of Mukuru from the water supply network.

Adversarial relationship with Water Company

Nairobi has a population of over 3,138,360 million residents and has a theoretical water demand of 650,000 m³ per day. However, the actual production of water is only 420,000m³ per day mainly from surface water sources (NCWSC, 2009). Recognising this shortfall and following the national Water Act of 2002, the NCWSC was formed in 2004. It was tasked with the management of the city's water supply and sewerage services incorporating an improved customer and commercial focus.

In 2006, in an attempt to regularise the SWE activities, the NCWSC installed water chambers on the edge of informal settlements to serve the residents. It was hoped that by bringing the water closer to the settlement it would encourage legal connections. However, the approach was fraught with difficulties and they continued to find that their relationship with the SWE was adversarial.

NCWSC locked their chambers (in theory) to prevent them from being tampered with. The relationship between the water company staff and the community was confrontational and so the company plumbers and meter readers were unable to enter Mukuru to make connections or read meters as they were often threatened with violence and chased from the settlement (Development Impact Consulting, 2009).

Ultimately the Mukuru Residents Suffered the Most

Figure 1 shows a simplified schematic layout of what the water supply arrangement was like in a typical portion of the Mukuru slum (it is not an actual map of the settlement). It shows the plots of houses, NCWSC's galvanized iron (GI) water main (secondary level), the water chambers and the plethora of small diameter plastic pipes (tertiary level) leading from the water chamber to the water points. Some of the tertiary level pipes were very long as the chambers were on the edge of the settlement; some were over 500 metres in length (Nekesa and Chege, 2010) and yet could reach the most remote parts of the slum.

In order to cut costs, the SWE used poor quality electrical conduit instead of more expensive metal pipes which could be stolen. These had the added advantage that they were flexible enough to follow the winding and irregular paths and lanes found in Mukuru. The pipes were laid in shallow trenches or existing ditches; limiting the amount of digging they had to do or pay for. Consequently, the pipes often broke and the supply was contaminated by the dirty faeces-laden wastewater which flows in the trenches and lanes of the settlement. (See Photograph 2)

The situation was most unsatisfactory for all the parties – the NCWSC, the numerous SWE but most of all for the residents of Mukuru. They had to endure:

- Paying high prices for water – sometimes as much as KES 5 per 20-litre can, which is over five times the NCWSC's average price of KES 18 per 1000 litres; The prices rose even higher than this during times of water shortages, which were frequent.
- Non-availability of water when the NCWSC forcibly disconnected the SWE pipelines;
- Long queues when the water pressure was low; and

- Poor water quality due to leaks as a result of the use of substandard materials and poor connections.

Neglected Sanitation and Hygiene

Sanitation in Nairobi's informal settlements is altogether much worse and more complex than water supply. Zero planning, a bare-minimum of investment and ad-hoc coordination has led to desperately poor sanitary conditions which are a permanent health hazard and an affront to human dignity .



Photograph 2: Old unimproved Water point in Mukuru kwa Njenga

The Mukuru settlement is no exception. In 2007, Practical Action's baseline survey found desperately poor conditions. Only 11% of the families interviewed had access to a private household toilet and only a few more, 16%, shared a toilet with their immediate neighbours. The remaining 73% claimed that they used a shared community block run by a landlord or SWE. However, these were so scarce, inconvenient, unaffordable, poorly maintained and crowded that many resorted to using open defecation and flying toilets in order to cope. Estimates vary but the ratio of people to toilets was somewhere in the region of one toilet cubicle for every 500 to 1,500 people .

Levels of personal hygiene were also appallingly low. Washrooms were scarcer than toilets. The baseline survey found

that 63% of residents bathed in their own houses with only the barest minimum of water, preferring to save water for drinking and cooking than for washing illustrating how the scarcity and high cost of water impacts greatly on how residents chose to use it. The few pay-and-use washrooms charged KES 5.00 per visit – unaffordable for most people most of the time. Hand washing was rarely practiced and water was stored in unsuitable and dirty containers which led to contamination and rendered it unfit for drinking.

The few toilets were made from iron sheets on a wooden frame and either discharged directly into the river or into the main sewer line that runs through the settlement. Many were built directly over the manhole access chambers for this sewer, they afforded little privacy, were poorly maintained and were wholly unhygienic. For the pleasure of using such a facility a payment of KES 2 was required! The consequence of this dire shortage was very visible, human waste was frequently found along the river edge, in the lanes and open areas where children play.

A new approach was needed in order to penetrate the informal settlements and enable the NCWSC to meet its mandate of serving all Nairobi residents with water and improving access to sanitation services.

The Project

This case study describes the project “Integrated Approaches to Reducing Poverty and Improving Health in Urban Slums” (IARP). It aimed to break the barriers that prevent delivery of water and sanitation services to informal settlements. The project ran for 3½ years from January 2007 to June 2010. It was implemented as a partnership between Practical Action and the Nairobi City Water and Sewerage Company (NCWSC). Funding came from the European Union (75%) and other donors including the Alistair Berkley Charitable Trust, with a total budget of Euros 740,125.

One of the major barriers blocking access to water and sanitation by Mukuru’s residents was the adversarial relationship between NCWSC and the residents. By improving the working relationship between the residents and the NCWSC the project expected that the quality of water and sanitation services in the settlement would be improved. It did this in ways which mainstreamed rather than excluded existing informal water providers. The project helped support investments in infrastructure (water pipes, meter chamber, storage tanks, latrines etc). This, coupled with capacity building on good hygiene practices in water handling and general life skills, was expected in turn to lead to a reduction in the incidence of water- and sanitation-related diseases and a change in hygiene behaviour. The reduction in disease incidence and availability of reliable and good quality water would also provide an opportunity for residents, particularly women who are much involved in provision of water to their families, to engage in productive activities and thus increase their incomes and well being.

The IARP project has been implemented in three Mukuru villages, namely Riverside, Donholm and Centre (see Photograph 1); which have a combined population of 67,000. These villages are in an area of Mukuru known as Lunga Lunga. During the course of the project, activities were extended to south of the Ngong River to two other areas known as Mukuru kwa Reuben and kwa Njenga. The intended beneficiaries were the slum-dwellers in Mukuru specifically the women and children of the community.

Purpose

This case study describes the model of delivery of water and sanitation services promoted under the IARP. The purpose of the case study is to highlight the replicable and scale-able aspects of the Mukuru model and consider the benefits of incorporating them in future projects not only in Mukuru but in other informal settlements in Nairobi and beyond.

Scope

The study covers both the water supply and the sanitation initiatives implemented by the project and also includes the hygiene and sanitation promotion activities. Before looking at the initiatives that the project has implemented in Mukuru it is useful to describe what the situation was like and indeed what it is still like in the neighbouring communities.

A New Beginning...

Partnerships and Communication

The water company adopts a typical top-down approach to service provision in Nairobi. For the 40% of the population who have legal connections this type of relationship is the norm and (with the odd exception) entirely satisfactory. However, in the informal settlements such an approach had failed.

In 2008 and in recognition of this failure, the Informal Settlement Department was established in the company. Its mandate includes reducing illegal connections, controlling water theft and wastage and expanding the water supply and sewerage system to serve more slums and their residents. The department is small and its task large; an estimated 60% of Nairobi's population live in informal settlements on just 5% of the residential land area .

Practical Action's collaboration with the NCWSC through the Informal Settlement Department has changed the way that NCWSC operates in Mukuru. It has facilitated a climate of participation. The company acknowledged that Practical Action was able to penetrate the slums and facilitate communication more effectively than any other organisation that NCWSC had worked with in the past. The relationship can be described as a tri-sector partnership. (See Figure 2).

