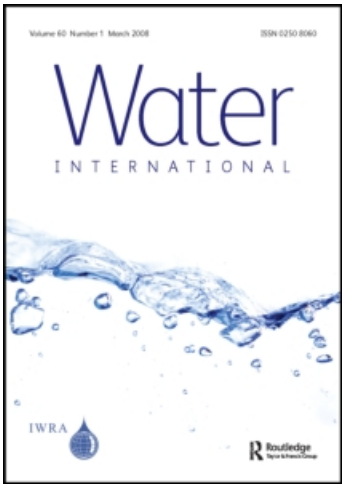

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Access to water in a Nairobi slum: women's work and institutional learning

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Access to water in a Nairobi slum: women's work and institutional learning

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This paper describes the ways that households, and particularly women, experience water scarcity in a large informal settlement in Nairobi, Kenya, through heavy expenditures of time and money, considerable investments in water storage and routinized sequences of deferred household tasks. It then delineates three phases of adaptive water and social engineering undertaken in several informal settlements by the Nairobi Water Company in an ongoing attempt to construct effective municipal institutions and infrastructure to improve residential access to water and loosen the grip that informal vendors may have on the market for water in these localities.

Keywords: slums; water supply; water markets; institutions; deliberative democracy; gender; household water storage; Kenya

Introduction

The issue – uncertain, expensive water and how to improve the system

In the slums of Nairobi, water is frequently scarce, sometimes costly, and its supply uncertain. On good days, women and others collecting water for their households spend about an hour going to a nearby vendor with water, queuing up, and then walking home with 44 lb containers carrying water on their heads (Brocklehurst *et al*. 2005). They make multiple trips to get sufficient water, particularly for laundry. On bad days, collecting water can take several hours. One estimate suggests that households spend 20% of their income on water (UNDP 2006). Women interviewed say they frequently curtail clothes-washing, often postpone baths, and sometimes have fewer meals, when water is unavailable or unaffordable. One corner, wall or under-table space of each 10 foot by 10 foot, mud wall and tin-roof dwelling has multiple containers in which water can be stored. With uncertain access to water, each household has to store water within the house.

Nairobi slums and the impetus for reform from Nairobi Water Company

Sixty percent of Nairobi's population live in about 160 informal settlements, 25% in one settlement, Kibera, alone. A significant and rapidly growing part of the world's population, perhaps a third, lives in informal settlements, more commonly known as slums

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(Davis 2006).[1] Service provision and the growth of institutions in these areas is of great significance to the wellbeing of a large proportion of humanity.

The research for this paper has primarily been in Kibera, the largest informal settlement in Nairobi. We refer also to two other informal settlements, Mathare and Mukuru. The history and structure of these three settlements differ, but the water company approaches them as similar settlements. We also believe that the conditions of water access and women's work are broadly similar in all three.

In the wake of elections won by a reforming coalition in 2002, the Nairobi City Water and Sewerage Company, frequently abbreviated as the Nairobi Water Company, was devolved from the Nairobi City Council. This occurred in the context of a new, liberalized water policy which emphasized devolution and the separation of policy and management from the provision of services (Brocklehurst *et al*. p. 3). Subsequently, officials within the Nairobi Water Company argued for and achieved a separate Informal Settlements Unit to deal with settlements like Kibera. They argued that there were social objectives to be achieved in informal settlements, notably access to clean water, which should override maximizing revenue as the principal goal for the water company.

At the time the Informal Settlements Unit was established by Nairobi Water Company, water mains had recently been constructed across Kibera, and an unregulated water trading system was in place, but traders operated largely with illegal connections to the mains. Payments to the utility for water were at best erratic, and the utility was unable to collect revenue or account for the distribution of more than half of the water being delivered.

Elements of a water-access system

Water-access technologies have three elements:

(1) a package of technologies which store, treat and deliver water;
(2) a social institution, such as a municipal utility, that builds and maintains the technologies; and
(3) a set of social practices (such as contracts and prices), institutions (for example, a kiosk or trader system working with the utility) and agents (such as utility officials, traders or non-governmental organizations [NGOs]) which enable individuals, households and enterprises to gain regular access to units of water.

Users of a pipe network delivering water to a household faucet may be unaware of the complex history that lies behind that water-access technology. Technical and social innovations may be required in all three elements and subtle alignments of political influence and economic interests are necessary before a functioning and sustainable system can emerge. Hamlin (1988) describes some of this history in four British towns. The story is complex and contingent in each of the four cases. It is difficult to generalize from Hamlin's description because each town has its own history, economic interests and political coalitions. Nairobi is in this respect similar. Institutional innovation and learning are occurring in the search for better water access. These initiatives are subject to constraints and buffeting by forces outside the control of those generating them.

