WSUP
Water & Sanitation for the Urban Poor

TOPIC BRIEF

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Business models for delegated management of local water services: experience from Naivasha (Kenya)

The provision of water and sanitation services for low-income urban communities necessarily requires a number of different actors to cooperate: in the case of water supply these actors typically include one or more network operators, an asset owner, and a regulator. In such situations a clearly defined institutional architecture is essential, requiring a series of agreements that define each actor's role, responsibilities and incentives, and how each actor will work with the others. This Topic Brief describes a business model for delegated management of local water services, recently developed with WSUP support in the Kenyan Rift Valley town of Naivasha. This business model is designed to ensure affordable but high-quality services for consumers, profitability for the operators, and sufficient revenues for sustainable asset maintenance.

Diverse actors are involved in the provision of urban water and sanitation services, creating a continuum of partnerships between private-sector operators, public actors and communities.[1] Private-sector participation in urban water supply has had a somewhat controversial history: particular controversy has surrounded the involvement of international corporations in the management of large-scale water supply networks, even though in some cases such involvement has been clearly beneficial for all parties.[2,3] The involvement of small private operators is less controversial. However, it is only in recent years that partnerships with small operators have begun to receive serious attention from researchers, planners and policy-makers.

Here we outline a framework of agreements relating to delegated management of a local water supply network by a small private operator in Naivasha (Kenya). Additionally, we briefly discuss a similar WSUP-supported delegated management agreement in Maputo (Mozambique). Delegated management agreements of this type have been documented previously in Manila in the Philippines,[4] Ecuador,[5] and the city of Kisumu in Kenya.[6]

> The principles of delegated management are similar regardless of whether the contractor is a private company or a community group

The Kisumu experience reported by WSP is particularly useful and relevant here. In Kisumu, small-scale operators are contracted by the municipal water utility (Kisumu Water and Sewerage Company) to manage local supply lines that take water from the bulk supply line into informal settlements. The small-scale operator may supply private connections, shared standpipes or commercial kiosks, and is responsible for billing and revenue collection and minor network maintenance. These operators have been able to run viable businesses while at the same time making water more affordable; this is fully in line with our experience in Naivasha.

A key point made in several previous reports is that the principles of delegated management are similar regardless of whether the contractor is a private company or a community group. In Kisumu, for example, small-scale operators may be private entrepreneurs or community-based organisations. In the Naivasha model described here, the small-scale operators are private entrepreneurs, but we consider that approaches of this type are equally applicable to situations in which the small-scale operators are community groups.

Also key for effective functioning of delegated management systems of this type are a) clear contractual arrangements and b) appropriate financial incentives for all actors. The present Topic Brief focuses particularly on these two aspects: on the contractual agreements between the key actors (borehole operators, small-scale network operator, utility, and asset owner), and on revenue transfers between actors that ensure sustainable system function.

Groundwater in the Naivasha region (as in many other Rift Valley locations in Kenya, Ethiopia and Tanzania) has very high fluoride levels, so that water needs to be defluoridated for drinking and cooking use. In the WSUP-supported Naivasha programme, defluoridation is done at the individual kiosk level using a local-technology bone char filtration system. For more information about the defluoridation process and about community demand for defluoridated water in Naivasha, see the box on page 8; this does not affect the basic business model described here.

Naivasha: background

Naivasha is a secondary town of about 70,000 people, but low-income settlements are rapidly developing nearby in association with the local floriculture industry. The Naivasha municipality has a population of over 300,000 distributed around Lake Naivasha and the surrounding hills. In the low-income settlements of Karagita and Mirera (current population about 55,000), Kamere (current population about 11,000) and Kasarani (current population about 12,000), WSUP is supporting the improvement of water services by construction of borehole-fed local water distribution networks supplying community water kiosks.

Ownership of discrete systems, each supplying around 20,000 population, is then transferred from WSUP to the local asset owner for water infrastructure (Rift Valley Water Services Board, RVWSB) under an Asset Transfer Agreement. Other contracts formalise operation and maintenance arrangements. Together, these agreements specify the relationships and revenue transfers between the five key actors: RVWSB, the water utility Naivawass, the private borehole owners, the small private operator responsible for managing the network and the water treatment process at kiosk level, and the individual kiosk attendants.