Instead of an adversarial approach where the slum-dwellers were forced to abide by a system which was not designed to meet their demands (Figure 2 (a)), the tri-sector partnership (Figure 2 (b)) allowed them to have a voice and actively participate in the planning, construction and operation of their water supply system. It allowed NCWSC to maintain control of the assets – ensuring that they are to specification, operational and legal. Meanwhile, Practical Action facilitated the process, providing a communication channel between the NCWSC, the SWE and the community, strengthening the capacity of the partnership and managing the disbursement of the project funds.

Table 1 illustrates the changing roles and responsibilities of the three parties during each of the project stages. The table shows how all three parties play a valued role and how the responsibilities have been shared – the process has been successful and engendered a sense of ownership in each.

Improved Access to Water

For the SWE customers the project intervention has resulted in the distance to the nearest water point reducing on average from 34.8 metres to ten metres . This is as a result of more SWE emerging and taking legal connections from the water chambers. The frequency of water shortages (and the resulting price rises) has reduced greatly. With more connections still to be made to the new water chambers the residents are optimistic that access to water will improve further. There is however, no formal control of where SWE should be located: there are concentrations of water points in some locations and yet they remain quite scattered in other areas.

Notably, the Mukuru model has greatly improved access to water. It allows individual households to access legal connections as well as SWE. There is a significant change

in attitude by the NCWSC which now recognises slum-dwellers as genuine customers. Once a household applies for a connection and pays the connection charges, it is entitled to an individual household connection, whether it chooses to sell the water or not.

Table 1: Roles and responsibilities of the parties during the project stages

Party	Roles and responsibilities		
	Planning and Design	Construction	Operation
Community	Negotiates and provides land for infrastructure and way leaves for pipelines	Provides unskilled labour and security services.	Pays SWE for volume of water collected from water point
SWE		Invests in pipeline from water chamber to water point, pipe laying and connection charge.	Engages with NCWSC as customers who hold legal contracts to buy water.
NCWSC	Provides technical advice and design services.	Provides supervision and technical advice.	Engages in legal contract with SWE to connect and supply water in exchange for payment.
Practical Action	Mobilises community, raises awareness and builds capacity of both SWE and the NCWSC.	Manages funds to enable supply of materials and construction of infrastructure.	Facilitate agreement of legal contracts and connections. Monitors operation and maintenance of services.
	Facilitate participatory engagement and partnership building		

Extending the Water Chamber Model

The model is an extension of the water chamber model started by NCWSC in May 2006. The project has successfully laid a total of 3,000 metres of four inch galvanised iron pipe to serve ten new water chambers right in the heart of the settlement. Each chamber contains between 26 and 30 water connections. The chambers are spaced at intervals of 400 metres along the pipeline. (See Figure 3 for the diagrammatic layout of the scheme).

In the new model the NCWSC remains responsible for the supply, installation and connection of the water chambers and all the secondary level pipe-work leading to them. The SWEs are responsible for the pipe-work from the water chamber to their water selling points. This included the cost of the pipe-work, connection charges and installation of the pipes. The NCWSC supervised the installation and ensured that the plumbers laid the pipe in accordance with NCWSC's specifications. (Photographs 3 and 4 show a typical water chamber and a typical SWE water selling point respectively).

The new water chambers have been positioned to allow the SWE to access as much water as they like and to reduce the distances from the chambers to the taps. Most houses are less than 200 metres from a water chamber. The NCWSC also required the residents to use better quality polypropylene co-polymer (PPR) pipe-work for all the connections. These three project initiatives have resulted in significant benefits, not only for the SWE but also for the NCWSC and the community.

Describing the main advantages of the new system, SWE say that:

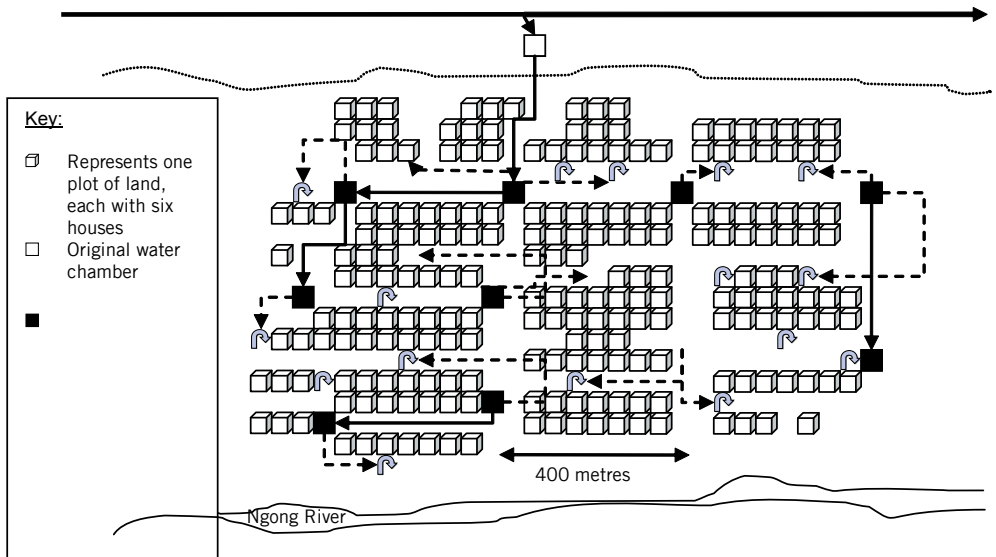


Figure 3: Schematic layout of the Mukuru model water supply arrangement; showing new water chambers; new PPR pipelines and increase in number of water points



Photograph 3. Water chamber in Lunga Lunga
Source: AJ Peal, Nairobi, 2010



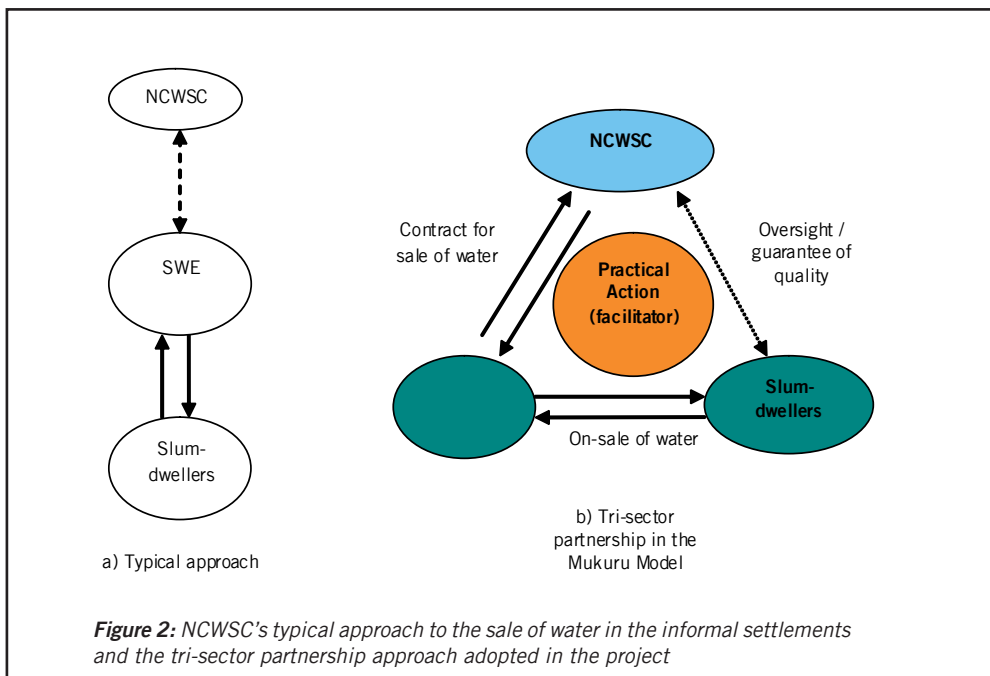
Photograph 4. SWE water selling point in Lunga Lunga
Source: AJ Peal, Nairobi, 2010

- Because the distance from the water chambers to the point of sale has been reduced considerably, SWE spend less money in pipe work for each water point; and
- Although the pipes are more expensive, they are of a better quality and does not break or burst like the old pipes. Consequently, the number of water pipe leaks reported has sharply decreased thus considerably reducing the running costs for the SWE.