Iterative initiatives

We describe three phases of water and social engineering in this paper. They represent iterative attempts by the utility to address the problem of unaccounted water,

and their social goal of improving water access in informal settlements. They focus primarily on improving elements (2) and (3) above, with less emphasis on technical innovation. These are "top-down" initiatives primarily started by people in the water company with encouragement from multilateral organizations like the World Bank-backed Water and Sanitation Program and government donor agencies. They are distinct from the community-based organizations described by Dill (2007, 2010) in Dar es Salaam, Tanzania. In both cases, however, there are "public–public" connections, of ideas, finance and everyday implementation, between state-based utilities and community-based organizations.

The first phase of water and social engineering was the formation of an association of water vendors in Kibera with a new relation to the Nairobi Water Company. In effect, the focus was on the third element of the water system (social practices, institutions and agents of access). The objective was to build on existing practices and institutions to find a better way of providing access to domestic water in Kibera. This was not a success. The association now exists in little more than name and little has been achieved through the association.

The second phase was the introduction of meter chambers in Mukuru. This experiment was focused primarily on the first element of the water system, the distributional technology. This second phase was only a partial success because the community groups that the utility imagined would take over the running of local pipe distribution and revenue collection turned out to be existing water vendors, part of a "cartel" distributing water.

The third phase is the work of introducing meter chambers in the settlement of Mathare with a much greater level of participation. The first and third elements of the water-access system are to be reformed in this third phase. While this third phase is still ongoing in 2010, it seems to have slowed down.

What the account of these three phases begins to reveal is an iterative process of experimentation and institutional learning. This experience suggests that sustainable social institutions need to be adapted to local histories and conditions through some process involving representation of the population needing access. We see a process of trial and error unfolding. Advance is slow and erratic. There are connections between this process and ideas of deliberative democracy (Rodrik 2002, Evans 2004) as a way of achieving effective, sustainable improvement. The Nairobi Water Company has been moving with successive iterations toward social practices and institutions, element (3) above, which involve community members and the users of domestic water in the operation and design of the water-access system. Deliberative democracy is proposed as an alternative to "technocratically designed blueprints backed up by global political and economic pressure . . ." (Evans 2004). Deliberation refers to a learning process in which residents of an area gain knowledge of development proposals before they are called upon to express their approval or disapproval. The first phase of development described, the association of water vendors, and the third phase, participatory design and development in Mathare, include elements of deliberative democracy.

Paper outline

This paper seeks to describe the impact of water scarcity and recent responses to this situation. It is based on interviews with households, water company officials and former officials, water vendors and landlords and on the experience of the second author working and living in Kibera for three years.

The second section of the paper describes water access in informal settlements, primarily in Kibera. The third section summarizes difficulties reported by the consumers of water and their responses to them. The fourth section describes some results of mass disconnections organized by the Kenya Police in August 2007. The fifth section describes the implementation of different attempts to improve water access in informal settlements. A summary and conclusion is provided in the final section.

Water in Kibera and other informal settlements

Some 60% of the population of Nairobi is believed to live in a large number of unregulated urban settlements with high population densities, unpaved roads, low levels of service and sometimes high levels of crime. The two largest settlements are Kibera and Mathare (Mitullah 2003).

Kibera is a 250-hectare informal settlement in the southwest of Nairobi with a population of 170,000 (Rasnah 2010). It was established after World War II by the British colonial government to house soldiers from Sudan who had fought in the British Army. These early residents were not given title to the land, but many of them have become the *de facto* landlords for Kibera through their informal rights as "structure owners" (Brocklehurst *et al*. 2005, p. 3). The settlement is adjacent to Nairobi's industrial area and a relatively affluent residential area, both of which provide employment for Kibera residents.

A survey of 674 households in the three largest Kenyan cities (Gulyani *et al*. 2005, Table 2) found that water supply was the top development priority for both rich and poor. Water and sanitation provision in Kibera are so inadequate that rates of infant mortality, under-five mortality and bloody diarrheal infection, are estimated to be three times the average for Nairobi as a whole (UNDP 2006, p. 38).

Women and children purchase water in 20-litre, yellow plastic jerry cans from water vendors who store water and sell it from standpipes. Most of the jerry cans once contained cooking oil. The streets of Kibera are narrow, unpaved and uneven. Many streets have open drains, doubling as sewers, which are periodically unblocked by residents shovelling mud and trash onto the street. (There are neither sewers nor organized garbage collection in Kibera). It is difficult work carrying heavy loads of water from standpipe to home.

There are estimated to be 650 water vendors in Kibera (Brocklehurst *et al*. 2005) connected, often through a combination of legal and illegal pipes, to the few water mains running through or near to Kibera. Thompson *et al*. (2000) note the rising importance of water vendors in East Africa. Because supply to the mains is rationed (rationing is described below) or uncertain, most vendors have at least one storage tank, and some have 10 or more (made usually of rusty sheet steel). Vendors sell water from standing taps in front of their houses or small offices. About 20 storage tanks and kiosks (small shops selling water) had been installed by community-based organizations in 2005, and are run by community organizations or women's groups (Brocklehurst *et al.* 2005).