How does the model work?

The system developed in Naivasha involves groundwater extraction by private borehole owners, who sell raw water to the small private network operator, who then distributes the water to a series of kiosks where some is treated for removal of fluoride, while the remainder is left untreated and sold at a lower price than the treated water. Kiosks may be staffed by employees of the private operator or may be sub-contracted out (though the private operator retains responsibility for managing the water treatment process):

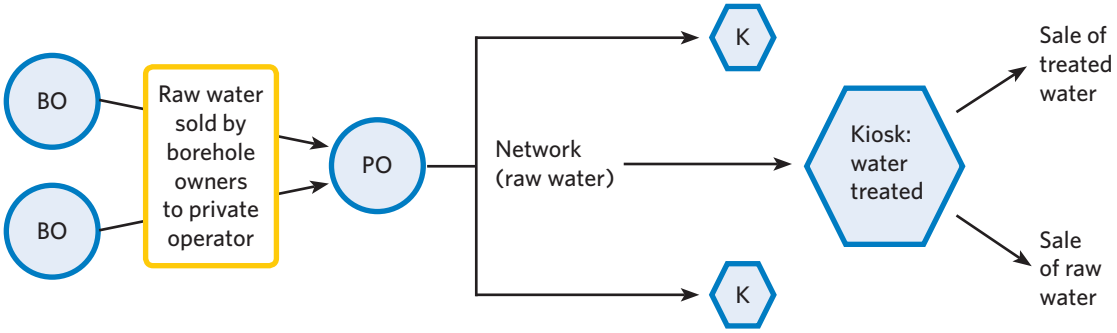


Figure 1. Basic structure of the Karagita water supply model in Naivasha.
Other supply areas may differ from this in the details, but the basic principles remain the same.
BO = borehole owner; PO = small private network operator; K = kiosk.

The model is structured by a series of contracts between the different actors, as summarised in Figure 2 on page 5, and as detailed in what follows.

Asset Transfer Agreement

This is an agreement between the asset owner (here RVWSB) and the financier/developer (here WSUP). The asset owner receives the fixed assets from the financier/developer subject to the following requirements:

- a set allocation of revenues from the *sub-agency agreement* (between private operator and utility; see below) goes to a low-income community (LIC) investment account to cover ongoing capital maintenance costs and expansion of pro-poor services
- a customer complaints procedure is set up via the local Water User Association
- a representative of the Water User Association is included on the utility board
- the utility is required to maintain ring-fenced records for the target service area
- the utility is authorised to replicate the sub-agency model in other low-income areas
- affordable and financially sustainable tariffs are set, approved by the National Regulator, and reviewed annually
- compliance of the utility and borehole owners with the terms of their supply agreement is ensured

The principal fixed assets transferred are the local water distribution network including storage tanks, and the individual kiosks each with water treatment unit. (The two boreholes and their pumping systems remain privately owned in the Karagita model, but this may differ in other locations such as Kamere.)


Digging a pipeline trench in Kamere

Sub-Agency Agreement

This is an agreement between the small private network operator (i.e. the sub-agent) and the utility (here Naivawass). The small private operator purchases raw water from the borehole owners, and manages distribution through the local network to household connections and kiosks. Within each kiosk some of the raw water is treated, with both raw and treated water then offered for sale (treated water is about twice as expensive as raw water; see box on page 6). The sub-agency agreement specifies that the sub-agent should:

- monitor water quality according to utility specifications
- clean the storage tanks
- manage the contract with the bone char supplier (for water treatment)
- employ kiosk attendants and monitor their performance
- ensure storage levels for 13-hours-per-day supply to the kiosks
- take and record meter readings together with the borehole owners and kiosk attendants
- collect and document revenue
- pay the utility (Naivawass) 15% of net revenue (see Figure 2 on the next page)
- pay for local network repairs