Box 1 describes how the changes have further affected the SWE.

The water company (NCWSC) says that the benefits from the model are clear:

- The revenue has increased from the sale of water to the SWEs;
- The amount of water wasted due to broken pipe work has reduced markedly; and
- The number of illegal connections has dropped off sharply.



The community claims to have benefited as a result of:

- An affordable reliable supply of clean water;
- Gaining dignity and recognition by the NCWSC as bonafide customers and consumers.

Box 1

Better pipes mean better business for the Small Water Enterprises

In contrast the new pipes are of much better quality and when correctly installed (at appropriate depths and bedding) they do not break. Thus, with this realisation, the cheap plastic electrical conduit pipes that the SWEs used earlier were replaced with those made from PPR. Although they are more expensive SWEs have realised the benefits of using them.

Mary Mugiori, a typical SWE in Mukuru says that she was paying about KES 2000 every month on repairs on her pipeline. She remembers having to employ a plumber to replace the broken lengths on her leaking pipeline about five times every month. For this she paid KES 500 every month to carry out the repairs and spend over KES 1500 for new materials in addition to other losses incurred while the repairs were going on

Mary reports that her maintenance costs have reduced immensely. In the last two months she has organised a plumber to fix just one joint, this cost her KES 30. She is therefore delighted that her monthly maintenance expenditure has fallen by up to KES 1900, from KES 2000 to KES 150 per month, a cost she refers to as negligible.

Her story is similar with most other SWEs in Mukuru since the new water chambers set up by NCWSC and the installation of the PPR pipes. They are able to avail water every day or at least whenever it is available.

A Business Arrangement or a Social Service

The project has helped NCWSC reach new customers and meet its mandate to serve the citizens of Nairobi. But is there a financial incentive for them to supply water to the informal settlements?

There is a major transformation as a result of the model. NCWSC says that it is too early to separate the investment made during the project and compare it with the revenue received. The company installed 10 water chambers, laid 3,000 metres of galvanised iron pipe and legitimised the operations of 31 SWE points. It has in the process of implementation ensured that people have access to improved water and sanitation facilities

Table 2 shows a comparison of the amount of money invested by NCWSC in the project on physical infrastructure - compared to the expected revenue from the new SWE connections. The analysis assumes that each water chamber has 26 active connections and that from each connection an SWE sells 100 jerry cans of water per day (60m³ per month). Using these assumptions the table illustrates that it could take NCWSC nearly 5 years to recover the cost of its capital investment alone.

Nevertheless, Eng. Nahashon Muguna of NCWSC's Informal Settlements Department affirms that NCWSC is fully aware of the benefit that the project will bring to the company. He states that they are not just providing a social service. The partnership with Practical Action has already enabled an increase in the number of SWEs who have connected legally - this will logically lead to an increase in revenue.

On the other hand, with careful supervision of the SWEs tertiary level pipe-laying, ensuring that the pipes used are of an appropriate standard, will result in a reduction in losses of water {non-revenue water (NRW)}. Indeed, the water engineer reports that in the last 12 months NRW has fallen from 39% to 35% in Nairobi. The improvements in Mukuru are making a positive contribution towards this reduction in NRW.

Whilst the model has been rated a success it was important to disseminate the outcomes as widely especially amongst the many stakeholders working in Nairobi's slum communities.

Table 2: Number of months to recover project investment

Investment by project	Unit	Quantity	Cost (KES)
Pipe-work	Metres	3,000	12,596,850
Water chambers	No.	10	525,000
Water points	No.	31	735600
Total capital expenditure			13856850
Average monthly income from Small Water Enterprises (water sold at KES 15 per cubic metre) ¹			234,000
Number of months required to recover project investment			60

Source: Practical Action, 2010

Note: 1. Average income assumes 26 active connections in 10 new water chambers. Each connection sells 100 cans of water per day or 60m³ per month (26 x 10 x 60 = 15,600 cubic metres/month). Therefore income = 15,600 x 15 = KES 234,000

The Informal Settlements Coordination Group

Live discussions amongst development professionals on how to improve coordination between the numerous organisations working in informal settlements have been going on. Recognising this as a problem in Nairobi's informal settlements, Practical Action supported the establishment of an Informal Settlements Coordination Group (ISDG), whose purpose would be to improve coordination between the organisations by sharing knowledge and experience. The group is now supported by WSP – Africa of the World Bank and coordinated by NCWSC.

The group is open to all national and international organisations involved in water supply and sanitation in informal settlements. This includes non-governmental organisations (NGO), International Organisations and water sector organisations. NCWSC acknowledges that since the formation and dialogue with the ISCG begun, the company is now better placed to manage and improve its services in Nairobi slums. There has been significant understanding and appreciation of the Mukuru Model too that has led NCWSC and other organizations working in slums in Nairobi to adopt the approach.

Further Intensification of the Network

NCWSC considers the project successful although it would be useful to increase the number of water chambers and points above what has been currently provided under the project. Indeed, Eng. Muguna, the water engineer says that NCWSC would like to intensify the network in Mukuru further.

In addition to ensuring that the model is replicated in other informal settlements in Nairobi, NCWSC is considering formulating and implementing various 'pro-poor policies'. Although still at the drafting stage, they are considering:

- Supplying and laying all the pipe-work up to the water point (including the supply and connection of a water storage tank); provided that (a) the pipe length is less than 200 metres (b) the SWE has paid the connection charge and (c) the SWE (or household) digs a trench for the pipe-work and makes arrangements for the tank to be erected. Eng. Muguna explains that the logic to this is that it ensures that pipe-work has been installed correctly and to NCWSC standards so minimising unnecessary water loss from leakages due to poor workmanship;
- Ring-fencing 1% of the company's revenue for improvements of the informal settlements; and
- Allowing payment of the connection charge to be staggered and paid over a period of up to 24 months. The reasons why this policy consideration may be necessary are discussed further below.

How Replicable is the Model?

The replicability of the Mukuru water supply model can only be demonstrated once its beneficiaries begin to attest positive improvements on their livelihoods. In this section we look at the model from the point of view of the Mukuru community – the SWEs and their customers.

Small Water Enterprises invest

Although the SWEs are suspicious and secretive about their returns, they are actually gaining a healthy return from their investment. Currently they are selling water for KES 3 per 20 litre jerrican; a price that goes up to KES 5 per 20 litre jerrican in times of shortage. Being that the NCWSC charges them a special bulk rate of KES 15/m³, the return therefore is over fifteen times above the amount.

The biggest challenge is perhaps not selling the water but getting a connection in the first place. Each SWE is expected to set up own infrastructure to the water chambers and pay the connection charge to the NCWSC. Currently the connection charge, to be paid upfront, is KES 7500 up from KES 3500 in June 2009 including a refundable deposit of KES 3500. The project reports indicate that after setting up the water chambers in the settlement, there has been a considerable reduction in the cost of infrastructural investment as this has eased access to the source points. The connection charge is at least a quarter of the total capital expenditure required. (See Table 3)

There has been a surge in the number of SWEs operating in Mukuru. Practical Action reports indicate that there are over 57 legally connected points and already 169 applications have been forwarded to NCWSC. Water provision has become a good business that provides the residents of the village a source of revenue while providing an essential service.