Prices

Prices vary seasonally and according to the supply of water. In summer 2007, a 20-litre (four gallon) jerry can of water varied from K Sh 2–3 (US 3–4¢) when many vendors have water, to K Sh 5–10 (US 7–15¢) when few vendors have water. An express rate of K Sh 20 (US 29¢), was widely reported to be charged giving the less penurious consumer the right to go to the head of line. (One trader said in 2008 that express prices are no longer common because they raise too much opposition from those in the line). A 2005

comparison of Kibera water prices with utility tariffs in Kenya and other African and European countries (Brocklehurst *et al*. 2005) indicates both the substantial range of water prices in Kibera (higher during shortages) and that minimum Kibera prices are higher than average prices in Kenya and maximum prices are about double European prices. In August 2008, a Nairobi newspaper reported (*Standard* 2008) that water in informal settlements was selling for K Sh 15 to 30 (US 22–44¢) per 20-litre jerry can. Brocklehurst *et al.* (2005) attribute high prices to the capital costs of traders (laying pipes and buying storage tanks; bribes for connections), the tariffs charged by the water company, and to vendors "taking advantage of temporary shortages to make rapid profits" (Brocklehurst *et al*. 2005, p. 7).

Rationing and shortages

Water in Nairobi is rationed. Traders in Kibera were told by the water company some years ago to expect water supply for three days out of seven. Different villages of Kibera expect to have water on different sets of days. When there are shortages in the reservoirs supplying Nairobi this may be reduced further. For example, in August 2008, the Director of Nairobi Water Company told the *Standard* (2008) that low water levels at Ndaikini dam, due to the failure of the rains, were to blame for shortage at that time.

Traders have responded to rationing in at least one way which tends to reduce the scarcity. Larger water traders interviewed described without hesitation their connections to several of the mains pipes going through or adjacent to Kibera. For example, one said he had "used a lot of money . . . to get pipe connections to [main] pipes #10, #4, #6 and Karanja. If one of them runs dry I can then get water from another one." To do this, he had bought pipes and obtained permission from the Kibera landowners whose land the pipes had to pass, then made an (illegal) arrangement with a water company plumber to get his pipes connected to the main (Interview, August 2008).

Kenya water reforms: a new policy toward informal settlements and the rise of Maji Bora Kibera

A change of government in 2002 brought policies focused on "good governance, devolution and a positive investment environment" (Brocklehurst *et al.* 2005, p. 3). A Water Act in the same year separated water management from provision of water services. As a result of the Act, the Nairobi Water and Sewerage Department was separated from the City Council in 2004 and established as the Nairobi Water and Sewerage Company. Hereafter, we refer to NWSC as the water company. Although the water company is owned by the City Council, it operates autonomously and water revenue is now exclusively available for maintaining and expanding water provision. Franceys and Weitz (2003, p. 1095) suggest that this sort of change can challenge "vested interests with a new organizational structure".

After the devolution of the water company, some officials of the new organization argued that informal settlements should be treated differently to urban areas with established infrastructure. The goal should be increasing access to water, not revenue for the company. This position, reinforced by huge water losses being incurred due to leaks and illegal connections, was accepted. In 2008, an Informal Settlements Unit was established. One result of this change of policy was the "balancing" of water pressure between different parts of Nairobi. This increased water pressure on mains in informal settlements, making more water available and reducing cross-contamination from sewage lines. A survey in

February and March 2010 (not yet analyzed) suggests that water availability had improved since 2007.

Both the City Council and, since 2004, the water company sought funding and advice from the World Bank/UNDP Water and Sanitation Program (WSP). The Third Nairobi Water and Sanitation Program starting in 1988 was supported by WSP. It included a program to "infill" mains pipes across Kibera and "enhance the role of the independent private sector in the delivery of water in Kibera" (Katui-Katua and McGranahan 2002, p. 1). Before the Kibera Water Distribution Infilling Component was terminated (without completion), it had established that there was local support for a village water sellers association (Katui-Katua and McGranahan 2002, p. 24).

In 2003, a series of meetings, facilitated by the Water and Sanitation Program of the World Bank, led to the formation of such an association, called *Maji Bora Kibera* ("better water for Kibera"). Initially vendors were concerned about the water reforms passed in 2002. One of the architects of the reform legislation spoke to an early meeting. After a membership campaign, 500 vendors, out of an estimated 650, joined the association. The company was approached and a joint association-company task force established. A letter from *Maji Bora Kibera* to the company listed the major problems they faced: shortages, lack of bulk connections, illegal connections, corruption and lack of sewerage. They offered to engage in a series of initiatives to regularize connections, pay water company bills, stop bribes and report leakages (Brocklehurst *et al*. 2005).