Equally, the sub-agency agreement requires that the utility should:

- supply and maintain meters
- set and monitor construction quality standards for new connections
- pay for extensions of the network as financial resources allow
- administer the customer complaints procedure

Bulk Water Supply Agreement

This is an agreement between each of the private borehole owners and the utility (here Naivawass). The utility authorises the borehole owner to sell bulk water to the sub-agent at a specified tariff. The sub-agent is required (under the sub-agency agreement) to purchase raw water only from the two borehole operators, and in equal amounts from each. The tariff is reviewed annually in relation to the cost of electricity.

Under the WSUP-supported project, borehole pumping systems were upgraded with direct subsidy from WSUP (around US$10,000 per borehole). Under the terms of the bulk water supply agreement, these amounts are treated as if they were interest-free loans from the asset holder to the borehole owners, to be repaid once the water supply network is generating revenues above a certain threshold. The sub-agency agreement specifies that the sub-agent shall be responsible for collection of these repayments, to be transferred to the asset owner's LIC investment account. Evidently, a similar approach could be used in eventual replications of this approach financed by the asset holder without donor support.

"Full coverage of capital replacement costs is rarely achieved even in high-income countries"

What are the model's goals?

By defining the responsibilities of the different actors, and by closely specifying percentage revenue transfers *between* these actors (see Figure 2, below), this delegated management model aims to achieve the following critical outcomes:

1) Affordability of the drinking water for low-income households
2) Acceptable service standards, in terms of water quality and continuity of supply
3) Reasonable profitability for the private operators
4) Generation of revenues sufficient to cover the operating and maintenance costs incurred by private operator and utility
5) Generation of revenues to *partially* cover the debt service costs and capital replacement costs incurred by the asset owner

Experience to date in Naivasha suggests that these goals are basically being met, though –as further discussed below– full coverage of capital replacement costs will certainly not be achieved. Full coverage of capital replacement costs is in fact rarely achieved even in high-income countries.[6] Here it is worth noting that the WSUP-supported networks are using polyethylene (PE) and concrete piping systems, with a projected 40-year lifespan, as opposed to the shorter-lifespan PVC and steel systems widely used in Kenya.

It should be stressed that the WSUP-supported system in Karagita is relatively recent: it currently comprises two boreholes, the privately managed local network and 8 kiosks serving a population of about 6,000 people. The system has been in operation since January 2010. An expansion is currently underway to serve an additional 14,000 people.