Table 3 and 4 show the number of months it will take a water seller to pay off his investment depending upon the number of 20 litre jerricans that are sold each day. The figures assume that the pipeline is 200 metres long (the longest distance that any water point should be from a water chamber); that all jerricans are sold at a rate of KES 150/m³ and that the SWE pays a plumber to repair only one minor joint leakage every two months. Table 3 assumes the connection was made before 1 June 2009 while Table 4 shows the additional cost of connecting after this date.

If the SWE can pay the initial capital costs it is clearly worth their while. An SWE who took his connection before the connection charge was increased and sells only 30 jerricans of water per day will take less than seven months to recover their costs (Table 3). Anecdotal evidence suggests that a more realistic figure is that they sell 80 to 100 cans per day, in which case it will take them about two months. Those connecting since 1st June 2009 have had to pay more because the connection charge and deposit was raised from KES 3,500 to KES 7,500. Consequently, it will take at least two months to break even if they sell less than 110 cans per day (Table 4) and eight months if they sell only 30 per day.

Water Consumption Remains the Same

A person requires between 20 and 24 litres of water in order to maintain a basic level of health according to the (WHO/UNICEF 2000) standards. On average each family in Mukuru collects and uses some five to six jerricans of water per day (100-120 litres). The Mukuru water supply model streamlined supply and brought it closer to the people. The consumption now is much more accountable than it had been earlier although there is no reported increase in consumption.

The level of consumption can perhaps be evaluated if the price were to fall below the current level to KES 2.00 or KES 1.00 per 20 litre jerrican. At the same time, the ease of use is also a major factor in Mukuru. A household that has access to their

own bathroom will bathe easily and freely use more water than one that has to use a communal bathroom and have to wait until darkness falls to bathe.

During the project the price of water reportedly stabilised as shortages became infrequent. It is envisioned that with more SWEs setting up water points and an increase in availability - this will eventually happen - water consumption will rise.

Improved Access to Sanitation

Nationally, sanitation falls under the docket of the Government that is involved in delivering Public Health and Sanitation services. Currently the Ministry of Public Health and Sanitation has limited capacity and is only able to perform a reactive role, for example, identify outbreaks of diarrhoea, cholera and typhoid and recommend actions to be taken to alleviate them. It has little to do with the day-to-day provision of sanitation services.

In Nairobi, while the NCWSC and those retailing its water are the primary actors in the supply chain of water services, this is not the case for sanitation; which is primarily left as a responsibility of each individual household. The NCWSC is responsible for providing the sewerage network but its jurisdiction ends at the house-to-sewer connection. Indeed, Nairobi's municipal authorities have very little involvement with toilet construction or management. A study by the Water and Sanitation Program in Kibera found that all but one of the 20 toilet blocks studied had been constructed and were being managed using donor or NGO funds .

In order to pay for operation and maintenance and to fund further extension of the sewer network, the NCWSC levy a conservancy charge on domestic house connections. This is currently set at 75% of a customer's water bill. However, there is no such charge on operators of water kiosks. Therefore, no household in the informal settlements pays the NCWSC for a sewerage related disposal service – this would appear to be very appropriate as such services are almost entirely neglected.



Photograph 5. Handwashing facilities can also be accessed as part of the SATs.

Source: Practical Action, Nairobi 2010



Photograph 6. Land owners have built own SAT facilities for their tenants

Source: Practical Action, Nairobi, 2010

Table 3: Number of months to pay off capital expense in laying 200 metres of ½ inch diameter PPR pipe and connecting to NCWSC

Description	Unit	Calculation						
Number of 20 litre cans sold per day	No.	30	50	70	90	100	110	120
Volume sold per month	m ³	18	30	42	54	60	66	72
Income ¹	KES	2,730	4,515	6,300	8,085	9,030	9,870	10,815
Monthly expenditure ²	KES	595	775	955	1,135	1,225	1,315	1,405
Monthly profit (income less expenditure)	KES	2,105	3,725	5,345	6,965	7,775	8,585	9,395
Capital expenditure ³	KES	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Connection charge including deposit	KES	3,501	3,501	3,501	3,501	3,501	3,501	3,501
Total capital expenditure	KES	13,500	13,500	13,500	13,500	13,500	13,500	13,500
Months to pay off capital expenditure	Mths	6	4	3	2	2	2	1

Notes:

1. Amount charged to customers is currently approximately KES 3 per 20 litre can.
2. Monthly expenditure includes payments to NCWSC of KES 15 per m³; meter rent at KES50 per month; and repair of one pipe joint per 50m length, every two months (plumber daily rate of KES 500 per day and material cost of KES 50 per joint).
3. Capital expenditure is cost of pipe materials and cost of paying a plumber to lay the pipe. Pipes cost KES 2,000 per 50m length and a plumber charges KES 500 to lay 50 metres of pipe once the trench has been dug.
4. Exchange rate = KES 105 = Euro 1.0.

Table 4: Number of months to pay off capital expense if connection made after 1st June 2009

Capital expenditure including higher connection charge ¹	Euros	17500	17500	17500	17500	17500	17500	17500
Months to pay off capital expenditure	Months	8.3	4.7	3.3	2.5	2.3	2.0	1.9

Notes:

1. From 1st June 2009 the connection charge and deposit was raised from KES 3,500 to KES7,500.

Box 2

Looking to the future with the Water Savings and Credit Co-operative Society (SACCO)

The Mukuru Lunga Lunga Water Savings and Credit Co-operative Society (SACCO) was formed in July 2009 and was registered with the Commissioner of Co-operative Societies in November 2009. The secretary of the SACCO, Patrick Mwangi explained that in Kenya, without this membership the SWEs are considered high risk illegal entities with whom no banks or businesses will engage. The project supported the formation of the SACCO by providing office paperwork and equipment and basic training in book-keeping and SACCO management. The purpose of the SACCO is to provide security for the SACCO members; enabling them to pay their water bills in times of difficulty when their cash flow is low and to improve access to working capital to enable them to invest in their enterprises. As it is now a legal entity the SACCO has opened a bank account and invested the members' savings.

Patrick Mwangi explained that the SACCO's membership has increased over the past four months and they now have 52 members who meet once a month when they deposit their savings into the bank. The joining fee is KES 350 per SWE and each one is required to save KES 600 per month. The SACCO members are saving enthusiastically and the bank balance now stands at a very healthy level, just over KShs 100,000 (a little under Euro 1,000).

To date (April 2010) the SACCO has not spent any of their savings but its members are all in agreement about what they are saving for. Their ambition is to save enough to buy water storage tanks for each of the SWEs. They realise that a tank will enable them to sell water on days when the NCWSC supply has low pressure or is temporarily unavailable. This will help their businesses to grow and improve their own and their family's security.

The activity of this SACCO shows a significant change from the situation before the project. The SWEs are now working together, communicating, organising themselves, and are enjoying being recognised as legal business entities. Whilst their lives are still fraught with difficulties they are now able to look to the future with more optimism than they did before.

The Mukuru Sanitation Model

The IARP sanitation component comprised three interventions to improve this dire situation: A hardware component—construction of two forms of sanitation facilities, namely Communal Sanitation Blocks and Stand-alone Toilets; capacity building—training of Mukuru residents to build and operate new sanitation facilities; and a software component—raising awareness and promoting hygiene and sanitation behaviour change.

Communal Sanitation Blocks (CSB)

The CSB model provides separate toilet and washing facilities for men and women; each gender has three toilets and one shower room. The blocks are relatively large, being approximately 6 X 6 m in plan which is sufficient space for four houses in Mukuru. The blocks are connected to the sewer network and to the water supply system. Each facility has a 5,000 litre water storage tank on the roof serving the toilets and bathroom; and a 10,000 litre water tank serving a water kiosk. Under the project three Communal Sanitation Blocks were constructed. The total cost of the three blocks to the end of the project was KES 4,368,158 at an average cost of KES 1,456,052 Table 5.