The first chairman of *Maji Bora Kibera* (MBK) describes the discussions as follows:

> Because [the World Bank/UNDP Water and Sanitation Program] were there as arbitrator, the Nairobi Water Company and the water vendors could . . . discuss [concerns about water in Kibera] . . . I told the company all the loopholes, and how to move forward . . . [We] do not want this corruption to go on. MBK committed ourselves, no illegal connections, no by-passes (we gave them this information), bills to be paid. [MBK was] committed to prevent corruption. (Interviews, August 2008)

MBK negotiated a written "minute" that committed both sides to a process (this minute has been lost): Illegal connections could be regularized. Unpaid water bills could be resolved, with large disputed bills (which had arisen before the devolution of the water company, at a time, the MBK chairman said, when there was wide corruption) waived and real bills paid in instalments. MBK vendors would detect leaks and illegal connections.

All this broke down in 2007, a few months before the Kenya Police moved in to make mass disconnections. A meeting in the spring of 2007 between the water company and officials of *Maji Bora Kibera* revealed misunderstandings about what had been agreed. The Chairman of MBK stalked from the meeting in anger. Then, in the summer, mass disconnections created mistrust between vendors and government which made further meetings difficult. We continue the description of that episode in the fourth section of this paper. Before that we describe some of the water access conditions brought to light by interviews with households.

Consumer reports

To get an introduction to conditions facing households, the first author talked in 2008 with women from 14 households. Eight were members of Makina Women's Group who had come together to organize a water kiosk. Another six were households identified to represent a range of livelihoods by one of Kenya Water for Health Organization (KWAHO)'s promoters of their solar disinfection system, SODIS.[2] So, these 14 households include

activists and SODIS water users who may be more disadvantaged and concerned about water than the average. (A survey of a larger and more representative sample of households is ongoing).

Three aspects of poor women's lives in Kibera speak to the difficulties they have gaining access to water. First, they note the time and cost of getting water. Water collection takes large parts of some days, and a significant slice of their earnings. Second, they describe the activities they have to curtail when water is scarce or unaffordable. All note that laundry may be deferred, showers may be foregone, and sometimes cooking reduced to one meal when water is scarce. Third, those who can afford to, own multiple jerry cans and drums in which they store water. These containers take up large parts of their small houses. Women we talked to knew exactly how much water they had in their houses.

Time, cost and quantities of water

There is one borehole at the Mosque in Kibera which provides the main alternative to piped supplies from the company. This provides the source of water that is available when all mains sources are dry. This source came up in almost all conversations in the summer of 2008. We visited the Mosque on three occasions that summer. Each time there were long lines of women with jerry cans waiting for water.

The cases of three women illustrate some of the difficulties they face when water is not available nearby. Mean household incomes in Kibera are K Sh 3000 (US$45) per month or K Sh 100 (US$1.50) per day (Crow unpublished survey 2010, see also Mutillah 2003, p. 13). We have also provided rent costs for comparison in this section because we suspect they are more reliably reported than incomes.

One single mother of four, who we will call Rahema, is a tailor who makes and repairs clothes for the community. She reports that on some weekends, and sometimes in August for a whole week, there is no water available. Then, Rahema goes to the Mosque to get water. At those times, it takes almost a whole day to get water and it costs K Sh 20 for four jerry cans. Those days she cannot do her tailoring. She gets four jerry cans of water, 80 litres or 21 gallons, for her family. Her rent is K Sh 700 (US$10) and her water may cost K Sh 300 (US$4.50) per month. When Rahema is able to fill four jerry cans, she brings home 16 litres/capita/day (lcd). This is substantially less than the estimate of 25–50 lcd required for basic needs (World Water Council 2006, p. 3).

Rosala works three to four days a week as a hairdresser. She has a household of eight: her brother, five children, her bed-ridden mother and herself. Most of the family were home when the first author visited. Their room is small. The household uses 10 jerry cans of water a day. This is 25 litres/capita/day. Fortunately there is a water tap in her compound where she buys water when it is available. But Rosala only owns four jerry cans. The two bigger children help, but "it is a struggle". It takes five hours per day to collect water when there is a shortage. Water costs her, she says, K Sh 30–50 (US 44–74¢) per day, at least K Sh 900 (US$13) per month, almost as much as the rent for the room (K Sh 1000, US$15) and about one third of mean household incomes.

Martha cooks Mandazi, snacks people eat for breakfast, which she sells from a stall at the side of a road. She has a husband and three children. Her husband drives construction machinery. She uses three jerry cans of water on alternate days when she does not do laundry and 10 when she does laundry. When there is water available, her landlord has a tap in the compound where the family have a small triangular room. When there is no water, as happened the weekend when we met, Martha had to get water from another part of Kibera. It took from morning till noon to get three jerry cans.

Activities curtailed by water shortage

A sequence of activities curtailed when water is short emerged from discussions with 14 women from Makina Women's Group. When water is scarce or unaffordable, clothes-washing is postponed to another day. If water is more scarce, then bathing is foregone for that day. If there is even greater scarcity, then the household may have to cut back to one meal per day.