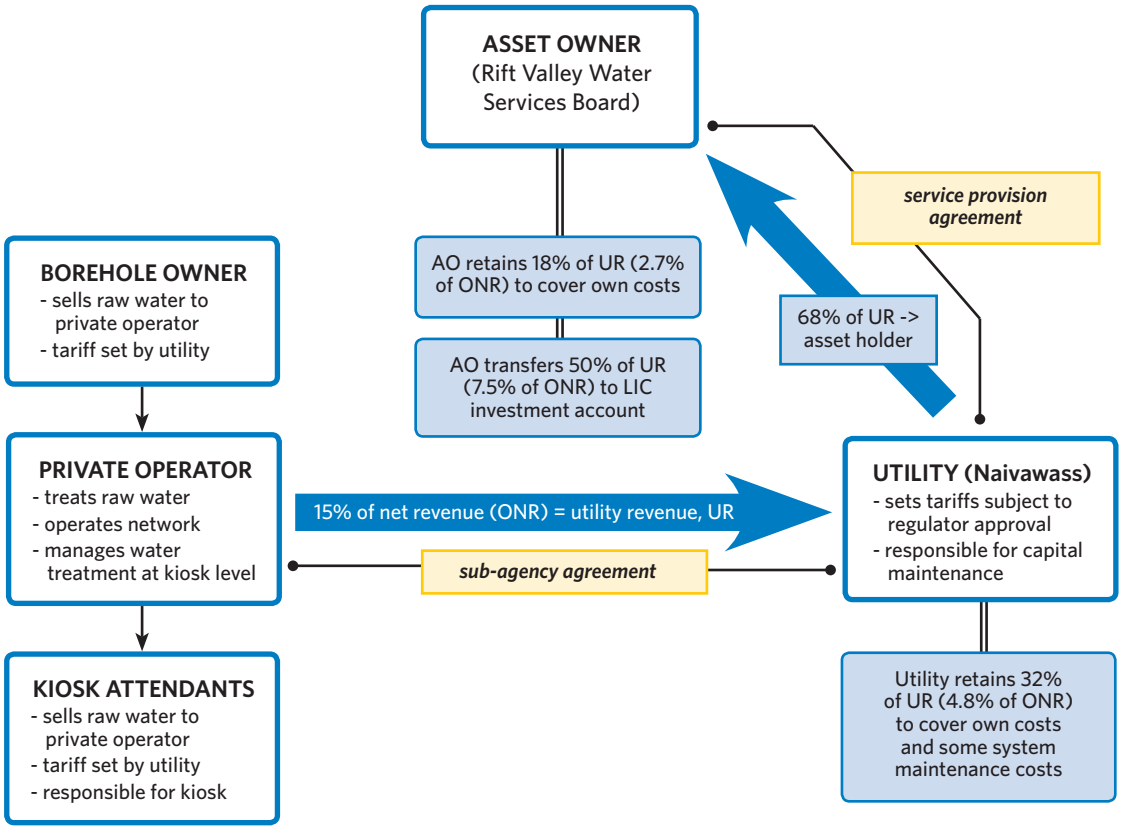


Figure 2. Schematic representation of the Naivasha business model, showing percentage transfers of revenue between the different actors.
ONR = operator net revenue, defined as total sales less [purchase price of borehole water plus costs of water treatment]
UR = utility revenue (i.e. 15% of ONR); AO = asset owner;
LIC = low-income community capital maintenance = ongoing rehabilitation/replacement of existing infrastructure
Naivawass is 49% owned by RVWSB, and 51% owned by the municipality
Not shown on this diagram: bulk water supply agreement between Naivawass and the borehole owner

Cashflow projections for a 14-kiosk system serving 20,000 people in Karagita

US $ per year (1 US $ ≈ 81 Kenyan shilling)	Borehole owner	Private operator	Kiosk attendant[3]	Utility	Asset owner
Total Revenues	8,235	34,312	4,289	2,492	1,695[6]
Untreated water	8,235	21,445	3,064		
Treated water		12,867	1,225		
Transfers				2,492	1,695
Total Costs	7,258	29,663	4,287	2,544	
Power	3,251	297			
Water		8,668	2,580		
Treatment		9,029			
Admin & staff	2,672	7,718	14,841[4]	626	
Maintenance	1,682	1,187	223	223	
Transfers	867[1]	2,492[2]		1,695[5]	
Net revenue % of turnover	544 6%	4,649 13%	0 0%	36 1%	

Water tank construction, Karagita

As at January 2011, the system serves about 6,000 people via 8 kiosks; the above projections are for an expanded system (currently under construction) serving about 20,000 people via 14 kiosks. This analysis also assumes that kiosk attendants will be self-employed sub-contractors, although at present they are employees of the private network operator. The analysis does not take into account repayment of the loan to the borehole operators (*see above*).

[1] 1% abstraction licence, paid to National Environment Management Agency (NEMA).

[2] Payment of 15% of ONR (as defined in Figure 2) to utility.

[3] The figures in this column are average figures for a single attendant (one of the total of 14).

[4] This is effectively a single attendant's income.

[5] From utility to asset owner: this is to cover asset owner operating costs, and to contribute to capital maintenance costs of the existing system and ongoing capital investment in other low-income communities.

[6] Of this amount, the asset owner retains US$449 (18% of the revenue passed to the utility) for own costs, and places the remainder in a LIC investment account to contribute to debt service, capital replacement costs and further investment in low-income communities.