Photograph 5. Mtongwe Communal Sanitation Block

Source: Francis Muchiri/PA, Nairobi, 2010

Table 5: Project investment in sanitation hardware and hygiene and sanitation promotion

Project Element	Unit	Qty	Cost (Euro)	Average Cost per Item (Euro)
Communal Sanitation Blocks	No.	3	4,368,158	1,456,052
Stand alone toilets	No.	15	2,377,500	160,000
225 mm diameter collection sewer	m.	950	4,485,473	4,722
Total cost of hygiene and Sanitation Promotion	No.	6522	1,050,000	161
Young mothers	No.	2500	105,000	42
School children	No.	4000	630,000	157
Teachers	No.	22	315,000	14318
School sanitation block	No.	1	210,000	210,000

Source: Practical Action, 2010

The project employed a Clerk of Works who supervised a local contractor to construct the blocks. At each of the blocks, a Self Help Group (SHG) was established to run the block once it was commissioned. The groups were tasked with identifying and procuring a suitable piece of land for the construction of the blocks. The respective group also arranged for transportation of the materials from the edge of the settlement to the site and then for provision of safe storage at the respective construction site. The settlement is highly congested and transporting goods across it requires skill and local knowledge. Transporting large bulky items such as water tanks does in some instances require partial dismantling of buildings or lifting of the item above the roof-line. All three blocks are operating as water kiosks and are all connected to the sewer network. Box 3 provides further details of the Mtongwe Communal Sanitation Block.

Mtongwe Communal Sanitation Block

The Mtongwe SHG was formed in 2001. The members decided to form the group to help each other when they faced difficulties by saving money from group activities. Their main activity was water vending and the group took a connection from the old water chamber which was over 500 metres away. When the project started they identified a piece of land for the construction of the CSB and using the group's savings from the water vending activities and a contribution of KES, 4,500 from each of the members they were able to secure use of the land. The block was built by the project at a cost of around Euro 16,000 and handed over to the group to run in November 2009 (see Photograph 5).

The group now has 21 members who are jointly responsible for operating and maintaining the CSB. The members of the group have jobs which restrict the amount of time they can devote to running the block themselves so they employ a caretaker. The block is open 24 hours a day. The block serves the households who are part of the SHG but it is also open to other users in the local area.

Currently 15 households pay a monthly subscription of KES100 to use the block while on average, a further 100 to 150 people (occupants of 20 to 30 households) visit the toilet and/or shower on a daily basis. The SHG charges KES 3.00 for use of a toilet and KES 5.00 for use of the shower room, this cost includes water.

Stand-Alone Toilet (SAT) Approach

The Stand-alone Toilet (SAT) approach differs from the Community Sanitation Block approach in a number of ways. The SATs are smaller and occupy only a single house plot. Each has two, three or four toilet seats. There is no shower cubicle, instead a handwashing basin is provided outside. Similar to the CSB, they are all connected to both the sewer network and to the water supply system.

The toilets were built by local artisans from the Mukuru settlement who received training from the project. Their work was overseen by the project's Clerk of Works who also helped select appropriate sites. Finding space for toilets in Mukuru is very difficult and the SAT approach has come up with a novel solution.

There is considerable variation in the sizes of plots owned by landlords in Mukuru. Figure 4 shows a typical layout which helps to explain the methodology of the SATs. In this example landlords own plots of land measuring 18 metres by 6 metres. The plots are further sub-divided into six rooms measuring 3 metres by 3 metres – each room or house is occupied by a family of on average five people. The SAT is built on one of the house plots for use by the residents of the remaining five houses on the plot. In some instances landlords own more than one plot and have agreed that all the residents will have access to one SAT. Similarly, a number of the SATs have been built jointly by two or sometime three landlords owning adjacent plots. The landlords have agreed that all the occupants will then have access to the SAT. To illustrate this Figure 5 shows five plots sharing one SAT – a total of 29 houses or 145 people (assuming average occupancy of 5 persons per household).

The project has funded the construction of 15 SATs in Mukuru. Each block has been built with a contribution from the beneficiaries of 12.5% of the construction cost; the construction cost being dependent upon the number of 'toilet seats' or cubicles in the block. The average cost of each is approximately KES 160,000, see Table 5. The fifteen blocks are largely completed and in use.

Nevertheless, the SATs have been identified by the community as a popular and affordable solution. Four landlords have gone ahead, independently, and built their own SATs. One of the four landlords has completed the sewer connection himself and

is using their SAT. A further eight landlords have applied to the project for permission to build a SAT using their own funds.

Box 4 describes the construction of the SAT by the project in Mamwika and Box 5 describes the SATs built independently by two landlords - Francis Ngugi and Wycliffe W. Walela – with only technical advice provided by the project.

Direct Benefits for SAT Users

The landlords recognise that there will be further expenditure to complete the 15 toilets and to secure water points at the SAT. Water is needed at each SAT for anal cleansing, flushing and hand washing. The project has agreed that once a SAT community has paid their water connection charge and dug a trench for the water pipes the NCWSC supervised the laying of the required length of water pipes and provide a water tank at each SAT. The cost of the water used at the SAT will be paid for by the landlord and users of the facility. Despite this remaining capital expense, and the not-insignificant ongoing running cost, the landlords responsible for the SATs express their enthusiasm and were very keen to start using the SATs.

Box 6 illustrates why they are so enthusiastic. It compares the amount that households are currently spending on pay-and-use toilets with what it is anticipated they will have to pay for subscribing to use a SAT. The box shows that the current monthly household expenditure on sanitation is estimated to be in the region of KES 709 while the cost of subscribing to use a SAT is estimated to be roughly one-sixth of this at KES111 per household. This is similar to the subscription rate that will be set for the Mamwika SAT (see Box 4) and also for the Mtongwe CSB (see Box 3), indicating that subscribing to a SAT or even a CSB will have a direct benefit for users.

Box 4

Mamwika Stand-alone Toilet

Landlord Josephine Peter is very excited about having a toilet and believes it will solve an awful problem that she and her large family face every day. With no toilet nearby her children are forced to use the flying toilet system, defecating into plastic bags which are then kept in the house until night-fall when they are simply thrown over the rooftops to land in or on someone else's house. If she needs the toilet at night she does the same, being reluctant to leave the house at night or leave her children alone if her husband is out.



Photograph 6. Mamwika Stand-alone Toilet

Source: AJ Peal, Nairobi, 2010

Josephine lives in an area of Mukuru known as Jamaica and has been keen to build a toilet for a number of years. She was aware that as well as being more convenient and safer, it would also help to reduce illness in her family. However, she had neither the space nor the money to build a latrine of any sort.

The project facilitated the construction of the Mamwika SAT in 2009. The facility has three toilet cubicles and will be shared by the tenants living on plots owned by three different landlords (see Photograph 6). Josephine agreed to give the land and proposed using a house from one of her plots while the other two landlords arranged to share the cost of both the roofing materials and the cost of transporting the materials from the edge of the settlement to the SAT site. The cost of this contribution came to KES 15,435.

The decision to move a family from the house selected for the toilet was reached amicably and it was sanctioned by the local administration with a signed agreement. The site selected is on the corner of a plot and on a main lane through the settlement – it provides convenient, easy access for the users.

The three landlords have already decided that the tenants from the three plots will pay a monthly subscription of KES 100 per month to use the SAT. The toilet will also be available for daily visitors at a cost of around KES 3.00 or 5.00 per visit. They have also decided that a caretaker will be employed to maintain the toilets. The caretaker will sell water from the water point outside the SAT once it is connected.