Here are summarized responses mostly from women of Makina Women's Group. We asked what they did if water was unavailable or they could not afford to buy enough:

> *Use just for drinking. Some times only have water for drinking.*
> *No daily washing of clothes. Skip showers. All family is forced to skip showers, we have only 1 jerry can.*
> *Many things [I cannot do]: 1 clothes 2 cleaning home 3 bathing 4 kitchen garden.*
> *Business – mandazi and soup. At times not able to open her shop because she is spending so many hours looking for water.*

It is reported that 75% of Kibera residents bathe inside their living room (Water and Sanitation Program 1997). This is often the only room with a curtain partitioning a bed area.

Household water storage

The average water storage capacity of the households we asked was 200 litres (53 gallons), equivalent to 10 jerry cans. Two households had only three jerry cans, 60 litres. The maximum storage capacity was 460 litres. Households with the largest capacity could afford two or more 100-litre (26 gallon) "super-drums". One older woman had no water stored; two women had less than 20 litres. With an average household size of seven people, the average storage capacity represents 29 litres/capita/day. The average of water actually stored when the women were interviewed around midday was 76 litres which represents 11 lcd, a tiny proportion of internationally estimated basic needs of 25–50 lcd.

Women are spending large parts of some days searching for water, significant proportions of their income buying water, and they have had to amass water storage. On some days, they face significant privation because water is unavailable or unaffordable. The dignity and wellbeing of their households and themselves is constrained by their inability to wash clothes or bathe. Their health is jeopardized when meals have to be reduced to one per day.

Water is scarce, costly and uncertain in Kibera for a number of reasons. In addition to the rationing of water, Brocklehurst *et al.* (2005) note a long history of neglect by the utility, a lack of pumping capacity and a "tendency to divert available water to neighboring high income areas where both political influence and revenue collection are greater" (Brocklehurst *et al.* 2005, p. 5). Neglect by the utility began to change after the formation of the NWSC and particularly its Informal Settlements Unit. This department designed the experiments described below.

Before we describe those experiments, we need to describe government action against gangs and their control, amongst other services, of water. The Kenyan government's response to the most famous ethnic gang in Kenya plays a part in water reform.

Mass disconnections and the Mungiki

A broad range of non-state institutions emerged in Nairobi's informal settlements particularly during the period of three decades after independence when government policy was that these settlements should be levelled. There was in this period no government

regulation of economic activity and little policing or law enforcement. These institutions are sometimes called cartels because they monopolize some economic activities, and they are sometimes organized along ethnic lines. In Mathare, a large informal settlement in the eastern part of Nairobi, revenue has been generated from much illegal or unregulated activity by a violent gang, called the Mungiki, associated with Kikuyu identity. Until 2007, the Mungiki raised income in Mathari from their control, backed by violence, of water and electricity services, the taxes they levied on minibuses (*matatus*) and head taxes levied on residents (*New York Times* 2007).

The violence and extent of Mungiki activity led to a series of actions in August and September 2007 by the Kenya Police. These actions started in Mathare but were then continued through many informal settlements. There were violent clashes in which people died (BBC 2007). One objective of the police was to disconnect illegal electricity and water connections from which the Mungiki derived income.

We asked a water company official if there was a connection between the Mungiki and water vendors:

> Most [of the water vendors] belong to this cartel. [. . .] It was not easy to walk into Mathare when the Mungiki were in charge. Nairobi Water Company lost a lot of revenue and water.

Then this official went on to describe the start of the mass disconnections:

> The Kenya Police called the Nairobi Water Company to a meeting, and told them to provide staff to do the disconnection. The police gave them security. (Interview August 2008)

At the time of the disconnections, water company officials explained their actions to the press in these terms:

> "So many people steal our water in this area. By cutting the water, we oblige people to report unauthorized connections. We started doing this in July 2007 in areas of the slum to identify illicit water points." (J. M. Ruhui, Engineer, Nairobi Water Company)
>
> "More than 90 percent of vendors [in Mathare] steal our water. They bribe plumbers or former employees of the company to get the water free . . . Sometimes our officials do not even dare penetrating the slums." (Edith Kamundi, sociologist, Nairobi Water Company) (IRIN 2007)

In subsequent months the police embarked on the operation to disconnect illegal connections in Kibera and other settlements. This is how the same company official describes the operation:

> It was a police operation to do away with the illegal cartels – all pipes and power were disconnected. Members of the Mungiki were flushed out of the village, some of them killed [others arrested].
>
> [How did you distinguish illegal and legal connections?:]
>
> [We] disconnected all indiscriminately. If [individuals] felt they were legally connected, they could make a case at the office and then the connection would be given back.