> "The Water Act of 2002 has ensured a solid and appropriate framework for delegated management arrangements of this type"

Key success factors for building the model

Building local ownership

During programme planning, the participation of a Project Executive Committee with representatives from all interested parties and clear roles in programme implementation was essential. This committee included representatives from RVWSB (the asset owner), Naivawass (the utility), the bore-hole owners, donkey-cart water sellers, Naivasha Municipal Council, the Naivasha Riparian Association, the National Environment Management Authority, and flower growers' associations. Project implementation was coordinated with a local community committee that then became the Karagita Water Users Association by registration.

Capacity development

Key aspects of capacity development included:

1) Legal support for developing the model and negotiating the agreements
2) Support to Naivawass in governance, strategy, planning operations, management and human resources to improve its performance and sustainability and to accommodate the sub-agency agreement
3) Support to Naivawass in strengthening its revenue collection and accounts systems as a means of improving overall performance and engaging the management in improving services to the poor, as well as allowing ring-fenced accounts for the discrete delegated management sub-agencies
4) Support to Naivawass and Naivasha Municipal Council in developing a master plan for water services to the town's low-income settlements
5) Technical assistance in network design, water treatment, financial modelling and community mobilisation, within low-income settlements only
6) Assistance to bore-hole owners in business development

Enabling conditions

The Water Act of 2002 has ensured a solid and appropriate framework for delegated management arrangements of this type. Under this Act, all service providers above a certain size are required to be legal entities subject to regulation: small operators supplying over 20 households and/or more than 25,000 litres a day for domestic use are required to enter into a sub-agency agreement with the region's utility.[7]

Fluoride treatment

As noted, a key component of the model in Naivasha has been defluoridation (*see next page*).

Defluoridation

Why defluoridation?

In Naivasha – as in many Rift Valley areas of Ethiopia, Kenya and Tanzania, and in other regions worldwide – fluoride levels in groundwater are dangerously high, so that defluoridation of drinking water is a public health imperative. The Karagita kiosks supply both untreated water for non-drinking use, and drinking water that has been defluoridated by a filtration process using locally manufactured bone char. So the general business model described here is potentially of broad applicability in other low-income contexts elsewhere, but the defluoridation component of the system is specific to Naivasha and other high-fluoride areas.

Fluorides and health

Ingestion of fluorides in drinking water can cause dental and skeletal fluorosis, organ damage and cancer. The results of long-term exposure to high levels of fluoride are irreversible. Excess levels of fluoride are not perceivable in the taste, smell or colour of the water, and are not removed by boiling.

In Naivasha –as in many parts of Ethiopia, Kenya, Tanzania, India, Pakistan, Bangladesh, Mexico and Iraq– the groundwater contains levels of fluoride above the 1.5 mg/l guideline limit for drinking water set by the WHO.[8] Specifically, water quality tests of boreholes in Naivasha have found fluoride levels ranging from 6 to 25 mg/l.

The defluoridation process in Naivasha

The Karagita kiosks defluoridate water using a process developed by the Catholic Diocese of Nakuru (CDN), in which water is filtered through locally produced bone char (processed and treated animal bones) with a commercially produced activator. The CDN is currently the sole producer and supplier of bone char to household and community defluoridation units in Naivasha and elsewhere throughout the Kenyan Rift Valley. For details of this technology and the current production model, see Arrenberg (2010).[9] This author concludes that the existing system maintains affordable costs and acceptable quality, but that its current revenue does not allow for future expansion of operations. Additionally, the characteristics of this centralised system make filter maintenance a significant problem.

In Karagita, each kiosk sells both untreated water for washing and hygiene, and defluoridated water for drinking and cooking. The price of water at the kiosks reflects the treatment process and the aim of financial sustainability: so untreated water sells at 1 Kenyan shilling (US$0.01) for 20 litres, and treated water at 2 Kenyan shillings (US$0.02) for 20 litres. Note that defluoridation is carried out at the kiosk level (rather than centrally) because this is the cheapest and simplest way to offer both treated and untreated water.