Box 5

Francis Ngugi's Stand-alone Toilet

Francis Ngugi is a qualified teacher and has lived in Mukuru for 20 years. Along with his wife he founded and now manages the Flamas Primary School. The school has grown rapidly since it started in 2005 and now has over 500 children on the roll and 15 teachers. The school is still expanding and a second site has been developed for use as a junior school. Francis has installed three sewer-connected latrines at the original site and three pit latrines at the new site. The project has provided a 10,000 litre water storage tank at both sites; these are connected to the reticulation system. The tanks also collect rain water from the substantial roof area.

Francis was so impressed with the stand-alone toilets that he saw being constructed on the project that he decided to build his own. He decided to build it in the corner of his house for use by his family only. The toilet is small and is only accessible from his one room but it has been connected to the water supply (Francis also sells water from a tap outside his house). The one seat toilet which is used by his family only cost around KES 10,000 to construct and KES 20,000 to connect to the sewer.

Wycliffe W. Walela's Stand-alone Toilet

Wycliffe Walela has been a landlord in Mukuru for 23 years. Before the project he and his family had no toilet and used either a small pit toilet on the edge of the settlement (about 400 metres from their house) or flying toilets. Wycliffe has a large family and three brothers who live in adjacent houses on his plot of land - the brothers also have families. Wycliffe bought materials and employed a fundi (technician) to build a toilet next to his house at a cost of KES 55000 – he had to spend additional money on stabilising the wet ground on which it was built. Wycliffe anticipates that about 18 people will use the toilet (his immediate family) and they are looking forward to “improved security, better health and a happier life”.

Both Francis and Wycliffe acknowledge that it was seeing the construction of the SATs that inspired them to build their own facilities. They also highlighted the support given by the project staff – particularly the Clerk of Works – who provided valuable technical guidance during construction.

Box 6

The Cost of Sanitation for a Household

How much are households currently paying per month to use pay-and-use toilets?

With very few privately owned toilets in Mukuru most people pay per visit to use a communal block or a privately run toilet, commonly operated by a SWE.

Assuming:

- A typical communal block or private toilet charges KES 3 per visit;
- Average household has five members (two adults and three children);
- Each member makes on average three visits every two days.

Then a household currently pays KES 709 per household per month

How much will households have to pay for using a SAT?

It is anticipated that the landlords will want to set the subscription for a SAT at a level at least equal to the cost of running it. The running costs will include the water supply used for flushing and hand washing, rent lost from using a 'house-space' as a toilet and cleaning and maintenance.

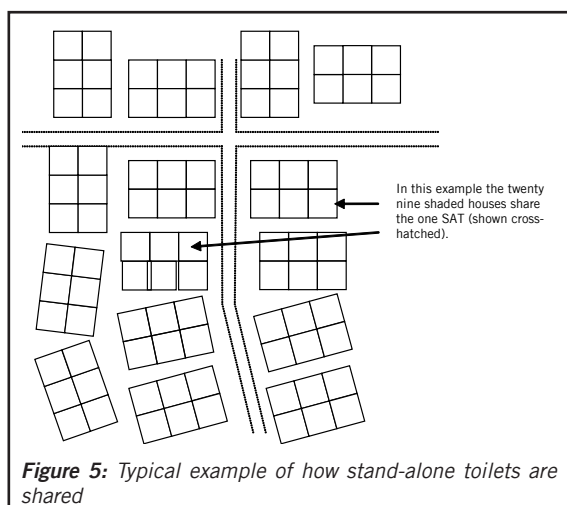
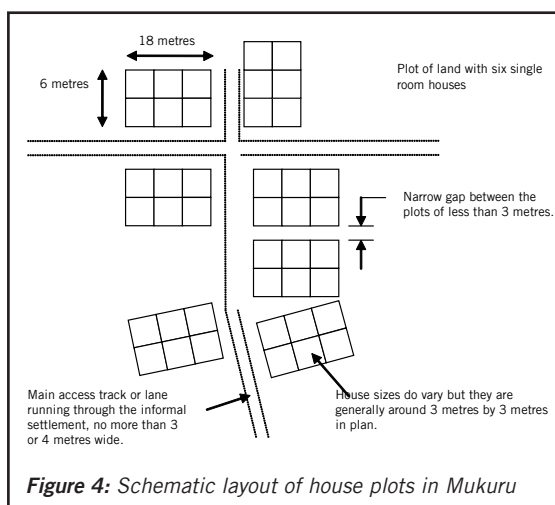
Assuming:

- SAT is shared by 29 households with average of five members per household;
- Each member still makes on average three visits every two days;
- One litre of water is used for flushing during each visit (assumes all are wipers not washers);
- One litre of water is used for hand washing each visit.
- Water costs at KES 15/m³.
- Rental of one house space = KES 1,050 per month
- Additional 5% of cost added for paper for wiping and cleaning and maintenance.

Cost of using a SAT will be KES111 per household per month.

Note:

This is very similar to the amount that the Mamwika SAT owner quoted she would charge, Euro 1 per household per month (See Box 4.)



Raising Hygiene Awareness

Along with the construction of sanitation facilities and the provision of safe drinking water, the project included a hygiene promotion campaign. The campaign targeted young mothers and school children in the project area. It reached over 2,500 mothers (see Table 5) and focused on proper use of toilets and disposal of sanitary materials. The project worked in eight schools providing training to teachers on hygiene and sanitation; how to promote it and how to communicate the messages to children. A blend of participatory tools was used incorporating the Child-to-Child methodology and Participatory Hygiene and Sanitation Transformation (PHAST) techniques to disseminate messages to over 4,000 school children. Significantly, although some schools had toilets, few had functioning hand washing facilities – consequently children were unable to practice what they had learnt. Therefore, the project included hardware provision as well: water connections and storage tanks being provided at all schools and new toilets erected in some of the schools where the need was greatest.

The hygiene promotion was done by the staff of Practical Action and the NCWSC; the success of the Mukuru model owes much to the hard work done by the promoters. The hygiene promotion cost Euro 10,000 (see Table 5) and at Euro 1.53 per beneficiary

was very cost-effective. The interest shown by the community in the SAT constructions and their enthusiasm to talk, ask questions and explain how they and their neighbours will benefit, indicates how successful the hygiene promotion campaign has been.

A Communal- or a Plot- Centred Approach

Although the Mtongwe block appears to be functioning satisfactorily (was open and clean on a site visit) there is evidence that these blocks will not provide a sustainable solution. There are four main reasons for this.

Firstly, there are limits to the extent to which the numbers of such blocks can be increased. Their construction relies on being able to find suitable unused land, or land which landlords are willing to sacrifice. In the highly densely settled informal settlements of Nairobi land is at a premium and the large area required (roughly equal to four house plots) limits its appeal.

Secondly, the average capital cost of the blocks is Euro 9,533 (see Table 5). This is too much for a private entrepreneur or SHG to raise from internal fund raising and each facility will require external support.

Thirdly, evidence suggests that women and children do not use the blocks as much as men do and that they continue to use 'flying toilets' or practice open defecation. In a study of usage of a block built by Practical Action, it was found that 224 men visited the block on average each day, compared with 168 women and only 70 children. Since men leave the settlement for work each day and women traditionally stay at home it is logical to expect that usage by women and children would be much higher.

The same study used qualitative methods to explore women's views of appropriate sanitation. The study found that reasons for not using communal facilities included:

- Inconvenience. Women reported that they do not want to travel far to use a toilet and it becomes inconvenient to use a toilet any more than 15m from their house. This issue is closely linked to privacy and security concerns.
- Lack of privacy. This is particularly important for women during their monthly period and when they are ill, they become embarrassed if they need to use the toilet too frequently.
- Security concerns. Women reported that they are particularly reluctant to use the communal blocks at night when it is unsafe for women (and even men) to stray outside their plot for fear of rape or other violent attacks.
- Payment methods. Women and men using a monthly subscription were equally likely to use the facilities but women with limited resources, and limited control over money in their household, were less likely than men to pay on a daily basis. Women considered paying for water and food as higher priorities than paying for sanitation.