In the wake of this indiscriminate disconnection, Mathare was without water. After a week, fear of the outbreak of disease forced the water company to provide water. They decided to provide free water at standpipes in each of the main villages:

> After mass disconnection, the village was a total mess. Toilets were stinking, people went back to using flying toilets.[3] It was on the verge of an outbreak of disease. Nairobi Water Company decided to give free water – to avoid an outbreak, and because it is a basic human need. The settlement was just a week without water. (Interview with company official August 2008)

Disconnections reached Kibera in September. The negotiations between the vendors association, *Maji Bora Kibera*, and the water company had broken down earlier. But the coming of the police reinforced the setbacks. The Chairman of *Maji Bora Kibera* describes how all pipes were disconnected: "They did not check if a connection was legal or illegal. We have a meter and an agreement to pay accumulated bills, legalize. Here, they went to the main and disconnected pipes" (Interview, August 2008).

Before the mass disconnection, the chairman says, corruption had been reduced by the dialogue between the *Maji Bora Kibera* and the company and the attitudes of the company employees and of the vendors had changed. Since the mass disconnections, the relation between the two groups has become more distant: "they are not comfortable, not friendly [since they] came with the police, arresting, beating . . ." (Interview with *Maji Bora Kibera* Chairman August 2008).

Initiatives in water and social engineering

There have been three recent rounds of innovation in water supply to informal settlements. Two have been concluded. The third is under construction. The first is the experiment in building a water vendors' association. We have described the rise of *Maji Bora Kibera*. We have now to describe the waning of this approach. The second is the Mukuru "chamber model" building on experience from an informal settlement in Kisumu, western Kenya. As the company admits, the Mukuru experiment, now termed a pilot project, was not a great success. It generated a new form of cartel, the chamber cartel. The third experiment, the delegated model in Mathare, seeks to learn from the outcome of the Mukuru experiment and takes the story on from the mass disconnections described in the fourth section of this paper. After a year of planning and consultation, construction was due to start in Mathare late in 2008. In March 2010, kiosk construction was reported underway.

These experiments have been facilitated by decisions of the Nairobi Water and Sewerage Company to plan water provision in informal settlements separately from the rest of Nairobi, and that social considerations not revenue should guide policy in those areas. The company had a team of three sociologists designing these initiatives, along with engineers. In 2010, the team was reduced to two. (The authors interviewed the Nairobi Water Company sociologists but have no relation to them.)

The decline of Maji Bora Kibera

A great deal of work went into the Kibera water vendors' association, *Maji Bora Kibera*.[4] Many meetings were organized in 2003/4. If the *Maji Bora Kibera* chairman, and the main published account (Brocklehurst *et al.* 2005), are to be believed, then considerable progress had been made.

In 2008, however, *Maji Bora Kibera* was in decline. No meetings were planned and no dialogue with the water company. This position had not improved by 2010. As we note below, the water company is now unsure how to proceed in Kibera.

The *Maji Bora Kibera* experiment set out to establish an association of vendors to 'promote self-regulation, improve their credibility and develop relations with the utility.' (Brocklehurst *et al*. 2005, p. 2). This, it was expected, would "result in a better business environment for the providers, less leakage for the utility, and, most importantly, greater accountability to customers – all important steps in developing better water services for the poor" (Brocklehurst *et al.* 2005, p. 2).

But, the agreements *Maji Bora Kibera* thought they had negotiated to legalize illicit connections and resolve outstanding bills did not hold. When implementation started in

the Kibera village of Soweto around April 2007, the company disconnected all pipes and the MBK chairman withdrew in anger.

Then, a few months later, the Kenya Police rode roughshod over all water connections and the potential for negotiated agreements between the *Maji Bora Kibera* and the water company. For the time being at least, this first initiative ended with the mass disconnections.

The accounts we have been able to collect from *Maji Bora Kibera* leaders and from the water company suggest that there was miscommunication about what had been agreed between the two. It is possible that there are wider political ramifications of which we are unaware. An attempt to organize landlord-water vendors to work with a water company is likely to be vulnerable in a community where landlords and water traders are believed to be making high returns.[5]

Mukuru chamber model

> In Mukuru we looked at it as an engineering problem. We thought putting in infrastructure would solve the problem, that people would automatically make connections to the chambers. (Mildred Ogendo, Informal Settlements Unit of Nairobi Water Company, Interview, 12 August 2008)

The second experiment is known as the delegated meter model. It was first pioneered in the Kisumu settlement of Nyalenda in 2006, then implemented in Mukuru, another informal settlement in Nairobi.

The delegated meter model is quite simple. A network of new water pipes is laid around the settlement, then "secondary branch" pipes (vertical lines in Figure 1) lead into the settlement to a series of meter chambers (a concrete box, of varied sizes, locked to prevent tampering – shown as rectangles beside the spur lines in Figure 1). Households, water traders or community groups connect their pipes to water meters in these chambers.