Water cum grocery kiosk in Karagita offering both defluoridated and untreated water

Community attitudes to defluoridation

Stroud (2010)[10] investigated kiosk use patterns and community attitudes in Karagita, within the first year of system operation. The great majority of people living within 100 m of the WSUP-supported kiosks are using them despite availability of other sources of supply. Of people living in Karagita but over 100 m from the kiosks, about half are using the kiosks, while the remainder rely mostly on donkey vendors.

However, 30% of kiosk users are buying only untreated, not defluoridated water, mostly because they consider the defluoridated water to be too expensive. Even among those purchasing treated water, about 40% are using it for drinking only, not for cooking. Non-purchase of defluoridated water does not appear to be related to low income: rather, it appears to be related to poor understanding of the health risks of fluorides. There is thus a clear need for ongoing community education about the health risks of fluoride.

> "Scale-up will require national government, local government and/or asset owners to take responsibility for future investment"

Scale-up and wider applicability

In the ongoing WSUP-supported intervention in Karagita/Mirera, all capital costs are covered by grant funding; scale-up to the rest of Naivasha and other Rift Valley towns will require national government, local government and/or asset owners to take at least partial responsibility for future investment. Financial projections based on the business model detailed above indicate that the capital cost for a system in Karagita serving 20,000 people via 14 kiosks will be 27 million Kenyan shillings (about US$335,000), while the asset owner will obtain an annual revenue of about US$1,382 per year (after a retention to cover own costs; see Figure 2 and cash-flow projections table, pages 5 & 6).

This is not sufficient for full cost recovery, i.e. debt service plus capital replacement costs (capital maintenance costs, CapManEx; see ref. 11). However, it is sufficient to cover debt service costs of a concessionary loan (estimated at 1% of loan amount per year) and about 30% of CapManEx (estimated at 10% of investment amount per year). Note that full cost recovery including CapManEx would be unusual even in a high-income country,[12] so that we can consider debt service and coverage of 30% of CapManEx to be acceptable.

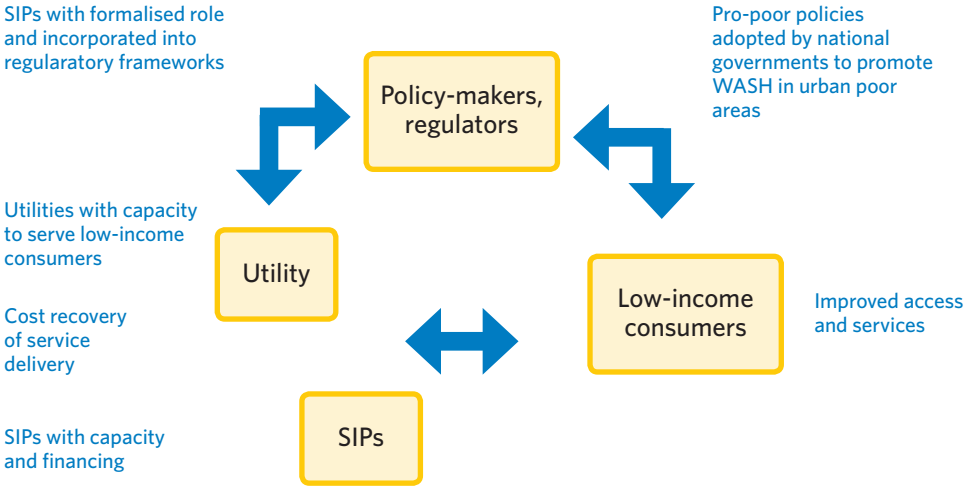
Thus the proposed model ensures critical outcomes 1–4 as listed on page 5, but requires substantial non-recoverable subsidy of capital costs (roughly US$1.2 million per 100,000 population, $12 per person). This subsidy might come from various sources, including national government tax revenues, a surcharge on household water bills, and/or external grant funding. In the authors' view, the need for some subsidy is normal: in other words, business models centred on profitability for private operators are critically important for improving water and sanitation for the urban poor, but the necessary capital investment will typically require public funding. [We stress that these are initial calculations based on projected revenues, pending more detailed data collection and financial analysis currently being carried out.]