Finally, there are concerns about the management of the communal blocks. The three blocks will be handed over to the SHGs in each of the villages. In Kenyan law SHGs or CBOs do not have a strong legal backing. These rights only apply once organisations are registered as co-operatives, associations, businesses or limited companies – a status which also entails various responsibilities such as submitting annual accounts, and reporting to relevant line ministries. If they remain in their current 'unregistered' status there is a danger that they will remain dependent.

The original project brief was to construct just five SATs but project staff quickly realised that the community preferred the SAT approach and were keen to have a SAT

built that they could access easily. Additional funds were accessed to enable the project to build the additional ten SATs.

The SAT approach has four major advantages which makes them more appropriate for Mukuru.

- i. **Affordability.** The average cost of each SAT block is Euro 1,670 (one sixth of the cost of a CSB – see Table 5). This low cost is much more affordable for the Mukuru population and can be met with no external support.
- ii. **Buildability.** Local artisans have been able to build the toilets with only advice and guidance from the project. Their skill levels match the level required to build the SAT.
- iii. **Convenience.** The approach brings sanitation closer to people’s homes. This close proximity means that women and children feel that they will be able to use the toilets.
- iv. **Space.** Space is at a premium in the informal settlements. The SAT approach occupies just one plot rather than the four needed for a CSB.

However, it does have significant disadvantages:

Relocation: The approach requires the conversion of one of the house-plots into a toilet. Therefore, a landlord who wants to build a SAT needs to either identify a vacant house or relocate one of his tenant families. This is a potential area of conflict. The number of families that have to be moved is directly proportional to the number of SATs that are built and if it becomes a common approach the number of relocations required will be considerable. The project has addressed this issue. Disputes over land in the settlement are traditionally resolved by the existing Provincial Administration. By securing their involvement in the project and allowing them to adjudicate over both the transfer of plots from houses to SATs and relocation of the displaced families has enabled the project to progress smoothly. A written agreement has been made for all SATs, these documents are held in the Chief’s office.

Paying for the SAT water usage, its operation and maintenance

Box 6 shows that those who subscribe to a SAT will in theory be able to make six times as many toilet-visits as they currently do for the same expenditure. Therefore, in theory, the households involved should easily be able to afford the SAT running costs. However, this assumes that the water use is reasonable and regular. The SAT will all have a water connection via a SWE connection to a water chamber. In order to encourage proper flushing and hand washing the water point should be as close to the toilets as possible – preferably inside the facility. Since this water (used for anal cleansing, flushing and hand washing) will have to be paid for, each SAT group will have to develop a mechanism for both monitoring its use and for raising the funds to pay for it. It could be that charging pay-and-use customers will raise sufficient funds, or as shown in Box 6 it could be included in the monthly rent for each household with access to the SAT. It is clear that establishing a mechanism to pay for the water use is an area of potential conflict as it may well be difficult to measure the amount of water used. However, the SATs also sell water for other domestic uses to residents.

As well as paying for the water supply to the SAT the users will also have to pay for maintenance (either in kind or by paying a caretaker) and those who anal cleanse by wiping will have to pay for toilet paper -substitute materials such as rags and

newspaper will quickly block the sewer connections. This requires not only an ability to pay but also willingness to pay and a willingness to change behaviour.

If these issues can be overcome then the SAT approach does appear to be an appropriate compromise; it is popular with the community and is attracting investment from slum-dwellers in Mukuru. If the toilets are used and maintained with as much enthusiasm then the approach has the potential to be a resounding success.

Challenges of Sanitation in Mukuru

- **Is there sufficient water available?** Increasing the provision of water-flushed toilets will result in an increase in demand for water – for anal cleansing, flushing and hand washing. The sewered connections will need water to function properly and if there is limited water available then blockages will occur.
- **Is there space for toilets?** The project intervention has resulted in an increase in the number of toilet seats, from approximately 150 in February 2009 (DIC, 2009) to approximately 225 seats in April 2010. These are to serve the current population of approximately 67,000 – this is still a staggering 300 people per seat! The very nature of the settlement will make it extremely challenging to reach a level which could be described as acceptable and the ratio of users to seats will always be high. (For example, providing another 75 three-seater-SAT will reduce the number of users per seat to 150). The lack of space will continue to be a limiting factor and the need to relocate a large number of tenants so that toilets can be built will be a critical issue in the process.
- **Can the sewer network be extended?** In order to connect the CSB and the SAT to the main Nairobi sewer network the project has laid 950 metres of 225mm diameter pipe through the settlement. This is a major accomplishment and shows how effective the project partnership has been – first in gaining approval from the landlords to lay the sewer and secondly, overcoming the logistical constraints of working in such a congested location. Further replication of the SAT (or CSB) model would require extension of the sewer network into all areas. Currently the project area is only partially covered and one neighbourhood (Riverside) is unable to connect. This is potentially very damaging as the residents feeling of exclusion could damage the strong relationship that has been built between the community and the project. The capacity of the (very local) main trunk sewer is more than adequate to cope with the additional discharge from the informal settlements. For its part, the NCWSC is keen to develop the sewer network further and appreciates that their role is to provide a disposal and treatment system to serve the informal settlements.
- **Can total sanitation be achieved?** The improvements in sanitation will no doubt result in more people using toilets and a decrease in open defecation and flying toilets. However, in order for a community to experience the true benefit of improved sanitation it is necessary for the whole community – not just the majority – to change their behaviour. Despite the project interventions this is unlikely to occur in Mukuru (or any informal settlement in Nairobi) because the ratio of people per seat will quite simply remain too large and as a result some people will continue to persist with open defecation. Any initiative that provides a hygienic sanitation solution is to be welcomed – the biogas plant operated by the Lunga Lunga Youth Group and the toilet block operated by the African Population and Health Research Centre are both examples of valuable

hygienic facilities – as it will help move Mukuru closer to total sanitation. However, many of the much more affordable small toilets erected by private operators are so poorly built and badly maintained that they are a hazard to human health. Pit latrines also have the disadvantage that they have to be emptied – this continues to be a challenge, especially in the congested slums of Nairobi. Of course there are some examples of private toilets that are hygienic but they are not the norm. In short, no project should support the construction of unhygienic toilets no matter how affordable they are.

What is the Potential for Scaling Up?

Scaling up the ‘Spirit’ of Mukuru’

The Mukuru model has achieved an enormous amount in a very short space of time. Where there was once a confrontational, adversarial relationship between the NCWSC and the residents of Mukuru there is now a formalised working agreement built upon understanding and trust. Practical Action has provided the catalyst that has enabled NCWSC to change its approach to the water vendors with whom they are now willing and able to engage. Consequently, the NCWSC now works with the SWE rather than against them and has grown not only in its understanding of the community but also in its ability to serve them with water and sanitation services.

Meanwhile, the community itself has developed and grown in confidence. The SWE who, a short time ago, were prone to arguing and fighting with the NCWSC and amongst themselves are now working together to improve their businesses, their livelihoods and ultimately their own family’s long-term financial security. Ultimately the residents of Mukuru are benefiting from improved access to a water supply that is subject to less water shortages and sold at a more stable price. They can also look forward to a time when they can use the new SAT (and CSB) and expend less of their resources on coping with the desperate lack of adequate sanitation but they have also benefited in other ways too. Importantly the increased dialogue and communication has led to the community enjoying higher levels of self-confidence and a greater sense of security and stability than they experienced before the intervention – in short there is a renewed ‘spirit’ in Mukuru that things can change for the better.