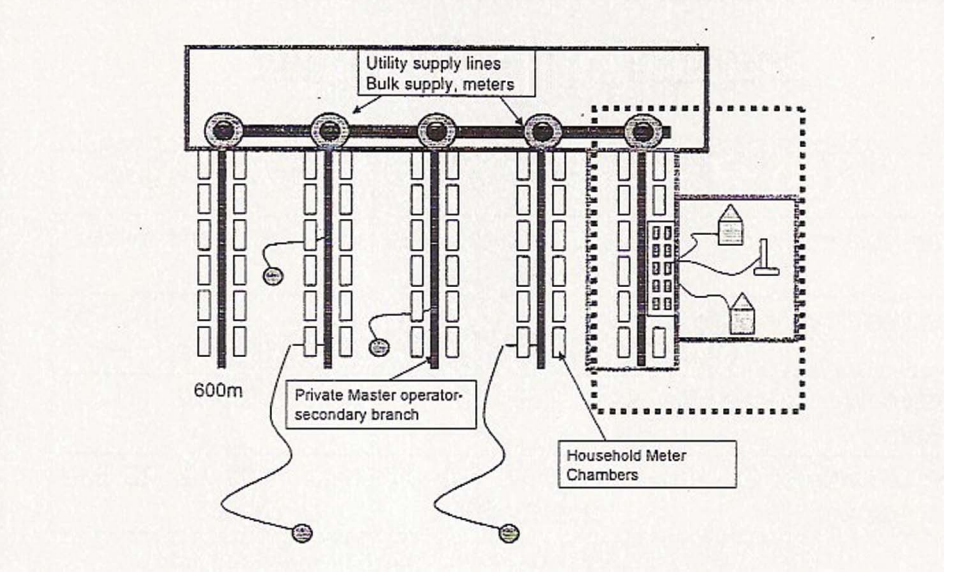

Figure 1. The delegated meter model: Nyalenda.
Source: Kisumu Water and Sewerage Company.

The "delegated" in the title refers to the goal of devolving responsibility for the service and bill paying to local vendors and community groups. In the original Nyalenda model, a "master operator" takes charge of the bulk-supply meter at the end of each secondary branch pipeline. The master operator can then allow connections to be made by individual households and to commercial vendor kiosks or standpipes. The water company delegates to the master operator responsibility for maintaining the service and collecting the money.

This model was implemented in Mukuru with the construction of 67 chambers with 25 or more connections to each. But when, in 2007, the company made a "socio-economic appraisal" of what had happened, they found, "the cartels had outsmarted us. We hoped the community would make the connections, but it was the cartels" (Ogendo, interview, 12 August 2008). The Nairobi Water Company intended that community organizations would maintain secondary branch pipes and take responsibility for collecting money and paying them for the water supplied to that branch. What they found was that influential individuals within the community, many of them former water traders, had taken over many connections and created monopoly conditions for trading water at high prices.[6]

Mildred Ogendo, of the Informal Settlements Unit of the water company, explained further the powers that accrue to the people (chairmen) the company had arranged to oversee the connections:

> When we went to ask [communities in Mukuru] to form groups, there was a lot of infighting. Everyone wants to do the talking to [the company]. We wanted a chairman for each chamber, we brought together groups and elected a chairman and secretary. We deal with the chairman for communication with the group using a chamber.
> [Does the chairman have a lot of power?:] Yes a lot. Mukuru has its own economic dynamic which we are not yet able to fully understand. Water is the economic base, the chairman has the authority to decide the number of people he wants to have connections. We are trying to [clean] it up. He knows who he wants to work with. [The company] entrusted him with power . . . We tried to empower the community, but [we] allowed [them] to elect leaders.

Ogendo says: "We wanted to learn from it. We did learn. When we go to another informal settlement" it will be different. The next settlement to be tackled was Mathare.

Delegated model in Mathare: learning from Mukuru

> We want to start a perfected project in Mathare. We are cautious. We have been planning for a year. Still . . . [we are] worried about the issues, so [we are] re-planning. (Ogendo, interview, 12 August 2008)

Mathare is the community where the Kenya Police fought battles with the Mungiki in 2007. In the three years after the mass disconnections water has been supplied free to a limited number of standpipes for each village in Mathare. The company has turned a blind eye to a number of unplanned connections in the more remote areas of each village.

In Mathare, the company decided to delegate the work of community building to a non-government organization, the Pamoja Trust. This group had previously worked on upgrading housing in Mathare. They arranged community mapping and enumeration. Different technical designs were presented to community meetings. Some have been rejected and alternatives created. New forms of subcontracting of community-supported water sellers are envisaged at the bulk meter and at the chamber. Some individual, household connections are envisaged for the large buildings constructed by landlords in Mathare. The new model is expected to "break the power of the vendors" because the community

will be involved in deciding who the sub-contractors will be and what the price of water will be (Interview with official who wishes to remain anonymous, August 2008). The company thought that the new design was done, and they were planning to go ahead with implementation in four of the 15 Mathare villages. Then, the Kenya Water Trust Fund (a government investment fund established to finance water provision in areas of poor access) got involved and made suggestions. The model was expanded. The kiosks are now intended to be multi-function kiosks, selling a range of goods as well as water. And, the installation of pipes will be used as an opportunity to improve drainage, that is replace open sewers, in Mathare. The project has taken longer than expected, In February 2010, the construction of kiosks was underway. Community groups had been trained, but water was still free.