Is there currently any interest in expanding the model in Naivasha or elsewhere in the Kenyan Rift Valley? The local private operator has informally suggested that they might be interested in expansion in Naivasha, with significant partial contribution to investment costs: it remains to be seen whether this may materialise. The asset owner RVWSB is understandably interested in asset transfer and sub-agency agreements, i.e. in investment models that pass ownership of assets to RVWSB rather than local communities.

However, RVWSB also recently committed to substantial counterpart funding in an investment bid based on the WSUP-supported approach (US$200-300,000): although this particular bid was not successful, this gives an indication of RVWSB's willingness to commit. Finally, the utility Naivawass report that they are happy with the delegated management model described here: although they do not derive significant revenues, they are able to expand their coverage (i.e. meet their social goals) without significant risk of *losing* money, and with minimal human resource requirements because system management becomes the responsibility of the sub-agent.

> In Maputo (Mozambique), WSUP is supporting development of another decentralised arrangement

Figure 3. Pro-poor service delivery models involving delegated infrastructure management by small independent providers . SIPS: private operators, vendors, trusts, CBOs.



A general model for pro-poor services?

These results from Naivasha support the view that well-structured delegated management agreements involving small private operators, as summarised in the schematic diagram above, can offer a very effective framework for water and sanitation service provision to the urban poor. Alongside WSP's positive experience in Kisumu, this strengthens the evidence base in favour of this model, and argues for wider application of models of this type in Kenya and beyond.

Within Kenya, Nairobi City Water and Sewerage Company is beginning to implement delegated management models for water kiosks and ablution blocks, as widely implemented in many African cities (for an overview, see ref. 13); however, NCWSC is not currently involved in agreements for delegated management of local supply networks. It may be that in Nairobi and other cities utilities are able to bypass small private operators and achieve direct service provision to low-income areas; but delegated management is clearly an attractive possibility.

In Maputo (Mozambique), WSUP is supporting development of another decentralised arrangement under which a small private operator (Empresa Moçambicana de Águas, EMA) is subcontracted by the main utility (Águas de Moçambique, AdeM) to manage water supply within the low-income bairro of Liberdade, population about 25,000. AdeM is a consortium of Mozambican companies and Águas de Portugal, currently operating the water supply network on a 15-year lease contract with the asset owner FIPAG (Water Assets and Investment Fund) ending in 2014.

Following a period of service agreement between AdeM and EMA, the two parties have recently formalised a management contract. Under this contract, EMA has taken on full delegated management of the water supply to AdeM customers in Liberdade. AdeM supplies and charges EMA for bulk supplies, and EMA collects revenues from customers. Since early 2009, WSUP has been supporting EMA with capacity development, and facilitated the formulation and formalisation of the contract arrangement between AdeM and EMA, including legal support.

Capacity development with EMA has included support with financial modelling, billing and revenue collection, business planning, baseline surveys, hydraulic network condition surveys, and network improvements. As at January 2011, EMA manages about 4,000 existing connections in Liberdade (total monthly billing about US$40,000), and continues to improve billing and collection efficiency. Ongoing network improvements