This is an area where scaling up is urgently needed, not just in Nairobi’s slums but in many other informal settlements in Kenya. Slum-residents lack the stature, confidence and resources to tackle such issues alone and need NGOs with access and respect to support them. Meanwhile, organisations such as NCWSC are frequently constrained by inertia borne out of protocol and tradition which makes it difficult for them to change without a third-party intervention. The Mukuru model, and particularly Practical Action’s role in facilitating communication between the Company and the Mukuru residents, has been very successful in igniting change where change is urgently needed.

However, apart from this improvement in socio-development aspects the success of the approach is also closely linked to the effect the model has on the finances of the NCWSC. The project has invested heavily in infrastructure for the settlement and it will take a long time to recover this investment (approximately five years). In the long-

term, if this model were to be scaled up, the NCWSC would want to recover the cost of such an investment (in other informal settlements) more quickly.

Scaling up the financial model

The Mukuru model enables the water company to deliver water and sanitation services to households which it could not reach previously. Water for these households is now sold (via SWE) rather than lost as unaccounted-for-water thereby increasing revenue to the company. Physical losses are also reduced; thus the approach represents an increase in net revenue to the company. Currently however, the price of water and the cost of the capital investments required mean that the company cannot cover the cost of the operation so remains in deficit for water services in the project area. The operation of the system in Mukuru is thus implicitly subsidised from NWSC budgets although the exact size of the subsidy may not be known. .

60% of the population in the NWSC service area live in informal settlements and currently do not benefit from formal water connections. In most of these areas it is reasonable to assume that the water company is losing money as it was prior to the project intervention in Mukuru (through theft of water and physical losses). It therefore seems reasonable to suggest that formalising service delivery to informal settlements, and reducing these losses should be an attractive option, and should rapidly become the core business of the water company. However, scaling up of supply to informal areas would be more attractive if it resulted in net positive revenues more quickly – this raises the question as to how the Mukuru model could be modified to make it more financially viable. There are three broad options;

i) **Increasing revenue:** This could be done in the first instance by increasing the bulk resale tariff currently offered to SWE. Given the high profit margins that SWE experience on water resales this might be a viable option but probably requires greater security of operation before it would be acceptable. An option that might make this increase more attractive would be to restructure tariff so that the price of a connection (currently cited by the SWE as a major barrier to access) is reduced or removed and the price of water increased. Care would be needed to ensure that the costs of operating sewerage were also covered appropriately through either the conservancy tax applied to water sales to SWE or through cross-subsidies from NWSC operations.

ii) **Reduce costs:** The capital costs of the new systems in Mukuru are reasonably high. If the approach were to be scaled up this might offer the opportunity to introduce cost savings through competitive bidding of contracts. Performance-based contracts (where contractors bid a unit price for connections made) might encourage cost savings through technical innovation and/ or competitive pressures.

iii) **Introduce an explicit subsidy:** The final option would be to seek funding for an explicit subsidy which could cover all or part of the capital investment costs. This would enable the water company to make a greater return on water sales in the project areas.

A key to achieving all these steps is probably to formalise the model now offered in Mukuru and make the tri-partite partnership model a **core business model for NCWSC**. This would enable communities all over the service area to apply to become partners with NCWSC and is probably an essential step if NCWSC is to reach the 2,000,000 people in informal settlements within their service area. Essentially any community could apply for service connections in return for agreeing to meet the specifications

offered by NCWSC (from the types of pipe used to the institutional arrangements in place in Mukuru). Once service delivery is operated at sufficient scale, the option to introduce competitive elements to bring down costs becomes more feasible. Some SWE may start to operate at a slightly larger scale enabling them to bring down their unit operational costs.

Facilitation and capacity building would still be needed in many communities, particularly at the early stages of the process before households develop confidence in the model. A suitable role for Practical Action might be to oversee the capacity building of suitable local partners in different communities – thus moving from direct implementation to becoming an implementation support partner to NWSC for a large number of new project areas.

What are the likely funding sources for an at-scale project?

There are three potential sources of funding for such an at-scale project:

- i. Firstly direct revenue from water sold to SWE (if tariff increases were an option);
- ii. Secondly indirect funding (cross subsidy) from NCWSC (a surcharge included in water bills for household customers could be used to finance an investment fund for informal areas – as has been done in Burkina Faso for example); and
- iii. Finally external funding which has two dimensions – commercial borrowing which could be repaid through the general revenue of NWSC or concessionary funding from donors.

Turning to this last option the potential for commercial funding is a direct function of NCWSCs operational viability. It is likely that increasing services to two million people will be a high-cost investment; it seems unlikely that NCWSC would be able to raise all the needed funds on the commercial market and would certainly not be possible while tariffs remain below cost-recovery levels.

However, some form of ‘blended finance’ might be possible. Many donors might prefer to see funding channelled through some form of output-based subsidy mechanism to ensure that investments do in fact result in sustained services in the informal settlements. The Global Partnership for Output-based Aid based at the World Bank for example offers grant funding for output-based subsidies that increase access to services for poor people. Other donors who are interested in this model include kFw, USAID, DFID and the EU.

Conclusions

The Mukuru Model is very clearly contributing directly to achieving the millennium development goals related to safe drinking water, sanitation and slum-dwellers (see UNDP, 2010) and has visibly changed the water supply and sanitation service in Mukuru. It has achieved an enormous amount in a very short space of time. At the heart of the project is the tri-sector partnership facilitated by Practical Action. The partnership has broken down long-established barriers between the NCWSC, the SWE and the Mukuru residents or slum-residents. In place of the barriers, an environment of communication and participation has been created which has enabled a major transformation to occur.

The SWE now have legal contracts with the NCWSC and are recognised as businesses rather than rogues or thieves. Communication between the SWE has improved and they are now working together to solve their common problems - pooling their resources, saving money and re-investing it in their businesses. They are even investing their own funds in sanitation, acknowledging that it will improve their lives (and the lives of their tenants); clear evidence that the SAT toilet system is a success story in the making.

Practical Action considers components of the model to be ground breaking in overcoming the barriers to delivering water and sanitation services in informal settlements and would like to replicate this model in other informal settlements in Nairobi. It recommends that the NCWSC makes the model a core part of its business strategy and scales up the approach to an appropriate level. The success of the model should not be confined to Nairobi but should be disseminated to other municipalities in Kenya for immediate incorporation in their programmes too.

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Note/s

- i) The water chambers are connected to the water supply network and are large ground level concrete boxes approximately 4 metres by 2 metres which contain banks of water meters. They are locked to (in theory) prevent tampering.
- ii) The average distance was about 300 metres but where nearer water chambers were already fully connected (the number of connection per chamber is between 26/30), the SWEs had to get their water from chambers further away, this was sometimes as much as one kilometre away.
- iii) Baseline survey, Practical Action, 2007, states that 49.8% admitted that they used plastic bags or open defecation to cope when they had no access to a toilet.
- iv) The location and site conditions in Mukuru meant that the use of traditional pit latrines was not a viable solution - the ground being too poor and unstable and the water table too high. Even if these technical difficulties could be overcome there was simply no space for them to be built. Since landlords were not required to provide a toilet for their tenants very few had willingly given up the space and, perhaps more significantly, the rent they could earn from a house in order to build a toilet.
- v) Domestic customers outside the informal areas pay for consumption based upon an increasing block tariff; starting at;
 - KES 18.71 per m³ for 0 to 10 m³ per month;
 - KES 28.07 per m³ for 11 to 30 m³ per month; and
 - KES 42.89 per m³ for 31 to 60 m³ per month.
- vi) Total investment in schools for hygiene promotion is Euro 17,000. This includes awareness raising costing 6,000. The remainder was spent on hand washing, rainwater harvesting and water storage facilities in all 8 target schools.
- vii) This figure is approximate – includes three CSB (each with six seats); fifteen SAT (average of three per SAT); plus twelve more one seat SAT by individual landlords without project funds = $(3 \times 6) + (15 \times 3) + 12 = 75 + 150$ (existing) = 225.

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