Conclusion: iterative experimentation buffeted by wider forces

Water is costing some households in Kibera nearly as much as the rent. Sometimes, families are reduced to one meal a day because the cost of water is high. Many women regularly postpone doing the laundry because water is scarce or too costly. Some women have to postpone their businesses because water has become scarce and several hours are required to obtain minimal water. Water is so uncertain that many, probably the overwhelming majority, store numerous jerry cans and other containers in their homes in circumstances where contamination is likely.

The task of creating infrastructure and institutions able to improve access to water is substantial. The water company has embarked upon a process of social and technical engineering which amounts to building foundations for municipal institutions and extending several levels of government. Engineers are working with sociologists and non-government organizations to "empower" communities and build infrastructure. This is a process which involves trial and error and is subject to pounding by external forces.

We have described three phases of innovation. First, *Maji Bora Kibera*, an association of water traders, many of whom were also landlords, was formed. This was an attempt to build on the existing informal and often illegal structures of water marketing established in Kibera. This initiative sought to resolve differences, about water payments, corruption, illegal connections and leakages, between the water company and the water traders. Misunderstandings seem to have brought this phase to an end. The intervention of the Kenya Police enforcing disconnection of all water pipes, first in Mathare, then in other settlements including Kibera, reinforced mistrust between the utility and the water traders and made the future of the initiative doubtful.

Then, in Mukuru, a second initiative brought technical aspects of innovation from Kisumu with the "chamber model" of water supply. The technology worked, but water company officials had not thought through assumptions about community control of the meter chambers. They anticipated that community groups would organize the connections and billing at each of the meter chambers but had not made detailed arrangements for this. So, when they revisited the initiative they found that powerful individuals and cartels controlled the chambers.

The third initiative in Mathare settlement brought a more conscious effort at community organizing into the process. We could call this a forerunner of deliberative democracy (Rodrik 2002, Evans 2004). In 2010, the Mathare project continues to make progress, though much more slowly than anticipated. The departure of the first head of the Informal Settlements Unit from the water company may illuminate the slow progress of this initiative. This supporter of innovative approaches decided to leave the Nairobi Water Company in 2010, after having been moved to another unit in 2008. Leadership of the Informal

Settlements Unit was taken by an engineer "from the central tribe [presumably Kikuyu] who had no knowledge of social issues".

Initiatives seeking to improve access to water in the informal settlements of Nairobi are in themselves projects with technical, social, political and economic dimensions. In addition to this inherent complexity, initiatives are subject to external forces including uneven police action to enforce laws and the activities of informal associations.

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Notes

1. United Nations (UN) HABITAT defines a slum as an area where households lack one or more of the following: durable housing, sufficient living area, access to improved water, access to sanitation, secure tenure. Available from: http://ww2.unhabitat.org/mdg/ [Accessed 25 August 2010). See Davis (2006, chapter 2) for generality of conditions.
2. KWAHO (Kenya Water for Health Organization) has been working on water issues in Kibera. One of its largest campaigns is the regular promotion of a very simple form of solar disinfection (SODIS) of water. Contaminated water poured into an empty soda, bottled water or other polyethylene terephthalate (PET) bottle, and placed in sunlight for six or more hours will be purified by the ultraviolet rays and heat of sunlight. A thorough description of the project, and a comparative analysis with alternative household treatments is reported in Baffrey (2005).
3. In the absence of sanitation facilities, people defecate into a bag and throw the bag onto a garbage heap. There is no systematic garbage collection, so unsanitary conditions prevail.
4. The initiative was started by Shagun Mehrotra, then a Junior Professional at the World Bank seconded to work with the multi-agency Water and Sanitation Program. Brocklehurst *et al*. (2005) provides a brief account of the background to the MBK. It represented a thoughtful and controversial initiative to try to involve landlords (structure owners) who were also water vendors.
5. Investigations by Mehrotra (phone interview March 2010) suggested that water vendors were making high returns but were not getting rich because the costs of the water trade were high.
6. The appraisal involved organizing a meeting of all account holders for each of 16 chambers. When the company expected 26 account holders, only 10 would come. Each person held two to four connections; some also held connections in the name of relatives. The company determined that the more influential people in the community were appropriating most of the connections. What was so bad about that? "When the company charges K Sh 3,500 (US$52), the cartel [is] re-selling at K Sh 20,000 (US$294)." (Ogendo, interview, 12 August 2008).

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