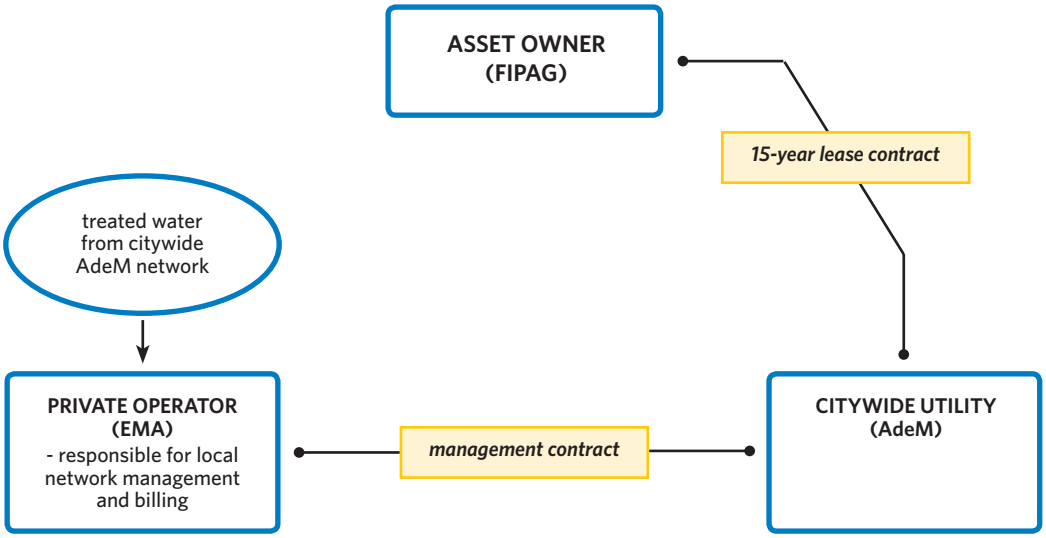

Karagita schoolchildren with new water supply

will provide water services to about 650 new households, and shared connections giving access to about 3,500 low-income consumers. Network extension to cover the remaining unserved areas of Liberdade will be dependent on AdeM's ability to provide increased bulk water supply to EMA. We are cautiously optimistic that this will be possible with the implementation of the current Maputo Water Supply project, under which the Maputo water assets base is being significantly improved by FIPAG.

This experience of helping to develop a small-scale local operator has been important for demonstrating the viability of the delegated network management model in Maputo as a mechanism for reaching poorer neighbourhoods. FIPAG is interested in this model and its possible wider replication in Mozambique. The EMA experience has highlighted several key challenges that need to be addressed when adopting this model on a wider scale:

- The capacity and resources of small local operators is often relatively weak, and therefore a sustained period of capacity development is required to help them to strengthen their operational skills
- Small operators may need access to investment and credit facilities to help them develop their operations and ensure sustainability
- The management contract developed for EMA could be used as a model for future contracts. However, the current form of the lease contract between FIPAG and AdeM imposes significant constraints on the formulation of delegated management contracts of this type

Figure 4. Schematic representation of the Maputo business model.
Detailed revenue transfer data not currently available.



A key difference between Naivasha and Maputo is that the Naivasha model concerns locally extracted borehole water, while the Maputo model involves bulk treated water supplied from the utility-run main network; and of course there is high demand throughout the city for this finite supply of water. In such situations, main utilities *may* view delegated management contracts as a way of achieving their coverage aims with minimal investment in infrastructure and human resources; but equally, and to some extent understandably, they may feel that by supporting small private operators they

> "The Naivasha model concerns locally extracted borehole water, while the Maputo model involves bulk treated water supplied from the utility-run main network"

are reducing their own direct sales and nurturing future competitors. Here it is relevant that small private operators tend to operate at the periphery of main networks, and in fact one long-term possibility is that the utility moves gradually into the periphery, while small private operators move ever further out until they are finally absorbed entirely.

Conversely, another option currently being considered as a possible solution by the asset holder FIPAG in Maputo is that the Greater Maputo area be divided up into relatively small areas in each of which water supply is managed by a small private operator like EMA. Clearly, these decisions have important implications for the negotiation of delegated management agreements of this type, and for services to the poor. It is the asset holder's role to ensure that there is an appropriate "balance of benefits" between the main utility and small private operators, in such a way as to optimise service for the poor.

In all cases, *clearly defined contractual agreements* are key to system function. The most successful and sustainable examples are found where contracts are clear about ownership, management and operation; where the SIPs are "tuned in" to their customers; where there are incentives to maintain healthy financial performance; and where the regulatory environment is supportive.

WSUP believes that models of this type are widely useful to municipal governments and service providers interested in achieving pro-poor water service delivery in secondary towns in Kenya, and potentially beyond. We invite requests for further information or support. Copies of the models of contract described in this Topic Brief are available for download from the WSUP website.

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